Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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What motivates Chinese consumers to avoid information about the COVID-19 pandemic?: The perspective of the stimulus-organism-response model

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ABSTRACT

This study investigated consumers' information-avoidance behavior in the context of a public health emergency—the COVID-19 pandemic in China. Guided by the stimulus-organism-response paradigm, it proposes a model for exploring the effects of external stimuli (perceived threat and perceived information overload) related to COVID-19 on consumers' internal states (sadness, anxiety, and cognitive dissonance) and their subsequent behavioral intentions to avoid health information and engage in preventive behaviors. With a survey sample (N = 721), we empirically examined the proposed model and tested the hypotheses. The results indicate that sadness, anxiety, and cognitive dissonance, which were a result of perceived threat and perceived information overload, had heterogeneous effects on information avoidance. Anxiety and cognitive dissonance increased information avoidance intention, while sadness decreased information avoidance intention. Moreover, information avoidance predicted a reluctance on the part of consumers to engage in preventive behaviors during the COVID-19 pandemic. These findings not only contribute to the information behavior literature and extend the concept of information avoidance to a public health emergency context, but also yield practical insights for global pandemic control.

"We're not just fighting a pandemic; we're fighting an infodemic."

–Tedros Adhanom Ghebreyesus, WHO's director-general

1. Introduction

The term *pandemic* refers to a large outbreak of infectious disease spread over a wide geographical area, with high mortality, which leads not only to a public health crisis, but also to social, economic, and political disruptions (Fineberg, 2014). In December 2019, some patients with pneumonia of unknown causes were identified in China (Zhu et al., 2020), and a type of previously unknown betacoronavirus was discovered in these patients. The betacoronavirus was named the "2019 novel coronavirus" (SARS-CoV-2), and the disease caused by SARS-CoV-2 was named COVID-19 (Lai, Shih, Ko, Tang & Hsueh, 2020). Within several months

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after the outbreak in China, COVID-19 quickly grew into a global pandemic, with outbreaks in many different countries (World Health Organization, 2020). By the end of July 2020, COVID-19 had resulted in more than 17 million confirmed cases and 6.6 million deaths across 188 countries (BBC News, 2020).

Owing to the development of the Internet, COVID-19-related information spread quickly around the world. Although the internet provides powerful channels for real-time information sharing over geographic barriers (Yao, Zhang, Qu & Tan, 2020), the dark side of this enhanced connectivity has been revealed in the fact that it at least partially contributed to an escalation in the devastating global effects of the disease, a situation that has been called an "infodemic" (Zarocostas, 2020). An infodemic, which is characterized by false news, misinformation, and conspiracy theories, imposes extra uncertainties and threats on people's daily lives. During the COVID-19 pandemic, a large amount of inconsistent and incorrect information spread, even resulting in many deaths (Love, Blumenberg & Horowitz, 2020). In addition to the misinformation circulating on social media, some governments acted too hastily in offering unfounded reassurances at the early stages of the pandemic, in order to be perceived as competent (The Lancet Infectious, 2020). Such miscommunication eroded the public's trust and increased their sense of helplessness, which served as a fertile seedbed for vicious circles of misinformation (Garrett, 2020). These events raise an important question of how we can conduct effective health communication in the context of public health emergencies to deliver accurate information to the end consumers.

Matters are also not simple for consumers. During the pandemic, consumers face many questions and concerns, such as whether they are in a high-risk group and how they can protect themselves from the disease. In uncertain circumstances, people may engage in two types of information behavior—they either seek health information to answer specific queries, or they avoid health information that challenges their beliefs or causes unpleasant emotions (Savolainen, 2015; Sweeny, Melnyk, Miller & Shepperd, 2010). Information seeking has been extensively studied in contexts of uncertainty, while information avoidance has been relatively less addressed (Case, Andrews, Johnson & Allard, 2005; Johnson, 2014). While information avoidance is conceived as a "non-seeking" behavior, which is simply the most inactive status of information seeking (Costello & Veinot, 2020), we posit that the two behaviors are fundamentally distinctive: they are triggered by different motives and occur through different psychological mechanisms (Case et al., 2005). Whereas information (non-) seeking implies that consumers have (few) information needs and make (few) related efforts to fulfill them (Pian, Song & Zhang, 2020), information avoidance seems to be a coping behavior on the part of individuals' who have received or encountered information. Many prior studies suggest that consumers' information avoidance predicts various negative outcomes in treatment contexts, such as disease screening avoidance and treatment avoidance (Golman, Hagmann & Loewenstein, 2017; Persoskie, Ferrer & Klein, 2014). Therefore, exploring consumers' avoidance behavior is critically important in public health emergency settings, because it not only determines if accurate information can be delivered to a target population (for instance, whether a communication campaign could achieve expected performance), but also matters to the public's well-being. To bridge the gap, this study will examine consumers' information avoidance and factors that predict it, in the context of the COVID-19 pandemic. Given the fact that China is one of the earliest countries to conduct risk communications in response to the pandemic, the findings of this study may have global implications for information behavior research and public health management.

This study adapted the stimulus-organism-response (S-O-R) model to investigate relevant variables, using survey data collected in China during the COVID-19 pandemic. In the rest of this paper, we will review the literature on health information avoidance, propose a theoretical framework based on the S-O-R model, propose an empirical model and several related hypotheses, describe the method of data collection, analyze the results from the model estimation, and discuss the main findings and implications.

2. Literature review

Many classic information science theories posit that people spend considerable effort seeking information to gain knowledge, resolve uncertainty, and achieve optimal decision making (Belkin, 1980; Kuhlthau, 1993; Wilson, 1999; Zhang, 2016). Nevertheless, people have also often been found to have less interest in information seeking, and sometimes they even avoid information (Johnson, 2014). *Information avoidance* is defined as "any behavior intended to prevent or delay the acquisition of available but potentially unwanted information" (Sweeny et al., 2010, p. 341), and it consists of both active and passive avoidance (Narayan, Case & Edwards, 2011). *Active information avoidance* refers to the behavior of intentionally avoiding information, whereas *passive information avoidance* involves ignoring received information or failing to take further steps to process it (Narayan et al., 2011; Sweeny et al., 2010).

Information avoidance is particularly common in healthcare contexts. According to a national survey in the United States, 31.1% of adults stated that they would rather not know their chance of getting cancer (St. Jean, Jindal & Liao, 2017). McCloud, Jung, Gray and Viswanath (2013) found that one-third of cancer survivors would purposefully avoid cancer information. However, avoidance of health information may result in negative consequences for individuals. It prevents people from digesting valuable information to improve health decision making, resulting in delayed or missed disease screening and doctor visits (Golman et al., 2017). For example, the findings of a randomized field experiment in China showed that information avoidance led to an avoidance of medical screening, even when there was no cost for the tests (Li, Wang, Zhang & Wen, 2020). Persoskie et al. (2014) found that 29.4% of adults in the United States aged above 50 would avoid receiving information from doctors even when they suspected they should. Golman et al. (2017) suggested that collective information avoidance under certain circumstances (e.g., public health emergencies) may escalate a society's collective irrationality and lead to a decline in a society's well-being.

Prior studies suggest that the discomfort stimulated by health information is the main reason for consumers' avoidance of health information. According to Sweeny et al. (2010)), people tend to avoid information when it is associated with socially undesirable behaviors, leads to potential belief change, causes unpleasant emotions, or decreases pleasant emotions. For example, health warnings on cigarette packages and anti-smoking advertisements usually include graphic, disturbing images to promote public

awareness of the negative health consequences of smoking. However, smokers were often found to actively avoid this information because seeing these images would arouse uncomfortable feelings (Maynard et al., 2014; McCloud, Okechukwu, Sorensen & Viswanath, 2017). Gaspar et al. (2016) found that risk messages about red meat that opposed consumers' attitudes resulted in consumers' avoidance of information. Other prior studies found that the unpleasant feelings (e.g., fear and worry) aroused by cancer may predict consumers' cancer information avoidance (Miles, Voorwinden, Chapman & Wardle, 2008; Persoskie et al., 2014; Vrinten et al., 2018).

During the COVID-19 pandemic, consumers were flooded by a great amount of disease-related information from a large variety of information sources, such as television, newspapers, government, healthcare providers, and various websites and social media. This information has been continually stimulating Chinese consumers and may arouse uncomfortable feelings, such as sadness and anxiety (Cao et al., 2020). Based on the literature review, we argue that COVID-19 information may result in information avoidance among general Chinese consumers. In the following sections, we will employ a theoretical framework based on the stimulus-organism-response theory to analyze the underlying relationship between the informational stimuli of COVID-19 disease and consumers' psychological states and information avoidance intention.

3. Theoretical framework

The stimulus-organism-response theory was presented in Mehrabian and Russell's (1974) seminal work in environmental psychology. Mehrabian and Russell (1974) proposed that sensory factors in the environment could arouse individuals' emotional responses, which could further induce them approach or avoid the environment. The relationship between environmental cues and their related effects on individuals' internal states and behavioral responses was expressed as a sequence of events, namely stimulus-organism-response (S-O-R).

In Mehrabian and Russell's (1974) framework, stimuli (S) represent a set of sensory variables in a particular environment, and information load which characterizes the spatial and temporal relationships among those stimulus components. Organism conditions (O) represent emotional reactions to the environmental stimuli and can be categorized into three types of states: degrees of enjoyment (pleasure-displeasure), levels of mental alertness (arousal-nonarousal), and feelings of control over activities (dominance-submissiveness). Among the organism conditions, pleasantness and arousal are mainly affective states, while dominance is related to cognitive judgment (Russell & Pratt, 1980). Responses (R) represent approach or avoidance behaviors. The basic scheme of the theory is shown in Fig. 1 (Vieira, 2013).

The S-O-R paradigm has been extensively employed by information science and information system researchers in studying both approach (Zhang, Lu, Gupta & Zhao, 2014) and avoidance behaviors (Cao & Sun, 2018). It has also proved to be effective in analyzing consumers' responses during the COVID-19 pandemic (Laato, Islam, Farooq & Dhir, 2020). Guided by the S-O-R paradigm, we will briefly review the characteristics of the COVID-19 and then analyze prominent emotion-inducing factors in the external environment and consumers' emtional responses.

COVID-19 involves the significant features of sustained human-to-human transmission and a high death rate. Its capacity for spreading quickly caused a global outbreak. According to medical research, the estimated death rate ranged from 0.4% to 3% among those who were infected (Xu et al., 2020). By the end of July 2020, COVID-19 had resulted in more than 17 million confirmed cases and 6.6 million deaths across 188 countries (BBC News, 2020). Therefore, we posit that the threat of the disease itself is the first primary environmental stimulus in the COVID-19 pandemic context.

In response to the threat of COVID-19, many governments made considerable efforts to communicate information about the disease and recommended preventive actions (Anderson, Heesterbeek, Klinkenberg & Hollingsworth, 2020). In addition to the government-led communications, a massive amount of COVID-19- related information also spread quickly in social media (Farooq, Laato & Islam, 2020). However, the large information volume did not equal better information quality. Misinformation and low-quality information were spread on the internet (Garrett, 2020). Thus, both the excessive information volume and low quality of information created an environment of information overload among the public (Bawden & Robinson, 2009). Therefore, we posit that information overload could be another primary featured stimulus existing in the COVID-19 pandemic.

These environmental stimuli influenced individuals' inner states. During the COVID-19 pandemic, Chinese consumers have endured various unpleasant psychological states, such as isolation, depression, anxiety, worry, and stress (Cao et al., 2020; Duan & Zhu, 2020; Li, Meng, Song & Zheng, 2020a; Wang et al., 2020). Despite the shared characteristic that those feelings are all unpleasant, the emotions are heterogeneous in terms of the nature of their activation levels. According to Russell and Pratt (1980), negative

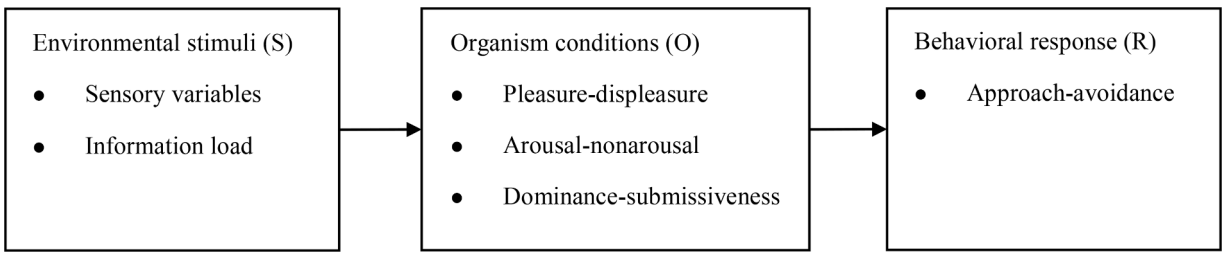

Fig. 1. S-O-R framework (Mehrabian & Russell, 1974; Vieira, 2013).

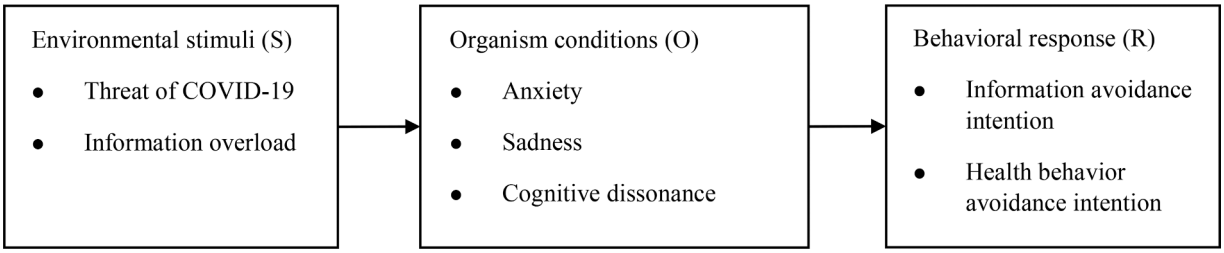

Fig. 2. Conceptual model based on S-O-R framework.

emotions fall into different places on a dimensional axis, from arousal states to sleepy states or from activation to deactivation (Russell, 2009; Zhang, 2013). Prior empirical findings also suggest that the uncertainty associated with COVID-19 caused cognitive dissonance among consumers (Li, Meng, Song & Zheng, 2020b), which echoes the cognitive components in the S-O-R model. Therefore, guided by the S-O-R paradigm, this paper aims to investigate two negative emotions across the two categories that were widely identified among the public during the COVID-19 pandemic: anxiety (in the category of unpleasant arousal) and sadness (in the category of unpleasant nonarousal), and one cognitive related factor: cognitive dissonance (in the category of submissiveness).

According to the S-O-R model, individuals' organism states will determine their approach or avoidance responses. The desire to approach or avoid a particular environment could cause physical or non-physical behaviors (Vieira, 2013). Prior empirical studies suggest that people are likely to avoid health information arousing unpleasant feelings and that avoidance of information can lead to further avoidance in health behaviors (Miles et al., 2008; Persoskie et al., 2014; Vrinten et al., 2018). Therefore, this study aimed to investigate information avoidance and health behavior avoidance intentions relating to the COVID-19 pandemic. The conceptual model is shown in Fig. 2.

4. Research model and hypotheses

4.1. COVID-19 as an environmental stimulus (S)

Threat refers to harm or danger that exists in the external environment. Different people have different perceptions of a threat, and the perceptions are sensitive to individuals' personal traits and past experiences (Slovic, Fischhoff & Lichtenstein, 1982). Therefore, compared to an object threat, perceived threat is more important for understanding people's responses (Slovic, 1987).

When people perceive the existence of a threat, the processing of the threatening event can arouse anxiety (Butler & Mathews, 1987). Beck and Clark (1997) argued that anxiety was an organism's response to the selective processing of threatening stimuli in the environment. According to the risk perception attitude (RPA) framework, a perceived threat is a predictor of the information recipient's anxiety (Rimal & Real, 2003). For example, Zhao and Cai (2009) found that smokers' perceived threat of lung cancer is positively associated with their anxiety in health information seeking. Prior studies also suggest that people are likely to feel anxious at the time of public health emergencies, as in the cases of the severe acute respiratory syndrome (SARS) epidemic (Hawryluck et al., 2004) and the Middle East respiratory syndrome (MERS) (Jeong et al., 2016) epidemic. In regard to the COVID-19 case, a recent survey found that 28.8% of the Chinese participants reported moderate to severe anxiety during the COVID-19 pandemic (Wang et al., 2020). Therefore, we proposed that Chinese consumers' anxiety was associated with their perceived threat of the COVID-19 pandemic:

H1a: The perceived threat of the COVID-19 pandemic is positively associated with anxiety.

In addition to anxiety, a perceived threat could also evoke an individual's affective responses, such as sadness and tiredness (Xie, Wang, Zhang, Li & Yu, 2011). In a study by Neubaum, Rösner, Rosenthal-von der Pütten and Krämer (2014), at the scenes of emergencies, individuals usually experienced significant grave affective states when they witnessed threatening events (Neubaum et al., 2014). During the outbreak of COVID-19, Chinese consumers who were exposed to stressful information about the severity of the pandemic experienced more negative affect (Chao, Xue, Liu, Yang & Hall, 2020). We posited that the feeling of sadness could come from the perception of threat:

H1b: The perceived threat of the COVID-19 pandemic is positively associated with sadness.

The S-O-R model suggests that information load in a particular environment is also a key stimulus. In the COVID-19 pandemic, the excessive volume of information and the problematic quality of information can lead to information overload for general consumers. The term *information overload* is often used to describe the phenomenon where individuals have received too much information on a particular subject (Eppler & Mengis, 2004). Information overload occurs when a person's information-processing capacity cannot meet the information-processing requirements, which involves not only information quantity, but also information quality (Eppler & Mengis, 2004; Keller & Staelin, 1987; Schneider, 1987). Some previous researchers attempted to find an objective threshold of information overload for ordinary consumers (Keller & Staelin, 1987; Lurie, 2004). However, the fact that different individuals may have different information processing capabilities (Grisé & Gallupe, 1999; Zhang, Sun & Kim, 2017), the level of information overload may vary across individuals, even in the same information environment (Chen, Shang & Kao, 2009). Therefore, many prior empirical studies used perceived information overload as a part of environmental stimuli (Cao & Sun, 2018; Liu, Suh & Wagner, 2018).

Information overload may result in some psychological discomfort. According to information processing theory (IPT), human's

cognitive resources are limited (Miller, 1956). The overstimulation caused by an excess of information may cause an increase in an individual's anxiety and a decrease in his or her psychological well-being (Chen et al., 2009; Eppler & Mengis, 2004). For example, Swar, Hameed and Reychav (2017) found that perceived information overload significantly predicted people's anxiety in everyday health information seeking. Therefore, we proposed that perceived information overload about the COVID-19 pandemic was associated with the Chinese consumers' anxiety.

H2a: Perceived information overload in regard to COVID-19 is positively associated with anxiety.

Information overload involves an imbalance between environmental demands and an individual's processing capacity. On one hand, information overload occurs when individuals estimate that they have to handle more information than they can efficiently use (Eppler & Mengis, 2004; O'Reilly III, 1980). The tension of excessive information exposure and one's limited information processing capacity may cause a conflict in cognitions. On the other hand, information overload often involves low-quality information (Bawden & Robinson, 2009). Inconsistencies in information quality can imply divergent, or even opposite, directions in guiding individuals' behaviors, which may further lead to conflicting cognitions. When two or more contradictory cognitions, attitudes, and behaviors occurred, individuals experienced a discomforting psychological condition—cognitive dissonance (Elliot & Devine, 1994; Festinger, 1957). Therefore, people who are exposed to an excess of inconsistent information may experience cognitive dissonance. Based on the above reasoning, we posited that:

H2b: Perceived information overload in regard to the COVID-19 pandemic is positively associated with cognitive dissonance.

4.2. Consumers' internal states (O)

People often use a set of umbrella terms to describe individuals' psychological states, such as *affect, emotions, moods*, and *feelings* (Russell, 2003, 2009). This paper will use the concept of "core affect" presented in Russell (2009) and treat affect as an intrinsic aspect of consciousness caused by stimuli. According to Russell (2009), individuals' affect can be described in terms of two underlying dichotomies: pleasure-displeasure and activation-deactivation. The structural description of affect echoes the two dichotomies of internal states in the S-O-R model: pleasure-nonpleasure, arousal-nonarousal. As an individual's information processing is sensitive to the affect associated with uncertainty appraisals, it is necessary to distinguish affect at a more fine-grained level than merely positive and negative (Tiedens & Linton, 2001). Therefore, we intend to investigate and distinguish two typical but different types of negative affect, namely, sadness (unpleasant deactivation) and anxiety (unpleasant activation).

Sadness is one of the most commonly experienced negative affect in people's daily life. There are several feelings related to sadness, such as tiredness, resignation, isolation (Nabi, 1999). As a low arousal state, sadness has the capacity to slow down an individual's cognitive system (Nabi, 1999) and trigger a higher tendency toward inaction than action in completing tasks (Albarracin & Hart, 2011). It tends to motivate people to calm down, focus inward, and perform systematic information processing in crises (Kim & Cameron, 2011). Therefore, we posit that people who experienced more sadness in the COVID-19 pandemic would be less likely to avoid disease-related information.

H3: Sadness is negatively associated with information avoidance intention in the context of the COVID-19 pandemic.

As is argued above, both perceived threat and information overload may increase consumers' anxiety. Given that anxiety is an uncomfortable psychological state (Beck & Clark, 1997), people who encounter anxiety may adopt some coping strategies to reduce the discomfort. The risk perception attitude (RPA) framework suggests that people may deliberately avoid threat-related information to reduce anxiety, especially when they perceive the risk but can do little to reduce the threat (Rimal & Real, 2003; Zhao & Cai, 2009). Using conceptual analysis, Savolainen (2014, 2015) revised the list of psychological factors associated with information seeking and reached a similar proposition, that anxiety is related to information avoidance. Many empirical studies have confirmed this relationship. For example, researchers found that cancer-related anxiety would make people avoid cancer information and cancer screening (Chae & Lee, 2019; Vrinten et al., 2018). Therefore, we posited that the anxiety incited by the threat of COVID-19 and information overload could further induce Chinese consumers' information avoidance responses.

H4: Anxiety is positively associated with information avoidance intention in the context of the COVID-19 pandemic.

According to cognitive dissonance theory (Festinger, 1957), holding two or more inconsistent cognitions will elicit a dissonance state for the individual. These incompatible cognitions could be beliefs, attitudes, and knowledge about the environment. Cognitive dissonance is also an uncomfortable experience, so that people are motivated to reduce it when it occurs. Festinger (1957) proposed that one way to reduce dissonance is to avoid information that might exacerbate it. Jean Tsang (2019) suggested that cognitive dissonance decreases people's information-seeking intentions in regard to inconsistent information. Gaspar et al. (2016) found that people tended to avoid health information about red meat risks that might conflict with their cognitions. In the COVID-19 pandemic, Chinese people are exposed to overwhelmingly inconsistent information about the disease, which may generate cognitive dissonance. We therefore further argue that cognitive dissonance motivates Chinese consumers to engage in information avoidance and reduce their information exposure.

H5: Cognitive dissonance is positively associated with information avoidance intention in the context of the COVID-19 pandemic.

4.3. People's response (R)

Information avoidance is a useful coping strategy for dealing with threatening and undesirable information (Case et al., 2005). However, when the avoided information is relevant and useful to those who avoid it, avoidance may generate negative consequences (Bawden & Robinson, 2009). In healthcare settings, information avoidance can lead to undesirable outcomes because it deprives people of opportunities to be informed about risk and to take preventive action (Golman et al., 2017). Prior studies suggest that

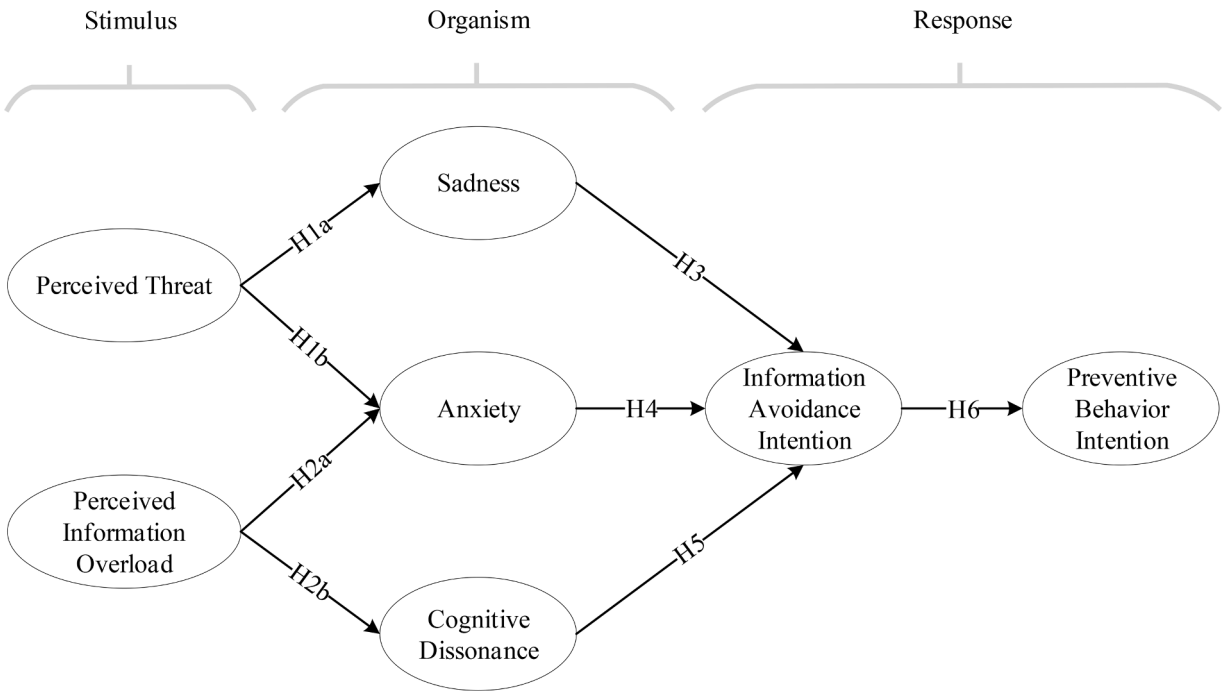

Fig. 3. Research model based on the S-O-R framework.

information avoidance may influence people's health behaviors. For example, Chae and Lee (2019) and Vrinten et al. (2018) found that the avoidance of cancer information predicted the avoidance of cancer screening. Therefore, we proposed that information avoidance is negatively associated with Chinese consumers' protective behavior during the COVID-19 pandemic.

H6: Information avoidance intention is negatively associated with the intention to take protective measures during the COVID-19 pandemic.

The theoretical model and hypotheses are presented in Fig. 3.

5. Methodology

5.1. Instruments

The measures for the seven constructs were adapted from validated scales to fit the context of the COVID-19 pandemic. All of the items were rated on five-point Likert scales, ranging from 1 (strongly disagree) to 5 (strongly agree) to test the respondents' attitude toward each statement. Perceived threat was measured with three items adapted from Yang (2012) and Lin and Bautista (2016). Perceived information overload was measured with three items adapted from Chen et al. (2009). The measures for sadness were adapted from Zhang (2013). Anxiety was measured with three items based on Marteau and Bekker (1992). A consensus on how to measure the state of cognitive dissonance has yet to be reached. Metzger, Hartsell and Flanagin ((2020)) remarked that previous research has mainly assumed that the state of cognitive dissonance results from exposure to attitude-inconsistent information, rather than measuring it. Metzger et al. (2020) operationalized cognitive dissonance in the form of mental discomfort arising from inconsistencies between two beliefs or between a belief and an action. We adapted three items from Metzger et al. (2020) and borrowed three items from Kahlor, Olson, Markman and Wang (2020) to measure information avoidance. Moreover, three items were developed for this study to measure preventive behavior intention based on the World Health Organization's (2020) advice on preventive behaviors during the COVID-19 pandemic. Appendix A shows these constructs, measurement items, and related references. As the respondents were Chinese, we used translation (from English to Chinese) and the back-translation (form Chinese to English) technique to develop the questionnaire. That is, the original English instruments were translated by the first author into Chinese; then the Chinese scales were translated back into English by the second author. The two versions were compared to resolve any inconsistencies, so that the Chinese questionnaire would be accurate. A pilot survey was conducted on a convenient sample of sixteen graduate students and two faculty members from a local university. The final questionnaire was then revised based on their comments and suggestions.

5.2. Data collection

The questionnaire was distributed on the Wenjuanxing (www.wjx.cn) site, which is one of the largest professional data collection

Table 1
Demographics of the respondents (n = 721).

Demographic variables		Frequency	Percentage
Gender	Female	423	58.7%
	Male	298	41.3%
Education Level	Junior high school	9	1.2%
	Senior high school	64	8.9%
	Associate degree	92	12.8%
	Bachelor's degree	433	60.1%
	Master's degree	94	13.0%
	Doctoral degree	29	4.0%
Professionals	Currently in healthcare	107	14.8%
	Worked in healthcare in the past	67	9.3%
	Never worked in healthcare	547	75.9%
Health Status	Extremely bad	1	0.1%
	Relatively bad	5	0.7%
	Normal	137	19.0%
	Relatively good	395	54.8%
	Extremely good	183	25.4%

platforms in China, with over one million active respondents per day. We used the sampling service provided by Wenjuanxing, which helped us to randomly select respondents to ensure the representativeness of the sample. We also included several questions to identify invalid responses which were irrelevant to the other items but requested extra attention to select correct answers (e.g., basic caculation questions). In total, 721 valid questionnaires were collected from May 20th to June 9th, 2020. Each respondent was rewarded with six yuan in cash (approximately one dollar) as an incentive.

Table 1 shows the demographic information of the respondents. Of all the respondents, 58.7% (n = 423) were female and 41.3% (n = 298) were male. Most of the respondents had a bachelor's degree or above (n = 556, 77.1%), and the majority were laypeople who had never worked in a healthcare profession (n = 547, 75.9%). In terms of health status, most of the respondents were feeling normal and well.

6. Results

We used a partial least squares (PLS) method and SmartPLS 3.0 to analyze the data. PLS is a second-generation, component-based, structural equation modeling technique that has been widely employed in various fields. We employed it for three reasons. First, it has been widely used as a method for testing theory in the early stage, while the covariance-based structural equation modeling technique in LISERL or AMOS is usually used for theory confirmation (Hair, Ringle & Sarstedt, 2011). As in previous research studies (e.g., Xu, Dinev, Smith & Hart, 2011), it is well-suited for testing models of theory building (Hair et al., 2011). Second, past studies have found that PLS is best suited for examining complex relationships and avoids unfeasible solutions and factor indeterminacy (Kim & Benbasat, 2006; Xu et al., 2011). This makes it well suited for testing models with many constructs and complicated relationships, as is the case here. Finally, PLS is characterized by its capability to assess the measurement model within the context of the structural model, which provides a more comprehensive estimation.

6.1. Measurement model

Tables 2 and 3 report the descriptive statistics and psychometric properties of all the constructs in the proposed research model. Reliability was examined using the values of Cronbach's alpha and composite reliabilities. As shown in Table 2, both were higher than the recommended 0.7 (Fornell & Larcker, 1981), satisfying the requirement for reliability. In terms of convergent validity, the values of average variance extracted (AVE) were all above 0.5 (Chin, 1998), and all the item loadings were larger than the required 0.7, indicating that convergent validity is satisfied.

Discriminant validity was examined with three methods, following Ko (2018). First, Table 2 shows that the square root of the AVE value of each construct was higher than its correlation with any other construct (Fornell & Larcker, 1981). Second, item loadings on their own construct were significantly higher than the cross-loadings on any other construct (Gefen & Straub, 2005). Third, we used the heterotrait–monotrait (HTMT) ratio to test for discriminant validity (Henseler, Ringle & Sarstedt, 2015). As reported in Table 4, the HTMT values were all below 0.85 (Voorhees, Brady, Calantone & Ramirez, 2016), indicating satisfactory discriminant validity. All of these results suggest acceptable psychometric properties for all of the constructs in the study.

6.2. Structural model

We used the standard bootstrap procedure in SmartPLS on 5000 bootstrapping samples to assess the significance of the paths of the structural model. Fig. 4 and Table 5 show the structural model results. We first examined the effects of perceived threat on anxiety and negative affect. The results show that perceived threat has a positive effect on both anxiety ($\beta = 0.142, p < 0.001$) and sadness ($\beta = 0.269, p < 0.001$). Furthermore, neither of the bias-corrected CIs equals zero. Thus, H1a and H1b receive support, respectively.

Table 2
Descriptive statistics and psychometric properties.

	1	2	3	4	5	6	7	8	9	10	11	12
1. Perceived threat	**0.826**											
2. Perceived Information overload	0.073	**0.834**										
3. Sadness	0.269	0.298	**0.827**									
4. Anxiety	0.178	0.501	0.572	**0.867**								
5. Cognitive dissonance	0.061	0.482	0.357	0.524	**0.825**							
6. Information avoidance intention	−0.193	0.320	0.071	0.237	0.375	**0.857**						
7. Preventive behavior intention	0.331	−0.072	0.101	0.044	−0.064	−0.340	**0.793**					
8. Age	−0.089	0.001	−0.085	−0.041	−0.001	0.067	−0.006	NA				
9. Gender	−0.023	−0.057	−0.102	−0.125	−0.027	0.029	−0.004	0.032	NA			
10. Education	0.118	−0.033	0.052	0.023	−0.002	−0.102	0.064	−0.352	−0.029	NA		
11. Professionals	0.098	0.005	0.075	0.085	0.084	−0.022	0.006	0.133	0.004	−0.020	NA	
12. Health status	−0.050	−0.148	−0.081	−0.153	−0.140	−0.144	0.025	−0.076	0.014	0.121	−0.041	NA
Cronbach's Alpha	0.767	0.785	0.764	0.835	0.765	0.819	0.712	1	1	1	1	1
Composite Reliability	0.866	0.873	0.866	0.900	0.865	0.892	0.836	1	1	1	1	1
Mean	4.393	2.701	3.469	3.061	2.610	1.991	4.207	32.264	0.413	4.868	2.610	4.046
Std. Dev.	0.605	0.902	0.853	0.916	0.904	0.786	0.627	10.077	0.493	0.933	0.732	0.695

Notes. The diagonal elements are the square roots of the AVE values; the off-diagonal elements are the squared correlations among factors. For discriminant validity, the diagonal elements should be larger than the off-diagonal elements.

Table 3
Item loadings and cross-loadings.

Constructs	Items	1	2	3	4	5	6	7
1. Perceived threat	Threat 1	**0.847**	0.062	0.229	0.141	0.066	−0.157	0.257
	Threat 2	**0.821**	0.023	0.212	0.135	0.021	−0.246	0.325
	Threat 3	**0.810**	0.092	0.224	0.163	0.062	−0.083	0.241
2. Perceived information overload	Overload 1	0.125	**0.838**	0.323	0.504	0.439	0.243	−0.012
	Overload 2	0.009	**0.832**	0.179	0.364	0.355	0.311	−0.089
	Overload 3	0.029	**0.834**	0.223	0.362	0.403	0.257	−0.092
3. Sadness	Sadness 1	0.233	0.178	**0.867**	0.460	0.294	0.040	0.105
	Sadness 2	0.236	0.261	**0.885**	0.502	0.323	0.033	0.119
	Sadness 3	0.194	0.307	**0.720**	0.455	0.266	0.107	0.022
4. Anxiety	Anxiety 1	0.189	0.375	0.505	**0.827**	0.392	0.163	0.073
	Anxiety 2	0.103	0.476	0.445	**0.880**	0.501	0.279	−0.029
	Anxiety 3	0.180	0.441	0.546	**0.892**	0.460	0.162	0.082
5. Cognitive dissonance	Dissonance1	0.083	0.398	0.296	0.440	**0.838**	0.335	−0.044
	Dissonance2	0.063	0.423	0.330	0.496	**0.852**	0.301	−0.048
	Dissonance3	0.002	0.372	0.256	0.355	**0.784**	0.292	−0.067
6. Information avoidance intention	Avoidance 1	−0.133	0.282	0.078	0.190	0.287	**0.834**	−0.284
	Avoidance 2	−0.194	0.258	0.043	0.199	0.336	**0.864**	−0.310
	Avoidance 3	−0.166	0.285	0.063	0.219	0.338	**0.872**	−0.281
7. Preventive behavior intention	Behavior 1	0.232	−0.039	0.081	0.024	−0.042	−0.211	**0.761**
	Behavior 2	0.258	−0.044	0.056	0.013	−0.073	−0.247	**0.805**
	Behavior 3	0.288	−0.080	0.100	0.059	−0.039	−0.330	**0.813**

Table 4
Heterotrait-monotrait (HTMT) ratio.

	1	2	3	4	5	6
1. Sadness						
2. Anxiety	0.722					
3. Preventive behavior intention	0.132	0.088				
4. Cognitive dissonance	0.466	0.648	0.088			
5. Information avoidance intention	0.094	0.280	0.432	0.472		
6. Perceived information overload	0.378	0.601	0.102	0.615	0.404	
7. Perceived threat	0.350	0.227	0.443	0.086	0.245	0.105

In terms of information overload, the results show that perceived information overload is positively associated with anxiety ($\beta = 0.490$ $p < 0.001$) and cognitive dissonance ($\beta = 0.482$, $p < 0.001$). The bias-corrected CIs also suggest consistent results. Therefore, H2a and H2b are supported. In addition, the R-squared values indicate that perceived threat and information overload together explain the 27.1% variance for anxiety; perceived threat explains the 7.2% variance for sadness; and perceived information overload explains the 23.3% variance for cognitive dissonance.

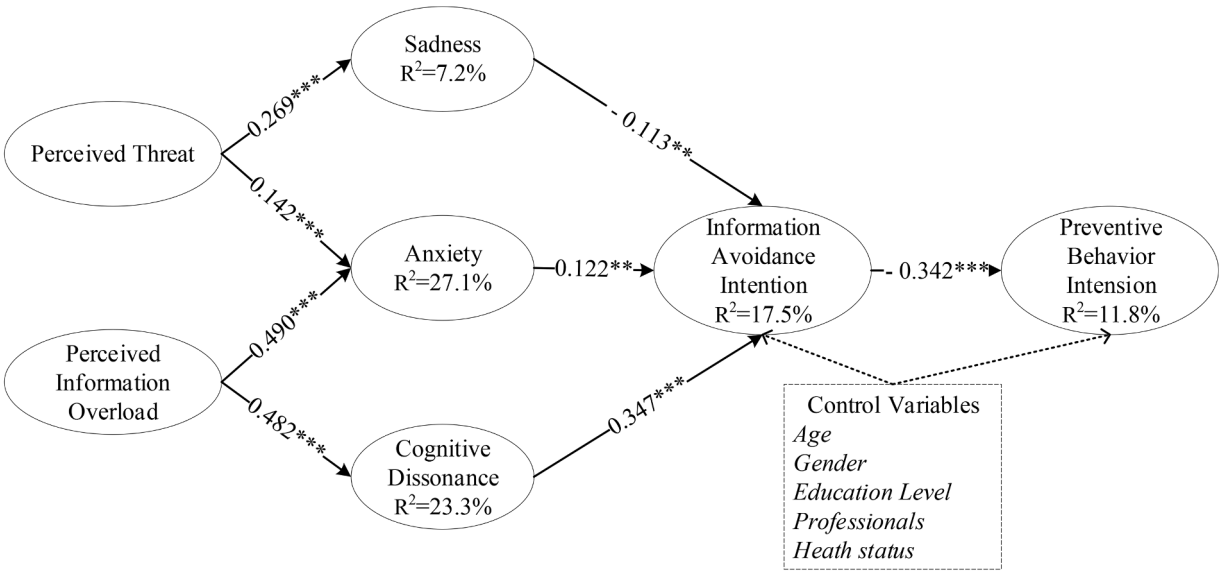

Fig. 4. Structural model results.

Table 5
Hypotheses testing results.

	Paths	Coefficients	T-values	*p*-values	95% Bias-corrected CI		Supported
					Lower	Upper	
H1a	Perceived threat -> Anxiety	0.142	4.939	0.000	0.084	0.195	Yes
H1b	Perceived threat-> Sadness	0.269	8.971	0.000	0.205	0.323	Yes
H2a	Perceived information overload -> Anxiety	0.490	16.407	0.000	0.431	0.548	Yes
H2b	Perceived information overload -> Cognitive dissonance	0.482	15.701	0.000	0.421	0.539	Yes
H3	Sadness-> Information avoidance intention	−0.113	2.873	0.004	−0.189	−0.036	Yes
H4	Anxiety -> Information avoidance intention	0.122	2.863	0.004	0.038	0.205	Yes
H5	Cognitive dissonance -> Information avoidance intention	0.347	8.538	0.000	0.265	0.425	Yes
H6	Information avoidance -> Preventive behavior intention	−0.342	9.073	0.000	−0.413	−0.263	Yes

Note: Bias-corrected confidence intervals (CI) are based on 5000 bootstrap samples.

Next, we examined the effects of three internal states—sadness, anxiety, and cognitive dissonance—on information avoidance intention. The results show that both anxiety ($\beta = 0.122, p < 0.01$) and cognitive dissonance ($\beta = 0.347, p < 0.001$) have a positive effect on information avoidance intention, while sadness ($\beta = -0.113, p < 0.01$) has a negative effect on information avoidance intention. None of the bias-corrected CIs equals zero. Therefore, H3, H4, and H5 are all supported. Moreover, the three internal states together explain 17.5% of the variance in information avoidance intention.

Finally, the effect of information avoidance intention on preventive behavior intention was scrutinized. The result suggests that information avoidance is negatively associated with preventive behaviors ($\beta = 0.342, p < 0.001$). Thus, H6 is supported. The 11.8% variance in preventive behavior intention can be explained by information avoidance intention.

7. Discussion

7.1. Main findings

This research revealed several interesting findings. Overall, the results suggest that the perceived threat and information overload related to the COVID-19 pandemic were associated with Chinese consumers' sadness, anxiety, and cognitive dissonance, which in turn were associated with their intention to avoid health information and preventive behaviors.

First, the study found that the perceived threat of the COVID-19 pandemic increased Chinese consumers' sadness; perceived information overload raised Chinese consumers' cognitive dissonance; and both the perceived threat and information overload increased Chinese consumers' anxiety. These findings suggest that both the perceived threat of the COVID-19 pandemic and the related information overload aroused Chinese consumers' uncomfortable psychological states.

Second, the results suggest that the uncomfortable psychological states led to different effects on behavioral intentions. Anxiety and cognitive dissonance increased information avoidance intention, whereas sadness decreased it. This heterogeneous effect can be explained by the different natures of the states. Although sadness and anxiety are both negative affective states, anxiety involves a higher level of arousal than sadness. The activation component of anxiety motivates individuals to take action to alleviate the discomfort, while the inactivation component of sadness slows down individuals' cognition and triggers systematic information processing. Therefore, anxiety is positively associated with consumers' information avoidance intention in relation to the COVID-19 pandemic, whereas sadness is negatively associated with information avoidance intention.

Third, information avoidance intention was negatively associated with the intention to take protective action during the COVID-19 pandemic. That is, when people had a stronger intention to avoid COVID-19-related information, they were more reluctant to take recommended actions to prevent COVID-19.

7.2. Theoretical implications

Our findings contribute to theory in several ways. First, this study enriched the literature on information behavior by switching the focus of inquiry from information seeking to information avoidance. Information science researchers noticed the phenomena of information avoidance a while ago, as Case et al. (2005), 2006) noted that people might deliberately ignore threatening information. However, classic information-seeking theories assume that people always tend to seek information (Kuhlthau, 1991; Wilson, 1999); thus, the essential research question concerns the scope of information selection among different sources (Case et al., 2005). This study highlights the significance of information avoidance and empirically investigates its important antecedents and behavioral consequences. Employing the S-O-R theory, the study incorporated contextual factors in model construction and linked external environmental factors in public health emergencies to consumers' information behaviors and consequent health decisions. We hope this model is more relevant than conventional ones in its additional consideration of the influence of social factors on health information behaviors.

The effort to distinguish information avoidance from information seeking also contributes to the risk communication literature. In traditional communication literature, information seeking and information avoidance are more like two sides of the same coin, as can be seen in the concept of "selective exposure." Selective exposure theory posits that people tend to seek information that is consistent with their beliefs and avoid information counter to their beliefs. In the risk communication literature, the extended parallel process model (EPPM) proposes a similar relationship. The EPPM suggests that the motivations for information seeking and information avoidance exist simultaneously in risk information processing. The motivation for danger control enhances the information-seeking process, while the motivation for fear control spurs information avoidance (Witte, 1994). More recently, Kahlor et al. (2020) fashioned an information avoidance model based on their earlier planned risk information-seeking model (PRISM) (Kahlor, 2010), and the two models share similar predictors, although the dependent variables differ. However, other scholars have suggested that it is necessary to distinguish information avoidance from information seeking (Barbour, Rintamaki, Ramsey & Brashers, 2012; Case et al., 2005). This paper is a response to this suggestion. We separate information avoidance from information-seeking behavior to enhance our understanding of information avoidance in risk communication.

Furthermore, this study tried to uncover the psychological mechanisms behind information avoidance. Although some prior studies have paid attention to information avoidance in healthcare contexts (Savolainen, 2014, 2015), the psychological factors that influence information avoidance have been relatively less investigated. In some prior studies, the three terms—*negative affect, anxiety*, and *cognitive dissonance*—were often interchangeably used, and these studies often produced inconsistent results. For example, Kahlor et al. (2020) measured what they called the *affective risk response* in terms of the two dimensions of worry and fear (Kahlor, 2010) and found a negative relationship between affective response and information avoidance. However, Swar et al. (2017) found that both "negative affect" and "anxiety" were positively correlated with information avoidance. This paper examined negative psychological states with a more fine-grained lens by dividing them into three categories (i.e., sadness, anxiety, and cognitive dissonance) and revealed that different negative psychological states, in terms of levels of arousal, produce different effects on information avoidance intention.

7.3. Practical implications

The results of this study suggest substantial practical implications for governments and the public. First, the results indicate that consumers might be exposed to an overstimulating environment during the COVID-19 pandemic. Threatening information and efforts to process an information overload trigger a set of negative psychological states, such as sadness, anxiety, and cognitive dissonance. To alleviate the discomfort, consumers' may deliberately avoid health information. This could be conceived of as a coping strategy to avoid an excess of information during the infodemic and may generate some temporal benefits for individuals in terms of

psychological well-being. However, information avoidance is not desirable for health decisions in the long term, because less-informed individuals are more reluctant to respond to well-founded recommendations. Therefore, individuals should trade-off information seeking and information avoidance. Consumers are better off seeking professional assistance when they experience discomfort from overstimulation.

These findings also suggest that government initiatives to deal with risk and health communication during a public health crisis might not perform as expected at the beginning, because the public may deliberately ignore overwhelming threatening information. This implies that accredited institutions (e.g., governments, centers for disease control and prevention) should constantly publish accurate but not overwhelming information in a timely fashion. When credible information is inadequate, misinformation and disinformation that irrationally exaggerate the threat can result in information avoidance behaviors on the part of the public.

Furthermore, this study found that information avoidance behavior leads to a decrease in preventive behaviors during the pandemic. The findings of some prior studies suggest that information avoidance predicts medical screening avoidance (Li, Meng, Song & Zheng, 2020c; Persoskie et al., 2014), and our study reached a similar finding, that increased information avoidance during the pandemic was a significant predictor of decreased efforts to prevent disease. This implies that reducing information avoidance through proper risk communication could be an effective intervention to promote disease control.

7.4. Limitations and future research

This study involves several limitations that provide research opportunities for future studies. First, the one-wave data collection could be extended to multiple waves in the future. The data were collected three months after the first outbreak of COVID-19, at which stage continuous community spread was well under control, and domestic cases were almost cleaned up in China. Although the pandemic was still severe across the globe, Chinese consumers may not have been reacting as strongly as they had at the very beginning of the outbreak. Moreover, the cross-sectional data did not support an investigation of people's responses through different stages of the epidemic. Therefore, future research could collect multi-wave data from the very beginning of a public health crisis and explore the effects through the different stages. Second, this study employed an online survey approach by distributing the questionnaire via a professional data collection platform. Therefore, the sample collected online may not represent the segment of the population who have limited access to the internet. Future research could further investigate the information behaviors of vulnerable populations with limited internet access in a public health crisis. Finally, respondents in other countries could be studied. Given that the pandemic is a global event and that coping strategies vary across cultures, future studies could test the proposed model in different countries and consider more contextual factors.

8. Conclusion

In the specific context of the 2020 COVID-19 pandemic in China, this research employed the stimulus-organism-response model to examine influential factors associated with information avoidance intention and how they impacted health behavior intentions. The results show that perceived threat and information overload induced negative psychological states (i.e., sadness, anxiety, cognitive dissonance). Anxiety and cognitive dissonance motivated information avoidance intention, while sadness discouraged it. Moreover, information intention avoidance predicted a decrease in consumers' intentions to take effective preventive measures against infection during the COVID-19 pandemic.

CRediT authorship contribution statement

Shijie Song: Conceptualization, Writing - original draft, Investigation. **Xinlin Yao:** Methodology, Formal analysis, Writing - review & editing. **Nainan Wen:** Conceptualization, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no conflict of interest in conducting this study.

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Appendix A

Measurement items

Construct	Measurement items		References
Perceived threat	Item 1	COVID-19 could put my health at risk.	(Lin & Bautista, 2016; Yang, 2012)
	Item 2	COVID-19 would be a very serious threat to my quality of life.	
	Item 3	COVID-19 pandemic would be harmful to my well-being.	
Perceived information overload	Item 1	There was too much COVID-19 information from media so that I was burdened in handling it.	(Chen et al., 2009)
	Item 2	I could not effectively handle all the COVID-19 information from the media.	
	Item 3	Because of the plenty COVID-19 information from the media, I felt it difficult to acquire all the information.	
Sadness	Item 1	I feel sad when reading COVID-19 information.	(Zhang, 2013)
	Item 2	I feel tired when reading COVID-19 information.	
	Item 3	I feel lethargic when reading COVID-19 information.	
Anxiety	Item 1	I feel tense when reading COVID-19 information.	(Marteau & Bekker, 1992)
	Item 2	I feel upset when reading COVID-19 information.	
	Item 3	I feel worried when reading COVID-19 information.	
Cognitive dissonance	Item 1	The information source on COVID-19 makes me uncomfortable	(Metzger et al., 2020)
	Item 2	I felt confused while reading COVID-19 story	
	Item 3	The COVID-19 story made me question my own beliefs	
Information avoidance intention	Item 1	I will avoid information related to potential risks posed by the pandemic in the near future.	(Kahlor et al., 2020)
	Item 2	I intend to avoid information about potential risks posed by the pandemic in the near future.	
	Item 3	I will try to avoid information about potential risks posed by the pandemic in the near future.	
Preventive behavior intention	Item 1	I intend to limit exposures in a crowded environment in the COVID-19 pandemic.	Self-developed based on (Word Health Organization, 2020)
	Item 2	I intend to conduct social distancing in the COVID-19 pandemic.	
	Item 3	I intend to wash hands often in the COVID-19 pandemic.	

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