

To know or not to know? Exploring COVID-19 information seeking with the risk information seeking and processing model

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Abstract

To cope with the COVID-19 pandemic and reduce uncertainty, the public needs accurate and timely information. Inspired by the risk information seeking and processing (RISP) model, this article discovers the significant predictors of individuals' COVID-19 information-seeking intention and behaviour. Overall, 394 adult participants from 47 states completed this study's online survey. The hierarchical regression analysis reveals that risk experience and informational subjective norms are the most substantial predictors of individuals' online information-seeking behaviour about COVID-19. Information insufficiency did not predict information seeking, and participants tend to overestimate their knowledge about COVID-19. RISP variables tend to share power in explaining the variances of information-seeking behaviour. Moreover, both channel beliefs and perceived information gathering capacity moderate information insufficiency's prediction of information-seeking intention. These findings will assist researchers in discovering the fundamental motivation of information seeking. This article can guide pragmatic interventions to reduce the public's uncertainty and mitigate the risk.

Keywords

COVID-19; crisis; health communication; information seeking; RISP

1. Introduction

While facing the COVID-19 pandemic, the public experiences high levels of uncertainty and fear. As of 30 December 2021, this pandemic has already caused 53,795,407 cases and 820,355 deaths in the United States [1]. It has also changed the way we work, live, research and communicate. Classes have been forced to move online, and people have been required to work from home. The Internet has become a major information channel for many people [2,3]. The information gap between ordinary citizens and experts prevents the public from mitigating risk and reducing uncertainty [4]. Thus, it is vitally important to empower the public to seek accurate information which can change their attitudes and behaviour coherently with consistent medical advice.

This article aims to investigate variables that impact individuals to seek COVID-19 information online and explore strategies to enhance information seeking. Specifically, this article theoretically and empirically examines the risk information seeking and processing (RISP) model [5]. Unlike many studies that tend to neglect 'communication and provision of information seeking' and overlook seeking motivations and search process [6], RISP posits that information seeking is motivated by individuals' desire to overcome information insufficiency, which is predicted by individual

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characteristics, risk perception, norms, information gathering capacity, and channel beliefs. Examining RISP's propositions in the COVID-19 context can assist scholars to unpack the underlying mechanism of health information seeking.

This study discovered that only risk experience and informational subjective norms significantly predicted individuals' COVID-19 online information-seeking behaviour. When individuals experience COVID-19-related symptoms or perceive stronger social norms for seeking COVID-19 information, they are more probably to seek COVID-19 information. Many people tend to perceive that they have enough knowledge to cope with the pandemic, which echoes the finding that information insufficiency did not significantly predict information-seeking behaviour.

Moreover, through exploring channel beliefs – the extent to which risk information on a channel is perceived as trustworthy and useful, this study examines RISP's attempt to bring communication's role in information seeking and analyses how channel beliefs impact information-seeking intention and behaviour. Particularly, when people perceive online COVID-19 information as exaggerated, biased, not trustworthy or unuseful, their information-seeking intention decreases even if they lack the knowledge to cope with the pandemic. Similarly, information insufficiency's impacts on information-seeking intention were moderated by perceived information gathering capacity. When individuals have a lower capacity to gather information, the impact of inadequate information on their intent to seek information decreases. These findings add new knowledge to the information-seeking literature and offer implications for health campaign design and risk management practice.

2. Literature review

2.1. RISP

Facing the COVID-19 pandemic, researchers and professionals need to unpack the underlying mechanism of information seeking. Many studies have succeeded in describing active information seekers' characteristics [7]. Some studies narrowed the discussions of information seeking to certain diseases or risks, as opposed to exploring individual seekers' motivations and search procedures [8,9]. Consequently, the knowledge from these studies may not be generalised to other contexts, such as COVID-19. RISP, however, has been examined in various health and risk contexts, such as flood [10], the H1N1 vaccine [11] and COVID-19 [12,13].

Moreover, in many information-seeking models, information-seeking mechanisms and their impact on the success of messages to facilitate healthy attitudes and behaviour have been less well understood. Health and risk information seeking should be treated as a unique concept, driven by various motivations and personality traits [14]. Thus, to better understand and predict COVID-19 information seeking, this study examines the RISP model.

RISP aims to unpack the mechanism of information seeking in which information seeking and processing are believed to be predicted by individual characteristics (e.g. risk experience), perceived risk characteristics, informational subjective norms, information insufficiency, channel beliefs and perceived information gathering capacity [5]. This article focused on exploring the effectiveness of RISP in predicting individuals' intention to seek COVID-19 information online and their COVID-19 online information-seeking behaviour. The following literature review introduced RISP's theoretical foundations, its core propositions and related empirical studies on health information seeking.

2.1.1. RISP theoretical framework. The RISP model (Figure 1) includes some of the same causal factors from the theory of planned behaviour (TPB) [15] and the heuristic systematic model (HSM) [16]. Impacted by TPB [15], RISP [5] posits that when individuals perceive the social pressure to obtain information (informational subjective norms), they will seek information; this prediction will be modified by their ability to gather information (perceived information gathering capacity).

According to HSM [16], if individuals recognise that their information cannot allow them to make a confident risk judgement, they will use systematic processing. Impacted by this statement, RISP posits a core proposition, that is, perceived information insufficiency will motivate individuals to actively seek information and use more cognitive effort to process information [17]. Recent research explored COVID-19 information seeking in the early stage of the COVID-19 pandemic and showed that only partial RISP variables – fear, information insufficiency and channel beliefs – significantly predicted information seeking [12]. This current study further explored how RISP constructs predict COVID-19 information seeking during the crisis stage of the pandemic.

2.1.2. Risk perception. Previous research suggests that individuals' cognitive evaluation of risk and affective responses to risk impact how they seek and process health and risk information [10,11,18]. According to RISP, perceived risk/hazard

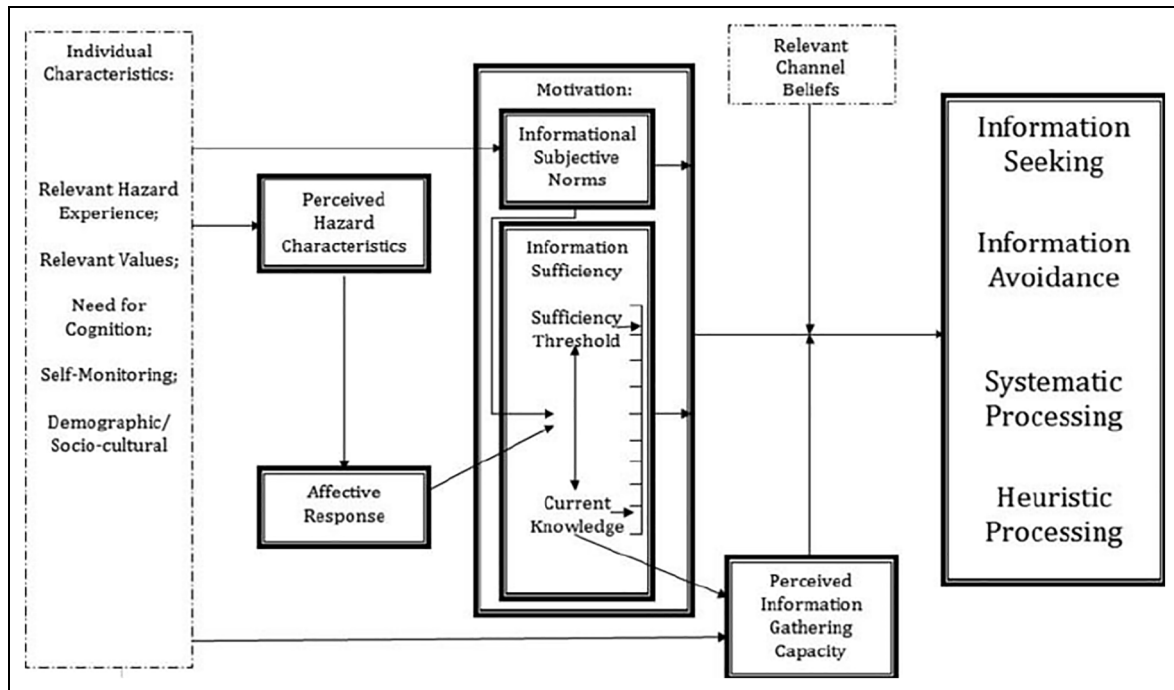


Figure 1. RISP model [5].

characteristics impact the perceived social norms of seeking relevant information and information sufficiency and hence impact risk information processing [5].

RISP [5] claimed that perceived risk characteristics predict individuals' affective responses to such risk (see Figure 1). Recent research focused on Chinese participants' COVID-19 information seeking and avoidance during the early stage of the COVID-19 outbreak [19]. Those authors found that participants' perceived risk of COVID-19 was associated with their affective responses to COVID-19 [19]. This current study explored risk perception's role in influencing American residents' COVID-19 information seeking.

2.1.3. Affective responses. Affective responses to risk have also been shown to impact information seeking [10,11]. RISP proposed that affective responses to risk impact information seeking by influencing information insufficiency [10,11,14]. According to RISP, both negative (e.g. fear, anger and worry) and positive affective responses (e.g. hope) indirectly predict health and risk information seeking [10,11]. Many empirical studies largely focused on negative affective responses to risk, such as anger, worry and fear [12,19], while paying limited attention to both negative and positive affective responses to risk, such as hope [11]. For instance, previous surveys of Chinese consumers' intention to seek and avoid COVID-19 information found that anxiety was associated with the increased intention to avoid information seeking [20]. Negative affective responses to the COVID-19 pandemic also impacted participants' perceptions of the information sufficiency threshold but did not predict the systematic processing of COVID-19 information [13]. These inconsistent findings call for a further examination of affective responses in information-seeking research. As such, this article explored how negative and positive affective responses to risk influence information seeking in the context of COVID-19.

Moreover, the most important query in the current health and risk information-seeking research is the lack of consensus regarding the fundamental motivations of information seeking. Inspired by the RISP model, this article explored how information insufficiency and informational subjective norms motivate individuals to seek COVID-19 information.

2.1.4. Motivations for information seeking. RISP proposes that the underlying motivation of information seeking is information insufficiency. As a unique construct of RISP, information insufficiency is defined as 'a person's perception that he or she needs more information to deal with the risk, that is, that his or her current knowledge is less than sufficient'

[10]. RISP argues that people's desire to overcome information insufficiency predicts information seeking and systematic information processing [5].

Previous research has discovered complex findings regarding this proposition. For instance, information insufficiency predicted both COVID-19 online information seeking and information avoidance [12]. In contrast, other articles suggest that participants tend to avoid information seeking to maintain information insufficiency where learning more about risk is not pleasant [21]. Previous RISP research found that college students tend to overestimate their knowledge about the H1N1 vaccine [11], which is consistent with some studies' findings [22,23]. This finding may indicate that the need for achieving information sufficiency is perhaps not the primary motivation for information seeking [11]. This study further examined how information insufficiency impacts COVID-19 information seeking.

Moreover, according to RISP, informational subjective norms impact information seeking [5]. In other words, when individuals believe that they are expected by relevant others to know about a risk topic, or when they perceive that relevant others already have obtained the risk information, they will show a stronger desire to achieve information sufficiency and hence seek and process risk information [14]. One study on COVID-19 information seeking found that Chinese participants' informational subjective norms significantly predicted their COVID-19 information seeking [19]. This current article examined how RISP constructs predict American residents' online information seeking about COVID-19 during the crisis stage.

More importantly, it is worth noting that many empirical studies have not fully examined all propositions of RISP. Particularly, RISP highlights the relationship between information channel usage and information seeking and suggests that channel beliefs may have direct and indirect impacts on information seeking [24]. Such suggestion needs to be clarified with empirical studies.

2.1.5. Information seeking and information channel usage. Information seekers evaluate whether a channel can meet their information needs [5,17]. RISP proposed the concept of 'channel beliefs' and described it as 'beliefs about channels of risk information, including their trustworthiness and usefulness' [5]. According to RISP, channel beliefs will influence individuals' routine and nonroutine information seeking and the extent to which people will systematically process information [5]. The emphasis on individuals' perceptions of information channels brings our attention to individuals' rationale in selecting channels to seek information. This concept also embraces 'communication and provision of information seeking' which some models have missed [6]. In addition, although the Internet was not the major information channel when this proposition was created, exploring individuals' perceptions of online information helps scholars and practitioners understand what impacts individuals to seek COVID-19 information on the Internet.

The previous study measured channel beliefs by examining the perceived usefulness, trustworthiness and accuracy of information related to the H1N1 vaccine [11]. These findings showed that when college students perceived the information about the H1N1 vaccine as objective and accurate, they were more probably to seek related information [11]. The current study examined how channel beliefs influence individuals to seek COVID-19 information on the Internet.

Moreover, previous studies found that perceived information gathering capacity was associated with more effortful and nonroutine information seeking and processing [24]. RISP also claims that perceived information gathering capacity influences the impact of information insufficiency on information seeking [17]. This article further examined these propositions of channel beliefs and perceived information gathering capacity with survey data.

2.1.6. Information seeking intention and behaviour. While facing a pandemic caused by a novel virus, the public needs to acquire information to reduce their uncertainty and fear and take precautionous behaviour to protect themselves and their loved ones. COVID-19 is a unique context for studying what factors predict health and risk information-seeking intention and behaviour.

It is worth noting that some RISP empirical studies did not distinguish information-seeking intention from actual behaviour. For instance, information avoidance was measured with the following items: 'When this topic comes up, I'm likely to tune it out' and 'Whenever this topic comes up, I go out of my way to avoid learning more about it' [24]. The first item reflected individuals' intention to avoid risk information. However, the second item was about the behaviour of avoiding information. These operationalisations mixed intention with behaviour. Being aware of this issue, this current study distinguished information-seeking intention from behaviour.

As reviewed earlier, previous empirical studies on RISP have generated incoherent findings, which may be the result of modifying the original RISP model or the variation in operationalising the key components. The inconsistent operationalisation of RISP variables leads to the difficulty of examining the effectiveness of the RISP model and, as such, confuses the identification of the essential factors needed to predict information seeking. To examine the effectiveness of RISP in predicting COVID-19 information seeking, this article proposed the following research questions:

RQ: Which RISP variables are significant predictors of COVID-19 information-seeking (RQ₁) intention and (RQ₂) behaviour?

Furthermore, RISP posits that channel beliefs are supposed to impact information insufficiency's prediction of information seeking [23] while limited research has tested this assumption [10,22]. Some of the current literature has examined the moderation functions of channel beliefs on information insufficiency and information processing. For instance, beliefs related to channels' trustworthy cues were associated with systematic processing; beliefs regarding channels' validity cues had a weak association with active information seeking [24]. Recent research on information processing also revealed that channel beliefs were a significant moderator of the information insufficiency's prediction of systematic processing [13]. Inspired by the RISP model and recent research, this article proposed that individuals' evaluation of online information about COVID-19 (e.g. believable, biased, exaggerated and sensationalised, and useful) will influence how information insufficiency predicts their intention to seek information. Thus, the following hypothesis was proposed to examine this assumption.

Hypothesis 1: Individuals' channel beliefs about COVID-19 information on the Internet will moderate information insufficiency's prediction of information-seeking intention.

Similarly, according to the RISP model, perceived information gathering capacity that reflects how individuals' confidence in searching for information to meet their needs is believed to influence information seeking [24]. Perceived information gathering capacity was assumed to interact with information insufficiency – the motivation for information seeking to influence how individuals seek out and process information [5]. A few empirical studies have tested how perceived information gathering capacity moderated the relationship between information insufficiency and systematic process [13]. Nevertheless, the perceived information gathering capacity's moderation between information insufficiency and information seeking needs to be examined. The second hypothesis aims to examine such a proposition.

Hypothesis 2: Perceived information gathering capacity will moderate information insufficiency's prediction of information-seeking intention.

3. Methods

To answer the research questions and test the hypotheses, the current study used a cross-sectional survey design. Considering COVID-19 is a novel virus and most in-person interactions and communication have been severely limited, this study focused on online information seeking. The following sections introduced the study procedure, participants and recruitment, measures and data analysis strategies.

3.1. Procedures

The Institutional Review Board (IRB) application was approved by a large research university. This study's Qualtrics survey link was presented on the VolunteerScience webpage and newsletters. Participants responded directly to the Qualtrics survey, but they were recruited using VolunteerScience (<https://volunteerscience.com/>), an online platform that assists social scientists to launch studies and recruit participants using a national panel. People needed to have visited the VolunteerScience website or have had accounts associated with VolunteerScience to participate in the online survey.

To take this survey, participants must be 18 years of age or older, living in the United States and can read English. People who do not meet the participation criteria were guided to the end of the survey. Before taking this survey, participants were informed about the recruitment criteria, study purpose and survey process, and offered a consent form. Participation is voluntary and confidential. Participants can choose to not respond to any questions and stop participation during the process.

3.2. Participants and recruitment

The authors conducted online surveys to collect adults' self-reported responses that were related to COVID-19 online information seeking. Participants were recruited from 5 June to 5 July 2020, via VolunteerScience. Participants must be adults (18 years of age or older) who have been living in the United States and can read English. To examine the variation of risk experience's impacts on information seeking, participants with and without a positive COVID-19 diagnosis

Table 1. Demographics of participants.

Demographics	Frequency	%
Sex		
Female	208	53
Male	182	46
Non-binary	4	
Ethnicity		
White/Caucasian	344	87
Black/African American	14	4
Other	14	4
Asian	12	3
Hispanic/Latino	7	2
American Indian/Native American	2	0.5
Pacific Islander	1	0.3
Education		
Post-bachelor degree	163	41
Bachelor degree	133	34
Some college	75	19
High school graduate, diploma or the equivalent	23	6
Residence		
Suburban community	179	45
Urban community	99	25
Rural community	80	20
Exurban community	36	9
Politics		
Liberalism	258	66
Conservatism	110	28
Internet		
Yes, have high-speed Internet	381	97
No, no high-speed Internet access	13	3
Health insurance		
Yes, everyone in my household is covered by health insurance.	345	88
No, at least one person in my household is not covered by health insurance.	31	8
Annual income (US\$)		
< 25,000	25	6
25,000–50,000	50	13
50,000–75,000	67	17
75,000–100,000	64	16
100,000–150,000	92	23
≥ 150,000	59	15

or symptom were all invited to this study. This recruitment strategy also ensures that people who were unable to receive COVID-19 routine testing can be included in this study.

This study's description and survey link were presented on VolunteerScience's webpage and newsletters. After excluding incomplete data, 394 participants' responses were analysed. These participants reported living in 47 states. For instance, 45 (11%) participants reported living in California, 27 (7%) in Texas, 21 (5%) in Florida, 17 (4%) in Virginia and 16 (4%) in New York. Participants aged from 18 to 88 years ($M = 51.97$, Median = 54, $\sigma = 16.20$). Table 1 provides other demographics of the research participants, including sex, ethnicity, education, residence community, political philosophy, Internet access, health insurance coverage and annual household income.

3.3. Measures

To achieve a conceptual-operationalisation fit, the first author carefully integrated and modified the existing measures that can capture the conceptual concepts of key variables. When some initial surveys of previous studies were not available, measures were modified based on previous publications' descriptions (see Table 2 for variable measures).

To estimate variables' reliability, Omega (ω) was calculated[26]. Recent publications posited that the Omega coefficient can compensate for the limitations of Cronbach's alpha reliability analysis and is an appropriate reliability

Table 2. Construct measures and psychometric properties.

Variable	Item(s)	Std. ω	α	PAF
Information-seeking intention	Scales: 0 – <i>strongly disagree</i> to 10 – <i>strongly agree</i> I am likely to search for information about COVID-19 [11] (p. 1708).			
Information-seeking behaviour	Scales: 0–8 1. How many channels have you used for seeking COVID-19? 2. How many different types of information* have you looked for in your most recent search of COVID-19 information online? [25]. *Information types include but are not limited to (1) Health and Risk Management Organisations (e.g. CDC, WHO, FEMA, state government and federal government), (2) cause or risk factors leading to COVID-19, (3) coping with COVID-19 (e.g. wearing facemasks, washing hands, maintaining social distance, etc.), (4) information about COVID-19 spreading (e.g. the number of COVID-19 cases, death tolls and screening) and (5) information about COVID-19 prevention (e.g. testing, symptoms and early detection of COVID-19).		0.738	0.766 0.766
Perceived risk characteristics	Scales: 0 – <i>not at all likely/serious</i> to 10 – <i>very likely/extremely serious</i> 1. COVID-19 could put my health at risk. 2. If [SITs/COVID-19] were to put your health at risk, how serious do you think the risk would be? [11] (p. 1709).		0.863	0.871 0.871
Channel beliefs	Scales: 0 – <i>strongly disagree</i> to 10 – <i>strongly agree</i> [11] (p. 1708). 1. I find most information on the Internet about COVID-19 exaggerated and sensationalised (reverse coded). 2. I find most information on the Internet about COVID-19 believable. 3. I find most information on the Internet about COVID-19 biased (reverse coded). 4. I find most information on the Internet about COVID-19 useful.	0.858		0.809 0.801 0.772 0.723
Perceived information gathering capacity	Scales: 0 – <i>strongly disagree</i> to 10 – <i>strongly agree</i> [11] (p. 1708). 1. I feel quite capable of finding the information I need about COVID-19. 2. If I wanted to, I could easily get all the information I need about COVID-19. 3. It is hard for me to get useful information about COVID-19 (reverse coded).	0.777		0.851 0.894 0.646
Informational subjective norms	Scales: 0 – <i>strongly disagree</i> to 10 – <i>strongly agree</i> [11] (p. 1708). 1. My family wants me to know about COVID-19. 2. My friends want me to know about COVID-19. 3. People who are important to me think that I should stay on top of information about COVID-19. 4. I am expected to be knowledgeable about COVID-19.	0.884		0.879 0.826 0.811 0.721
Positive affective	Scales: 0 – <i>strongly disagree</i> to 10 – <i>strongly agree</i> [11] (p. 1708).	0.890		

(continued)

Table 2. (continued)

Variable	Item(s)	Std. ω	α	PAF
Responses	1. How optimistic do you feel when you think about possible treatments or vaccines for COVID-19?			0.907
	2. How hopeful do you feel when you think about possible treatments or vaccines for COVID-19?			0.895
	3. How enthusiastic do you feel when you think about possible treatments or vaccines for COVID-19?			0.755
Negative affective Responses	Scales: 0 – <i>strongly disagree</i> to 10 – <i>strongly agree</i> [11] (p. 1708).	0.951		
	1. How anxious do you feel when you think about COVID-19?			0.958
	2. How worried do you feel when you think about COVID-19?			0.929
	3. How afraid do you feel when you think about COVID-19?			0.904
Information insufficiency	Current knowledge: Rate your knowledge about COVID-19 on a scale of 0 to 100, where zero means you know nothing about it and 100 means you know everything you could possibly know. How much do you currently KNOW about COVID-19? Information sufficiency threshold: Think of the same 0–100 scale again. How much knowledge do you need to cope with COVID-19? [10].			

PAF: principal axis factoring; CDC: Centres for Disease Control and Prevention; WHO: World Health Organization; FEMA: Federal Emergency Management Agency.

estimation of unidimensional measures [27,28]. Therefore, the first author used [28] Macro with maximum likelihood exploratory factor analysis to calculate the standardised [26] Omega coefficients of composite variables measured with three or more items. Cronbach's alpha was conducted to evaluate the reliability of variables with two items in case Omega cannot be computed.

Moreover, the first author conducted exploratory factor analysis (EFA) with the principal axis factoring (PAF) extraction method to uncover the underlying structure of composite variables. The following sections described key variables' measurements and psychometric properties.

3.3.1. Variables.

3.3.1.1. Risk experience. The previous study measured risk experience based on individuals' personal experience with certain diseases or risks, such as symptoms [25]. Since many people may not receive routine tests when this study was conducted in 2020, this study focused on the extent to which individuals experience symptoms associated with COVID-19. Participants responded to this statement: 'I have shown one or more of the following symptoms: cough, fever, tiredness, difficulty breathing, repeated shaking with chills, aches and pains, headache, sore throat, muscle pain, and/or new loss of taste or smell'. Participants selected options from 1 – *none at all* to 5 – *a great deal*.

3.3.1.2. Affective responses. The RISP model does not specify the details associated with the concept of affective responses. However, it suggests that positive and negative affective responses impact individuals' evaluation of their current knowledge about the risk as insufficient. Built on the measurements used by previous research [11], this study measured positive affective responses based on the degree to which participants feel hopeful, optimistic and enthusiastic when they think about the possible treatment or vaccine for COVID-19. Negative affective responses were measured by assessing the extent to which participants feel afraid, anxious and worried [11] about the possible treatment or vaccine of COVID-19. Following previous research's example [11], all items were assessed using 11-point scales ranging from 0 – *strongly disagree* to 10 – *strongly agree*. The measurement of positive affective responses showed high reliability ($\omega = 0.890$) and so did the measurement of negative affective responses ($\omega = 0.951$).

3.3.1.3. Information insufficiency. Information insufficiency was conceptually defined as ‘a person’s perception that he or she needs more information to deal with the risk, that is, his or her current knowledge is less than sufficient’ [10]. Guided by previous studies [10,11], this study measured individuals’ current knowledge and sufficiency threshold to calculate information insufficiency. Participants were asked to report their current information level about COVID-19 and their perception of how much information they need based on 0–100-point scales [10].

To measure information insufficiency, the current study followed an established approach [10,11] that regresses the information sufficiency threshold on current knowledge to calculate ‘difference’ scores [29]. To be specific, the information sufficiency threshold measure was set as the dependent variable and current knowledge was set as the independent variable. The standardised residual that effectively reflects the difference between current knowledge and the sufficiency threshold was saved as the final measure of information insufficiency. The regression approach is especially appropriate when it is necessary to calculate difference scores between two correlated variables [29,30], such as in the case of current knowledge and information sufficiency.

3.3.1.4. Perceived risk characteristics. RISP does not offer a clear conceptualisation of perceived risk characteristics. It has been measured as perceived susceptibility and severity [11] and trust in risk management agencies [31]. However, the trust measure was shown low reliability ($\alpha = 0.58$) [10]. Guided by previous empirical research [11], this current study measured perceived risk characteristics by assessing perceived probability and perceived severity. For instance, the perceived probability was assessed by the following item: ‘COVID-19 could put my health at risk’. All responses to questions were from 0 – *not at all* to 10 – *very likely*.

3.3.1.5. Channel beliefs. Channel beliefs were defined as ‘one’s beliefs and evaluations about the outcomes of one’s seeking and processing risk information from various channels’ [14]. Previous empirical studies have measured channel beliefs by examining the perceived validity, usefulness and trustworthiness [10,11,32]. Following the previous study’s [11] example of measuring channel beliefs about the H1N1 vaccine, this study measured channel beliefs based on the degree to which participants perceive online information about COVID-19 to be biased, exaggerated and sensationalised, useful or believable. The responses to these items were measured using 11-point scales ranging from 0 – *strongly disagree* to 10 – *strongly agree*.

3.3.1.6. Informational subjective norms. Previous RISP research defined informational subjective norms as ‘felt pressures from relevant others to keep on top of risk information’ [10]. Using one item – individuals’ perceptions of being knowledgeable about the topic – to measure informational subjective norms may not well capture this concept [11]. Hence, the previous study [11] also explored the norms of family and friends (examined in one item), and significant others. This study distinguished family norms from friends’ norms and modified the items from the previous study [11]. It measured informational subjective norms based on the relationship between participants and potential norm resources, such as perceived pressure of getting informed from significant others, family and friends. Participants also reported the degree to which they are expected to be knowledgeable about COVID-19. This measurement approach avoids the reliability issue associated with using a single-item measurement. All items were measured on 11-point scales ranging from 0 – *strongly disagree* to 10 – *strongly agree*. The measurement of informational subjective norms presented high reliability ($\omega = 0.884$).

3.3.1.7. Perceived information gathering capacity. Perceived information gathering capacity is defined as the ‘perceived ability to perform the information seeking and processing steps necessary for the outcome one desires’ [14]. This study operationalised perceived information gathering capacity by capturing the degree to which participants can easily obtain information about COVID-19 (Table 2). Options to these items ranged from 0 – *strongly disagree* to 10 – *strongly agree*.

3.3.1.8. Information-seeking intention. As discussed earlier, this study distinguished information-seeking intention from actual information-seeking behaviour. The two items of information seeking used by the previous study [11] showed low reliability ($\alpha = 0.602$). Thus, the authors modified one item that has been tested by several studies [10,11] to measure information-seeking intention: ‘I am likely to search for information about COVID-19’. The response options were on an 11-point scale ranging from 0 – *strongly disagree* to 10 – *strongly agree*.

3.3.1.9. Behaviour. The dependent variable of this study is information-seeking behaviour. Behaviour was measured with two dimensions: depth (the number of information types that participants have looked for) and channels of information seeking (the number of channels that participants have used for information seeking). Specifically, the study adapted one item from early research [25] to explore the number of types of information that individuals have looked for in their most recent search of COVID-19 information online. This study also created one item to measure the total number of information channels that people have searched. The scales ranged from 0 to 8. The measurement of behaviour demonstrated high reliability ($\alpha = 0.738$).

3.4. Data analysis strategies

This study took place for 32 days, from 4 June to 5 July 2020. To examine whether participation time impacted individuals' responses to COVID-19 information seeking, the authors categorised two groups: Group 1 (4 June to 19 June) and Group 2 (20 June to 5 July). A series of independent *t*-tests were conducted. The results revealed that there was no statistically significant difference between participants who completed the survey early and people who participated later. Thus, samples were combined and analysed to answer research questions and test hypotheses. The assumptions of normality, linearity, multicollinearity, independence and homoscedasticity were confirmed before conducting any tests. The rationale for conducting specific data analyses was explained below.

3.4.1. Linear regression. To answer RQ₁ and RQ₂, hierarchical linear regression tests were conducted with intention or behaviour as the dependent variable. The first block predictors included risk experience, perceived risk characteristics, negative affective responses, positive affective responses, information insufficiency, informational subjective norms, perceived information gathering capacity, channel beliefs and information-seeking intention. Linear regression allows the authors to describe the best-fitting linear relationship between independent and dependent variables. Multiple hierarchical linear regression also offers R^2 change and *F* statistics change, which reveals the best model that explains the most variance of the dependent variable.

3.4.2. Moderation. To test *Hypotheses 1 and 2*, this study conducted moderation tests using [33] PROCESS Macro to identify the RISP's influence pathway. Although the RISP model proposes that channel beliefs and perceived information gathering capacity can impact information insufficiency's influence over information seeking, such arguments have received limited empirical examination [22]. This article aims to clarify how channel beliefs and perceived information gathering capacity influence information-seeking intention.

4. Results

4.1. RQ₁: RISP variables predict information-seeking intention

To answer RQ₁, a multiple hierarchical regression was conducted to evaluate the variance in intention explained by the whole model of RISP. The predictors were entered into the regression in the following order: (1) risk experience, (2) negative affective responses, positive affective responses and perceived risk characteristics, (3) informational subjective norms and information insufficiency and (4) channel beliefs and perceived information gathering capacity. The Model 4 ($F(8, 373) = 11.40, p < 0.001$) explained about 18% of the variance in information-seeking intention: $R^2_{adj} = 0.179, R^2 = 0.196$. Among these eight predictors in the Model 4, only risk experience ($\beta = 0.121, SE = 0.19, t(373) = 2.55, p = 0.011$), informational subjective norms ($\beta = 0.279, SE = 0.06, t(373) = 5.30, p < 0.001$) and channel beliefs ($\beta = 0.168, SE = 0.08, t(373) = 2.93, p = 0.004$) significantly predicted information-seeking intention (see Table 3).

4.2. RQ₂: RISP variables predict information-seeking behaviour

To answer RQ₂, a multiple hierarchical regression was conducted to evaluate the variance in behaviour explained by RISP. The predictors in the hierarchical regression included (1) risk experience, (2) negative affective responses, positive affective responses and perceived risk characteristics, (3) informational subjective norms and information insufficiency and (4) channel beliefs and perceived information gathering capacity. The Model 3 was the best model that explained the most variance in behaviour ($F(6, 375) = 13.01, R^2_{adj} = 0.159, R^2 = 0.172, p < 0.001$). Among these six predictors (risk experience, perceived risk characteristics, positive affective responses, negative affective responses, informational subjective norms and information insufficiency), only risk experience ($\beta = 0.135, SE = 0.12, t(375) = 2.82, p = 0.005$) and informational subjective norms ($\beta = 0.286, SE = 0.04, t(375) = 5.40, p < 0.001$) significantly predicted information-seeking behaviour (Table 4).

Table 3. Hierarchical regression analysis of RISP predictors of behavioural intention.

Predictor	Model 1		Model 2		Model 3		Model 4	
	β	SE	β	SE	β	SE	β	SE
Risk experience	0.121*	0.20	0.110*	0.20	0.121*	0.19	0.121*	0.19
Perceived risk characteristics			0.188*	0.07	0.086	0.07	0.058	0.065
Negative affective responses			0.151*	0.07	0.087	0.07	0.049	0.055
Positive affective responses			0.067	0.06	0.061	0.06	0.041	0.053
Informational subjective norms					0.279**	0.06	0.279**	0.06
Information insufficiency					0.048	0.16	0.029	0.087
Perceived information gathering capacity							-0.052	0.07
Channel beliefs							0.168*	0.224
R^2	0.015		0.114		0.178		0.196	
R^2_{adj}	0.012		0.104		0.165		0.179	
R^2	0.015		0.099		0.064		0.019	
F	5.63*		14.08**		14.60**		4.30*	

SE: standard error.

Note. * $p < 0.05$, ** $p < 0.001$.

Table 4. Hierarchical regression analysis of RISP predictors of behaviour.

Predictor	Model 1		Model 2		Model 3		Model 4	
	β	SE	β	SE	β	SE	β	SE
Risk experience	0.150*	0.13	0.130*	0.12	0.135*	0.12	0.134*	0.12
Perceived risk characteristics			0.202*	0.04	0.106	0.04	0.093	0.066
Negative affective responses			0.130*	0.04	0.082	0.04	0.060	0.042
Positive affective responses			-0.024	0.04	-0.031	0.04	-0.041	-0.034
Informational subjective norms					0.286**	0.04	0.287**	0.219
Information insufficiency					-0.006	0.10	-0.017	-0.032
Perceived information gathering capacity							-0.037	0.05
Channel beliefs							0.091	0.076
R^2	0.022		0.108		0.172		0.178	
R^2_{adj}	0.020		0.098		0.159		0.160	
R^2	0.022		0.085		0.064		0.005	
F	8.71*		12.04**		14.58**		1.23	

SE: standard error.

Note. * $p < 0.05$, ** $p < 0.001$.

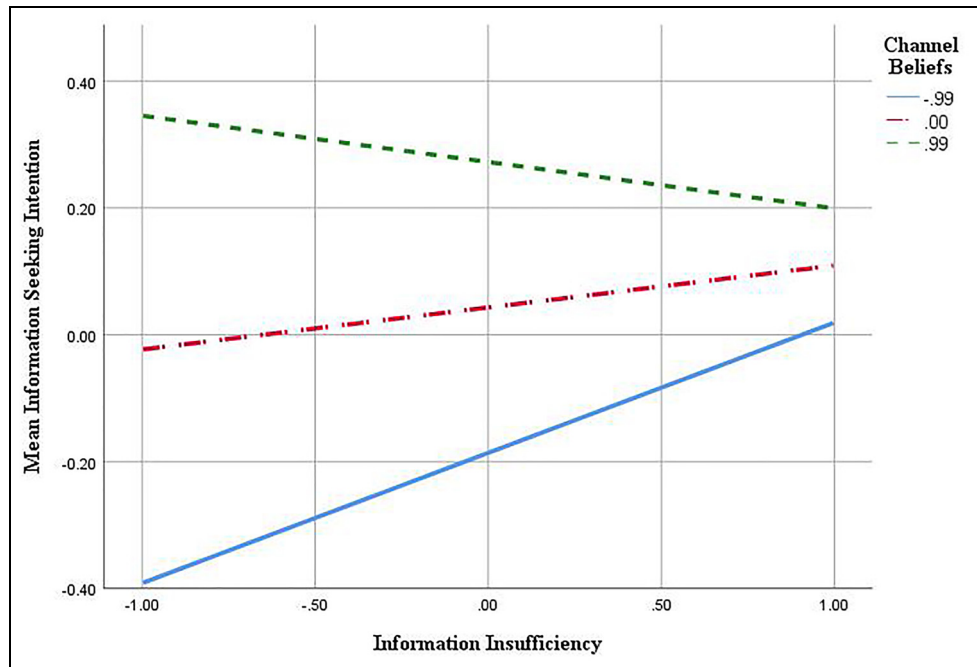


Figure 2. Information insufficiency predicting intention by channel beliefs.

4.3. Channel beliefs and information insufficiency

To examine moderating effects of channel beliefs and perceived information gathering capacity, moderation analyses were conducted with Model 1 (conditioning values were set as ‘-1SD, Mean, + SD’) of PROCESS MACRO v3.5 [33]. The first moderation test was used to examine whether channel beliefs moderate the relationship between information insufficiency and information-seeking intention. Z scores of variables were computed and used for moderation tests to obtain a standardised coefficient.

According to the moderation results, the model showed statistical significance: ($F(3, 385) = 15.64, R^2 = 0.109, p < 0.001$). The interaction of channel beliefs and information insufficiency ($\beta = -0.140, SE = 0.04, t(385) = -3.20, p = 0.002$) significantly predicted information-seeking intention ($F(1, 385) = 10.23, p = 0.002, R^2 = 0.024$) (Figure 2). Channel beliefs significantly predicted information-seeking intention ($\beta = 0.231, SE = 0.05, t(385) = 4.64, p < 0.001$). However, information insufficiency did not significantly predict intention ($\beta = 0.066, SE = 0.05, t(385) = 1.31, p = 0.191$).

4.4. Perceived information gathering capacity and information insufficiency

Similarly, a moderation test was conducted to examine how perceived information gathering capacity and information insufficiency predict intention. The moderation results revealed that the model was statistically significant ($F(3, 388) = 6.73, R^2 = 0.040, p < 0.001$). The interaction effect of perceived information gathering capacity and information insufficiency ($\beta = -0.122, SE = 0.05, t(388) = -2.71, p = 0.007$) was also statistically significant ($F(1, 388) = 7.35, R^2 = 0.018, p = 0.007$) (Figure 3). Information insufficiency was a significant predictor of intention ($\beta = -0.151, SE = 0.05, t(388) = 3.02, p = 0.003$). Nevertheless, perceived information gathering capacity did not significantly predict intention ($\beta = 0.064, SE = 0.05, t(388) = 1.31, p = 0.191$).

5. Discussions

By theoretically and empirically examining RISP in the context of COVID-19 information seeking, this article identifies the most prominent predictors of information-seeking intention and behaviour. Moreover, the current

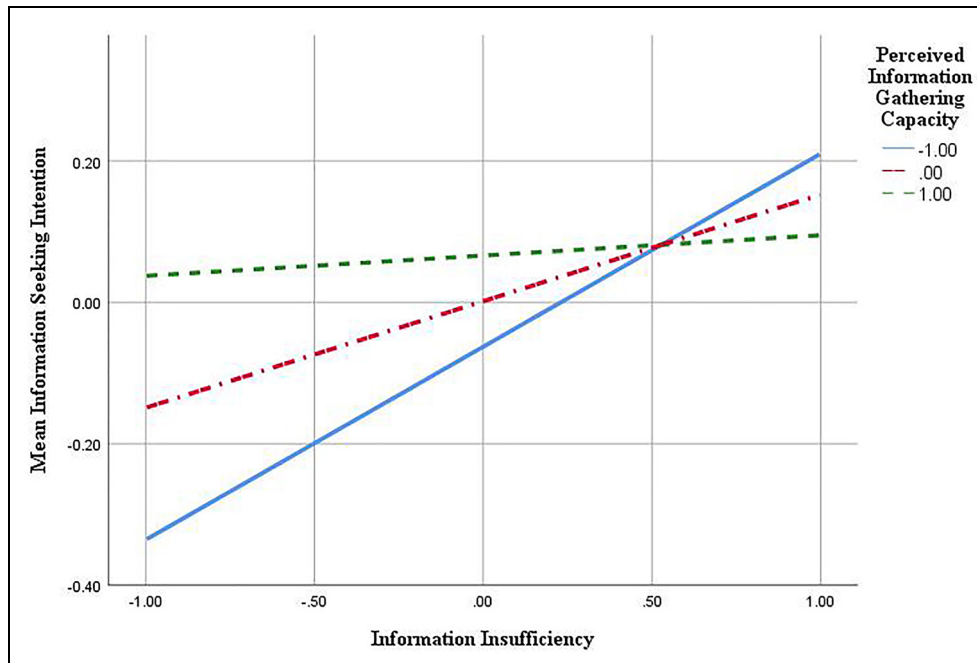


Figure 3. Information insufficiency predicting intention by perceived information gathering capacity.

study clarifies the indirect impacts of channel beliefs and perceived information gathering capacity on information-seeking intention. These findings offer theoretical implications for information-seeking theory development. This article also guides pragmatic implications for professionals to increase individuals' information seeking, place COVID-19 campaigns on the appropriate channels, lessen the public's uncertainty and eventually help to reduce the health disparities due to the information gap.

5.1. Theoretical implications: effective way to predict health and risk information seeking

This article suggests that the fundamental motivation of information seeking may not be information insufficiency, which contradicts the main proposition of RISP [5]. The unexpected findings should be interpreted with the phenomenon that many people perceive that their current COVID-19 knowledge is more than they need. Instead, multiple factors, such as risk experience, channel beliefs, and informational subjective norms impact individuals' information seeking. Channel beliefs and perceived information gathering capacity appear to indirectly influence information-seeking intention. These findings help researchers understand the 'black box' of health and risk information seeking. The following sections describe the theoretical implications of the current findings.

5.1.1. Motivations for information seeking. According to RQ₁'s results, information-seeking intention's variances are best explained by eight variables: risk experience, channel beliefs, informational subjective norms, perceived risk characteristics, negative and positive affective responses, information insufficiency and perceived information gathering capacity. Among the eight variables, only risk experience, channel beliefs and informational subjective norms are the significant predictors of intention. Surprisingly, information insufficiency is not one of the substantial predictors of information-seeking intention, contradicting RISP's main argument. While facing COVID-19, a novel virus, people's knowledge about COVID-19 should be inadequate. However, interestingly, many participants reported that their current knowledge about COVID-19 is more than the information sufficiency threshold, which is consistent with the previous empirical finding that people tend to overestimate their knowledge about H1N1 vaccine [11].

5.1.1.1. Risk experience. While answering RQ₁ and RQ₂, this study discovers that risk experience significantly predicted both information-seeking intention and behaviour. The multiple hierarchical regression results showed that without other predictors, one unit change in risk experience will lead to a 0.12 change in information-seeking intention and a 0.15 change in behaviour. However, the statistically significant changes in intention seem small. When the current study was conducted from June to July 2020, home testing kits were not available, and many people still lacked access to COVID-19 tests. The average daily tests performed per thousand people in June and July 2020 ranged from 1.53 to 2.24, which was less than the number in 2021 and 2022 [34]. Participants may not perceive that they experience the risk of being infected. As a side note, many participants in this study are White, enjoy higher education, reported stable incomes and had health insurance coverages. They may perceive less risk compared with other lower-income groups and minorities who experienced health disparities. Risk experience may explain more variation in information seeking for communities that are at more risk in this pandemic. Future studies should further explore how demographic variables influence health information seeking online. These findings also suggest that individuals' information-seeking intention is more impacted by channel beliefs and informational subjective norms.

5.1.1.2. Informational subjective norms. Informational subjective norms are the most important predictor of information-seeking intention. When individuals perceive that they are expected to be knowledgeable about COVID-19, or their family and friends want them to know about COVID-19, they express a stronger intention to search for information. This finding is consistent with the proposition of TPB [15] and RISP [5]. Recent research reveals that subjective social norms were the most substantial predictor of individuals' social distancing [35] during the pandemic. While facing the COVID-19 pandemic, many people tend to behave in a way that meets their network's norms. If the network has expected rules for seeking COVID-19 information and practicing compliance behaviour to cope with the pandemic, individuals within this community tend to follow these rules.

The different norms of seeking COVID-19 information may be also associated with the political polarisation of this pandemic. Recent studies suggest that information selection of and exposure to COVID-19 are associated with political ideologies [36,37]. This study does not examine political ideology's potential role in information seeking. Future studies should expand on this topic. Interestingly, this study suggests that individuals' inner motivation for information seeking – the desire to overcome information insufficiency – however, does not seem to predict information seeking, which contradicts the RISP's major proposition [5].

5.1.2. Information seeking and information channel usage. Although individuals' beliefs about information channels were expected to facilitate information seeking [5,17], limited empirical studies have examined and supported this proposition [10,22]. This study clarifies the roles of channel beliefs in RISP.

5.1.2.1. Channel beliefs. The results of Hypothesis 1 reveal that information insufficiency exerts indirect impacts on intention through channel beliefs. When individuals perceive the information channels as highly believable and useful, the more they perceive the insufficiency of their current information, the stronger their seeking intention is. This pattern still applies when people evaluate information channels as moderately believable and useful. However, when individuals present a low level of channel beliefs, their information-seeking intention decrease while their information insufficiency increases. If people evaluate information channels as biased, exaggerated, sensationalised, not trustable or not useful, they are less likely to search for information to meet their needs even though their knowledge about this topic is not adequate.

These findings echo previous research's suggestions that individuals are likely to acquire information from outlets they trust and tend to accept such information [38]. Recent research also suggests that channel beliefs moderated how information insufficiency predicts Chinese respondents' systematic processing of COVID-19 information [11]. It is not clear whether these results are a function of the COVID-19 pandemic risk situation or if they can be applied across a wide range of risk contexts. What is evident from these findings, however, is that the RISP model is useful in calling attention to the importance of channel preferences and usage for risk information seeking.

These complex findings also show that channel beliefs not only directly predict information-seeking intention but also influence information insufficiency's impacts on information-seeking behaviours. Previous RISP studies largely ignore channel beliefs' impacts on information-seeking intention and purely focus on the relationship between insufficiency and intention [10,22]. This study reveals that without interpreting channel beliefs' influence, merely examining information insufficiency's impacts can result in misleading conclusions. These findings also echo the previous study's [11] suggestion that information insufficiency may not be the most prominent predictor of information seeking. As a

function, risk researchers should be diligent in their attempts to clarify and refine existing communication theories – especially the RISP model.

5.1.2.2. Perceived information gathering capacity. Besides channel beliefs, RISP [5] proposes that perceived information gathering capacity influences information-seeking outcomes. However, limited empirical studies have tested this proposition. This study contributes to the current literature by clarifying perceived information gathering capacity's role in RISP.

The moderation results of Hypothesis 2 showed that information gathering capacity did not predict intention. However, the interaction of information gathering capacity and information insufficiency significantly predicted intention. When individuals perceive that they have a high capacity to collect COVID-19 information, the increase in their information insufficiency will lead to a big increase in their intention to seek information. Information insufficiency remains positively related to information-seeking intention when people perceive a moderate level of information gathering capacity, while the increase in intention impacted by the growth of information insufficiency is smaller even though significant. The ratio change tends to further decrease when individuals' level of information gathering capacity is low. In other words, when individuals do not think that they have a strong capacity to collect information, the impacts of their inadequate knowledge on their intention to seek information tend to decrease.

This finding is especially meaningful for stakeholders who have limited access to the Internet and other new information channels during crises. People with lower social-economic status may perceive less capacity to obtain information and hence experience bigger knowledge gaps about health risks. It is helpful to further explore the relationship among social-economic variables, perceived information gathering capacity, information-seeking intention and behaviour.

5.1.3. Call for a parsimonious model. The multiple hierarchical regression results show that about 16% variance of information-seeking behaviour is explained by RISP. Only risk experience and informational subjective norms are the most influential factors. The findings suggest that many RISP variables share the variance in predicting information-seeking behaviour. In other words, many RISP variables' influence over information-seeking behaviour overlaps with each other. The variables that have been examined by many empirical studies are closely associated with each other and are very likely to be one piece of the motivation discovery 'puzzle'. These findings may indicate that the RISP model can be simplified into a parsimonious model.

5.2. Implications for health and risk management practice

This study's findings provide practical implications for health and risk management institutions. Increasing health and risk information seeking will advocate precautionary preventive behaviours, which could save lives in this COVID-19 pandemic. A recent study showed that receiving more online information about COVID-19 was positively associated with more preventive behaviours, such as wearing facemasks, washing hands, maintaining social distance, staying home and sanitising surfaces [39]. Results of the current study suggest that health and risk management professionals can continue to be confident in their use of the RISP model to help shape messages. It may well be, however, that some of the RISP model constructs are more important and require special consideration (e.g. risk experience and informational subjective norms).

Facilitating health and risk information seeking will also help reduce the public's uncertainty and mitigate risk. Health and risk management institutions, such as the Centres for Disease Control and Prevention (CDC), federal governments and state governments, should maintain a credible and trustworthy reputation. If the public loses trust in these institutions, they will not seek information from these institutions. Previous research also suggests that misinformation, fake news and rumours will be the dominant information resources [40]. Recent research shows that when people perceived a higher reputation of CDC, they tend to practice compliance behaviours [35]. Thus, it is vitally important for health and risk management institutions to be trusted by the public.

In its current form, the RISP model does not directly address source credibility, but including the construct could potentially increase the predictive value of the RISP model – especially during the early stages of a major crisis, such as the COVID-19 pandemic. Recent research [41] discovered that authors' reputation, honesty and expertise impacted authors' credibility in discussing information about COVID-19 vaccines. Assuming that information from official organisations is always perceived as credible could impede the efficacy of risk messages – especially if the information changes during the crisis event.

While the public has uncertainty about the pandemic, such as concerns about the effectiveness and safety of vaccines, this study offers pragmatic implications for public health professionals and health campaigners as they place messages

on the appropriate information channels. As suggested by the current data, channel beliefs are a prominent predictor of information-seeking intention. In practice, public health professionals and health campaigners need to place the campaigns on the channels that the target audiences perceive as believable and useful to increase the visibility of COVID-19 campaigns and then possibly persuade audiences to change their attitudes and behaviour.

Moreover, when individuals do not think they have enough capacity to search for COVID-19 information, even if they acknowledge that their current knowledge is not adequate, they are still less probably to seek information. Such findings illustrate that health and risk management professionals should offer easily accessible information to people who cannot gather information. This insight is particularly important considering that many public libraries have been temporarily closed during the crisis stage of this pandemic.

Last, as this article illustrates, informational subjective norms play an important role in predicting both information-seeking intention and behaviour. Health and risk management institutions can use campaigns and interventions to form social norms that encourage the public to consume accurate information through trustable channels. Such social norms will facilitate health and risk information seeking, reduce the public's uncertainty, advocate recommendations for pre-cautious behaviour change (e.g. wearing facemasks, maintaining social distance and washing hands) and eventually help diminish health disparities due to the information gap.

5.3. Limitations

Although this study offers valuable insights for information-seeking research and practice, it has several limitations in sampling and design. This study uses VolunteerScience to recruit participants. This sampling strategy allows the authors to reach participants who live across the United States and are from diverse age groups, instead of merely recruiting college students as samples. Nevertheless, this sampling strategy has limitations of generalisation too. Individuals who are not familiar with VolunteerScience were not well represented in this data.

Second, as a study built on an online survey, this study has limitations in controlling potential external impacts on participants while joining this study. Participants may have anticipated other behaviour, and their responses to the survey may be distracted. Last, this study does not examine demographic factors' potential impacts on information-seeking intention and behaviour. Individuals' political beliefs may lead to different risk perceptions of COVID-19 and hence may impact information-seeking intention and behaviour. Being aware of the limitations, this study's findings should be interpreted with caution. Future studies that can compensate for these limitations will be needed.

5.4. Future directions

The authors recognise the inconsistency in operationalising key variables of RISP models. The problems associated with conceptualisation-operationalisation fit inhibit scholars from examining how key constructs impact information-seeking behaviour. Future research should pay more attention to clarifying the conceptualisation-operationalisation fit of key variables. Meta-analysis research on empirical operationalisation of information-seeking variables and scales-development studies will be helpful.

Moreover, the misinformation about COVID-19 that has been and is being spread through social media channels is especially problematic [42]. Future research can further explore what information individuals have sought from various channels and how misinformation impacts individuals' attitudes towards and responses to this pandemic.

More importantly, the current study indicates that many key variables share variance in predicting information-seeking outcomes. The authors view these findings as an alert or a signal that RISP has not yet successfully disentangled the core mechanism of information seeking. Future studies should further explore the motivation of information-seeking beyond the predictors examined in RISP.

6. Conclusion

This study theoretically and empirically examines the RISP model. It examines the conceptual-operationalisation fit of key variables. This study identifies that risk experience and informational subjective norms are the most substantial predictors of behaviour. With the current data, information insufficiency does not predict behaviour, and many people tend to overestimate their knowledge of COVID-19. Unfortunately, there are divided perspectives about the COVID-19 pandemic in the United States. This study suggests that when individuals' family and friends expect them to be knowledgeable about the COVID-19 topic, they search for more types of information.

A close examination of RISP reveals that people who hold negative channel beliefs (e.g. distorted, biased) are not likely to seek COVID-19 information regardless of their insufficient knowledge. The extent to which individuals think

of themselves as capable of gathering information appears to indirectly influence their intention to seek information. Such knowledge will not only offer implications for health and risk information-seeking theory development but also provide practical implications for health campaigners and risk management professionals to cope with the COVID-19 pandemic.

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References

- [1] Centers for Disease Control and Prevention (CDC). United States COVID-19 cases, deaths, and laboratory testing (NAATs) by state, territory, and jurisdiction, 2021, https://covid.cdc.gov/covid-data-tracker/?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fcases-updates%2Fcases-in-us.html#cases_deathsper100klast7days
- [2] Hernández-García I and Giménez-Júlvez T. Assessment of health information about COVID-19 prevention on the Internet: infodemiological study. *JMIR Public Health Surveill* 2020; 6(2): e18717.
- [3] Kim HK, Ahn J, Atkinson L et al. Effects of COVID-19 misinformation on information seeking, avoidance, and processing: a multicountry comparative study. *Sci Commun* 2020; 42(5): 586–615.
- [4] Jin X and O’Hair HD. Air pollution and health in China. In: HD O’Hair and MJ O’Hair (eds) *The handbook of applied communication research*. Hoboken, NJ: Wiley-Blackwell, 2020, pp. 935–954.
- [5] Griffin RJ, Dunwoody S and Neuwirth K. Proposed model of the relationship of risk information seeking and processing to the development of preventive behaviors. *Environ Res* 1999; 80(2 pt 2): S230–S245.
- [6] Robson A and Robinson L. Building on models of information behaviour: linking information seeking and communication. *J Doc* 2013; 69(2): 169–193.
- [7] Anker AE, Reinhart AM and Feeley TH. Health information seeking: a review of measures and methods. *Patient Educ Couns* 2011; 82(3): 346–354.
- [8] Dutta-Bergman MJ. The relation between health-orientation, provider-patient communication, and satisfaction: an individual-difference approach. *Health Commun* 2005; 18(3): 291–303.
- [9] Johnson JD. On contexts of information seeking. *Inform Process Manag* 2003; 39(5): 735–760.
- [10] Griffin RJ, Zheng Y, ter Huurne E et al. After the flood: anger, attribution, and the seeking of information. *Sci Commun* 2008; 29(3): 285–315.
- [11] Yang ZJ. Too scared or too capable? Why do college students stay away from the H1N1 vaccine? *Risk Anal* 2012; 32(10): 1703–1716.
- [12] Zhou X, Roberto AJ and Lu AH. Understanding online health risk information seeking and avoiding during the COVID-19 pandemic. *Health Commun*. Epub ahead of print 11 August 2021. DOI: 10.1080/10410236.2021.1958981.
- [13] Yang JZ, Dong X and Liu Z. Systematic processing of COVID-19 information: relevant channel beliefs and perceived information gathering capacity as moderators. *Sci Commun* 2022; 44(1): 60–85.
- [14] Griffin RJ, Dunwoody S and Yang ZJ. Linking risk messages to information seeking and processing. *Ann Int Commun Assoc* 2013; 36(1): 323–362.
- [15] Ajzen I. The theory of planned behavior. *Organ Behav Hum Dec* 1991; 50(2): 179–211.
- [16] Chaiken S. Heuristic versus systematic information processing and the use of source versus message cues in persuasion. *J Pers Soc Psychol* 1980; 39(5): 752–766.
- [17] Griffin RJ and Dunwoody S. Risk information seeking and processing model, 2014, pp. 102–116, https://epublications.marquette.edu/cgi/viewcontent.cgi?article=1385&context=comm_fac
- [18] Kahlor LA, Wang W, Olson HC et al. Public perceptions and information seeking intentions related to seismicity in five Texas communities. *Int J Disast Risk Re* 2019; 37: 101147.
- [19] Liu M, Chen Y, Shi D et al. The public’s risk information seeking and avoidance in China during early stages of the COVID-19 outbreak. *Front Psychol* 2021; 12: 649180.
- [20] Song S, Yao X and Wen N. What motivates Chinese consumers to avoid information about the COVID-19 pandemic?: The perspective of the stimulus-organism-response model. *Inform Process Manag* 2021; 58(1): 102407.

- [21] Yang ZJ and Kahlor L. What, me worry? The role of affect in information seeking and avoidance. *Sci Commun* 2012; 35(2): 189–212.
- [22] Kahlor LA. An augmented risk information seeking model: the case of global warming. *Media Psychol* 2007; 10(3): 414–435.
- [23] Griffin RJ, Neuwirth K, Dunwoody S et al. Information sufficiency and risk communication. *Media Psychol* 2004; 6(1): 23–61.
- [24] Griffin RJ, Powell M, Dunwoody S et al. Testing the robustness of a risk information processing model. In: *Proceedings of the association for education in journalism and mass communication*, Toronto, ON, Canada, 4–7 August 2004.
- [25] Hartoonian N, Ormseth SR, Hanson ER et al. Information-seeking in cancer survivors: application of the Comprehensive Model of Information Seeking to HINTS 2007 data. *J Health Commun* 2014; 19(11): 1308–1325.
- [26] McDonald RP. *Test theory: a unified treatment*. Mahwah, NJ: Lawrence Erlbaum Associates Publishers, 1999, 485 pp.
- [27] Goodboy AK and Martin MM. Omega over alpha for reliability estimation of unidimensional communication measures. *Ann Int Commun Assoc* 2020; 44(4): 422–439.
- [28] Hayes AF and Coutts JJ. Use omega rather than Cronbach's alpha for estimating reliability. But... *Commun Methods Meas* 2020; 14(1): 1–24.
- [29] Cohen J, Cohen P, West SG et al. *Applied multiple regression/correlation analysis for the behavioral sciences*. 3rd ed. Mahwah, NJ: Lawrence Erlbaum Associates Publishers, 2003, 703 pp.
- [30] Castro-Schilo L and Grimm KJ. Using residualized change versus difference scores for longitudinal research. *J Soc Pers Relat* 2017; 35(1): 32–58.
- [31] Slovic P. Perceptions of risk: reflections on the psychometric paradigm. In: S Krimsky and D Golding (eds) *Social theories of risk*. Westport, CT: Praeger, 1992, pp. 117–152.
- [32] Kahlor L. PRISM: a planned risk information seeking model. *Health Commun* 2010; 25(4): 345–356.
- [33] Hayes AF. *Introduction to mediation, moderation, and conditional process analysis: a regression-based approach*. New York: Guilford Press, 2018.
- [34] Our World in Data. Daily COVID-19 tests per thousand people, 2022, <https://ourworldindata.org/coronavirus/country/united-states#how-many-tests-are-performed-each-day>
- [35] Chon M-G and Kim S. Fostering compliance with COVID-19 guidelines: insights for risk communication strategies during a pandemic. *Soc Sci J*. Epub ahead of print 23 March 2022. DOI: 10.1080/03623319.2022.2049555.
- [36] Jin X. Politicized COVID-19 information seeking: examining the comprehensive model of information seeking. In: *Proceedings of the 72nd annual convention international communication association conference*, Paris, 26–30 May 2022.
- [37] Moon W-K, Atkinson L, Kahlor LA et al. US political partisanship and COVID-19: risk information seeking and prevention behaviors. *Health Commun*. Epub ahead of print 27 April 2021. DOI: 10.1080/10410236.2021.1912948.
- [38] Druckman JN, Peterson E and Slothuus R. How elite partisan polarization affects public opinion formation. *Am Polit Sci Rev* 2013; 107(1): 57–79.
- [39] Li S, Feng B, Liao W et al. Internet use, risk awareness, and demographic characteristics associated with engagement in preventive behaviors and testing: cross-sectional survey on COVID-19 in the United States. *J Med Internet Res* 2020; 22(6): e19782.
- [40] Swire-Thompson B and Lazer D. Public health and online misinformation: challenges and recommendations. *Annu Rev Public Health* 2020; 41(1): 433–451.
- [41] Savolainen R. Assessing the credibility of COVID-19 vaccine mis/disinformation in online discussion. *J Inf Sci*. Epub ahead of print 19 August 2021. DOI: 10.1177/01655515211040653.
- [42] Zhou C, Xiu H, Wang Y et al. Characterizing the dissemination of misinformation on social media in health emergencies: an empirical study based on COVID-19. *Inform Process Manag* 2021; 58(4): 102554.