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Influence of Online Social Support on the Public's Belief in Overcoming COVID-19

Zhong Yao [1], Pengfei Tang [1], Jiarong Fan [2], Jing Luan [3,*]

[1] School of Economics and Management, Beihang University, Beijing, China
[2] Chow Yei Ching School of Graduate Studies, City University of Hong Kong, Hong Kong, China
[3] School of Economics and Management, Beijing Jiaotong University, Beijing, China

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ABSTRACT

The sudden outbreak of coronavirus disease 2019 (COVID-19) in early 2020 has dramatically changed people's lives. Some countries have taken mass home quarantine to control the virus. However, the side effects of quarantine have rarely been interrogated by current COVID-19 research. This study thus investigates the effects of online social support on the public's beliefs in overcoming COVID-19 by embracing their cognition and emotion during the epidemic. First, by crawling and content analysis of the messages posted on "Baidu COVID-19 bar[1]", this study identified 5 types of online social support given or received by the public during COVID-19. On this basis, a model explaining the public's beliefs was developed from the perspectives of online social support, cognition and emotion. 334 valid online questionnaires were collected to examine the proposed model and hypotheses. The results show that cognition has a direct effect on the belief, while emotion affects the belief via a full mediating effect of cognition. Tangible support and esteem support can directly affect the public's beliefs, and educational level significantly moderates these effects. In addition, the public's cognition is influenced by informational support, however, emotion is not influenced by social support but by other factors (e.g., information disclosure, material supplies and frustration caused by the epidemic). These research results provide a deep insight into how to reduce the negative effects of quarantine, consolidate the theoretical basis of the public's beliefs, and have important practical implications for individuals and the government in dealing with such emergencies.

1. Introduction

In 2020, a new type of coronavirus, named coronavirus disease 2019 (COVID-19) by the World Health Organization[2] (WHO), had caused a pandemic outbreak in the world. WHO has declared COVID-19 a public health emergency and has called for global concern and support. As of April 3, 2020, there were 1,011,193 confirmed cases and 207 countries with cases[3]. To prevent the uncontrolled

* Corresponding author.
E-mail addresses: iszhyao@buaa.edu.cn (Z. Yao), tang@buaa.edu.cn (P. Tang), jiaronfan2-c@my.cityu.edu.hk (J. Fan), jingluan@bjtu.edu.cn (J. Luan).

[1] Baidu COVID-19 bar. https://tieba.baidu.com/f?kw=%E6%96%B0%E5%9E%8B%E5%86%A0%E7%8A%B6%E7%97%85%E6%AF%92&ie=utf-8

[2] Novel coronavirus 2019. https://www.who.int/emergencies/ diseases/novel-coronavirus-2019

[3] WorldoMeters. COVID-19 Open Datasets. https://www.worldometers.info/coronavirus

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spread of the virus, Chinese authorities have taken prompt and rigid public health measures, including lockdown and home quarantine. Fortunately, these actions function well and help to effectively prevent uncontrolled spread. On April 3, 2020, 1,562 confirmed cases remained in China[4].

Since the COVID-19 outbreak, many cities in China have been placed under mass quarantine. Globally, such measures have also been taken to fight against SARS (2003) and Ebola (2014). It is undoubted that quarantine effectively reduces the infection risk and stops future uncontrolled spread. However, quarantine is often an unpleasant experience for people who suffer it (Brooks et al., 2020; Zhao, Cheng, & Yu, 2020; Wang, Wang, Liu et al., 2020; Grey et al., 2020). People in home quarantine are separated from their friends, experience loss of freedom, face uncertainty over disease status, and become bored in their isolated life. All of these experiences can create dramatic effects. However, there is a dearth of COVID-19 research concerning the negative effects associated with quarantine. As called for by Brooks et al. (2020) and Grey et al., (2020), the use of quarantine as a public health measure requires us to have insights into how to reduce its negative effects. To narrow this gap, this study aimed to investigate the impacts of online social support, emotion (especially negative emotion evoked by the pandemic), and cognition (especially pessimistic thinking toward the pandemic) on individuals' beliefs to fight against the epidemic and the specific influential mechanisms involved in fostering those beliefs. Such understanding is of great importance for guiding the public to appropriately act during the pandemic and helping them learn how to deal with public health emergencies such as COVID-19. These findings are expected to be valuable for the government and health departments to better communicate and cooperate together with the public to overcome the disease.

Belief indicates an individual's perception of reality and can be specific to an activity or institution, so it is more directly related to behaviors (Fu et al., 2004). In this study, we define belief to overcome pandemic as the public's trust and confidence in that the pandemic can be conquered. At the beginning of the pandemic, the origin, spread, and mortality rate of the disease were partly unclear and unexplained, and the public could only obtain limited information. Additionally, the unchecked and rapid dissemination of misinformation hinders public trust, consensus and subsequent behavior (Limaye et al., 2020). Under this condition, the public easily produces panic, nervousness, depression and helplessness (Brooks et al., 2020; Ni, Yang, Leung et al., 2020; Saltzman, Hansel & Bordnick, 2020), resulting in a lack of belief in overcoming the disease. Therefore, belief becomes a source of power to support individuals to positively face the pandemic and actively cooperate with the authorities. During such public health emergency, it is important and necessary to develop and strengthen the public's beliefs to overcome the pandemic, especially when quarantine is applied, so that people are isolated from others.

Fortunately, in recent years, social media has developed rapidly and has gained increasing popularity. Online social media accelerates emotion dissemination and opinion formation (Lee, Ha, Lee, & Kim, 2018; Li, Zhang, Wang et al., 2020), especially during public health emergencies (Househ, 2016; Carvajal-Miranda, Mañas-Viniegra & Liang et al., 2020; Zhong, Huang & Liu, 2021). Regarding COVID-19, due to draconian physical distancing measures, people heavily rely on digital social network to maintain connection (Limaye et al., 2020; Ni, Yang & Leung et al., 2020). According to "The report on public cognition and information dissemination of COVID-19[5]" issued on February, 2020, 90% of people were concerned about information on COVID-19, and 95% of them used at least one online media (e.g., Weibo, Wechat, Post bar) to communicate. Through online social media, people could obtain information, suggestions or guidance, referrals, and situation appraisals related to COVID-19 (informational support); could express their emotions and feelings to relieve themselves (emotional support); could be accompanied by others through chatting, watching movies, and playing games (companionship support); or could obtain money or material assistance, such as face masks and disinfectors (tangible support), and so on. Online social support has been the focus of some interest during the current pandemic, such as its role as psychosocial protection to relieve mental health problems (Grey et al., 2020). Therefore, through online social media, online social support is delivered to people who undergo quarantine, which could influence their cognition, emotions or behavior toward COVID-19. For the purpose to explore how to reduce negative effects of quarantine, this study concerned the influence of online social support on individuals' belief.

Because quarantine could cause negative experiences and leading to potential psychological costs, in this study, we also focus on the effect of online social support in mitigating people's negative emotions and pessimistic thinking created by quarantine. Brooks et al. (2020) provided a rapid review on the psychological impact of quarantine. They pointed out several common negative outcomes reported by people during or after quarantined period, such as fears, frustration, boredom, depression, stress, anger, low mood, and so on. There is evidence that these negative psychological effects can still be detected months, or even years, later (e.g., Jeong et al., 2016). Therefore, particular focus should be carefully considered for potential negative emotions during the epidemic. In addition, research has shown that emotions are closely related with cognition (e.g., Dolan, 2002; Pessoa, 2008; Hayes, VanElzakker, & Shin, 2012; Ge, Qiu, Liu et al., 2020). There is considerable evidence that both emotion and cognition are required to form beliefs (e.g., Spezio & Adolphs, 2010). Therefore, negative emotion caused by quarantine could interact with individuals' cognition, which may influence their beliefs to overcome the epidemic and their active participation in the measures of prevention and control.

In summary, to explore how to reduce the negative effects pertaining to quarantine during COVID-19, this study investigated the influence of online social support on the public's cognition, emotion, and belief to overcome COVID-19. Specifically, we investigated two research questions: (1) what types of supportive messages (online social support) were communicated in online social media serving individuals during the outbreak of COVID-19; (2) what effects did online social support, negative emotions and pessimistic thinking have on individuals' beliefs, and what are the mechanisms of how online social support affects people's beliefs. These results

[4] Baidu big data. https://voice.baidu.com/act/newpneumonia/newpneumonia/?from=osari_aladin_banner#tab4

[5] The State Information Center and the Network Communication Research Institute of Nanjing University in China. http://www.sic.gov.cn/archiver/SIC/UpFile/Files/Default/20200226101829580669.pdf

are hoped to contribute to the public, the government and the health department from both theoretical and practical perspectives. For example, these results are expected to help authorities utilize online social support to increase the public's belief so that they can relieve negative effects of quarantine and cooperate with the public to fight against the epidemic, and help authorities identify ways to relieve the public's negative emotion and promote their positive emotion and optimistic thinking to fulfill a better social administration.

2. Literature review

2.1. Social support

Social support refers to the resources or aids exchanged with others through their interpersonal ties (Cohen & Hoberman, 1983), which has been expanded into the online context (called online social support) (White & Dorman, 2001; Coulson, Buchanan, & Aubeeluck, 2007) and regarded as one of the positive outcomes of online social networks (Oh, Ozkaya, & LaRose, 2014). Social support involves resource exchange among individuals who regard it as intended to improve the recipient's well-being (Tengku Mohd et al., 2019). Such support can make people feel better, even though the support does not bring direct assistance in solving their problems (Liang, Ho, Li, & Turban, 2011). The invaluable influence of online social support on people's health has been widely stressed (e.g., Yan & Tan, 2014; Yao, Zheng, & Fan, 2015; Zhang et al., 2017). Also, identifying such support can help authorities learn the social support pattern under online social context and take full use of these voluntary efforts (Li, Zhang, Wang et al., 2020). Since the 1990s, researchers have engaged in identifying the dimensions of online social support and the relative importance of different types of support. Analysis of 1,179 turns posted on a computer bulletin board by Braithwaite, Waldron, & Finn (1999) identified 5 types of online social support, namely, information support, tangible assistance, network support, esteem support and emotional support. They also examined the frequency of these online social supports, where emotional support (40%) and informational support (31.7%) were the top two, followed by esteem support, network support, and tangible assistance. Based on the division of Weiss (1974), Berkman et al. (2000) classified online social support into subtypes that include emotional, instrumental, appraisal and informational support. Referring to the categories of Wortman & Conway (1985), Bambina (2007) and Yan & Tan (2014) adopted four types of online social support, namely, informational, emotional, companionship and instrumental (or practical) support.

Thereafter, researchers have focused on revealing the influence of social support on people's behavior. For example, Oh et al. (2013) investigated people's perceived social support from Facebook friends and examined the relative significance of different dimensions of social support including emotional, informational, tangible and esteem support. They revealed that emotional support significantly predicted health self-efficacy and was the most prevalent dimension on Facebook. To examine how online social networks enhance people's life satisfaction, Oh, Ozkaya, & LaRose (2014) looked at the influence of perceived social support (i.e., appraisal, companionship, and esteem support) on life satisfaction and sense of community. Their results suggested that companionship support was a significant predictor of life satisfaction, while appraisal and esteem support enacted indirect influence. Wang, Wang, Yao et al., (2020) revealed the positive relationship between online social support (informational and emotional support) and consumers' involvement and engagement in social commerce communities. Ni, Yang, Leung et al. (2020) found that emotional support can help mitigate probable anxiety and depression during COVID-19. Zhong, Huang & Liu (2021) reported that Wuhan residents obtained more informational and peer support but relatively less emotional support, and they also suggested that these social supports could predict the public's social media usage and health behavior change.

In summary, researchers have investigated the multidimensional construct of social support in the online environment through a content analysis of messages posted online (e.g., Braithwaite, Waldron, & Finn, 1999; Coulson, Buchanan, & Aubeeluck, 2007; Yao, Zheng, & Fan, 2015) or by adoption of existing categories that are consistent with a specific research context (e.g., Yan & Tan, 2014; Oh et al., 2013; 2014; Wang, Wang, Yao et al., 2020; Zhong, Huang & Liu, 2021), indicating that the components of online social support may differ from context to context (Liang, Ho, Li, & Turban, 2011). Therefore, when identifying potential online social support people have conveyed during COVID-19, we referred to existing subtypes and conducted content analysis of messages posted on online social media to corroborate the assumed types of online social support. Also, this allows us to better understand relative frequency and importance of different subtypes of social support during COVID-19. Through scrawling and analyzing messages posted on the social media "Baidu COVID-19 bar" in China, we tested our assumption and ensured the specific social support types. Further, we examined the effects of online social support on individual belief to overcome COVID-19.

2.2. Emotion and cognition

Emotion mirrors complex psychological and physiological states that index the occurrence of value that a stimulus, event, or situation has (Dolan, 2002; Spezio & Adolphs, 2010). Emotion can be an automatic response people have to stimuli and to the motivational effects on following behavior. Negative emotions (e.g., depression, irritability, loneliness, fear, nervousness, sadness) invoked due to social distancing and social isolation during COVID-19 have increasingly been highlighted by relevant research (e.g., Brooks et al., 2020; Grey et al., 2020; Ni, Yang, Leung et al., 2020; Saltzman, Hansel & Bordnick, 2020). Additionally, the interaction between emotion and cognition has been emphasized by researchers (e.g., Dolan, 2002; Pessoa, 2008; Hayes, VanElzakker, & Shin, 2012; Ge, Qiu, Liu et al., 2020; Yin, Zhang, & Liu, 2020). Here, cognition refers to processes such as perception, attention, memory, problem solving or planning (Pessoa, 2008), which comes from inference of the sensory attributes of stimuli, events or situations with respect to their value and meaning. In this study, cognition is defined as the perception, thinking and judgement from inference of the pandemic status. Previous psychological studies have shown that mass traumatic events can cause an individual's negative cognition,

such as feelings of incompetence about oneself and unjust feelings about the world (Zhen, Quan, & Zhou, 2018). In pandemic, pessimistic thinking is a common negative cognition, which refers to pessimistic perception and estimate of the pandemic status. Virtually, emotion exerts global effects on all aspects of cognition. For example, when we are unhappy, we feel the world is less bright, and when we struggle to concentrate, we are selective in what we recall. By strongly influencing reason, emotion can contribute to the fixation of an individual's belief, and both cognition and emotion are necessary for beliefs.

Research has focused on the relationships among emotion, cognition and behavior. Ge, Qiu, Liu et al. (2020) raised a cognition-based framework of "Emotion- Cognition-Market" to explore the influence of stock market during the market crash. They confirmed that the impact of emotion on the stock market is the outcome of constantly changing market cognition affected by emotion. Yin, Zhang, & Liu (2020) identified that both affective (negative emotions) and cognitive (issue involvement) perspectives have direct and positive impacts on people's posting negative information behavior on microblogs. According to affect infusion model (AIM, Forgas, 1995), affective states interact with cognition and judgement by impacting the availability of cognitive constructs used in processing information. That is, affect plays an important role in what is perceived, learned, and recalled and how the information is interpreted. Following this line of logic, Dolan (2002) further used neuroscience technique to reveal the process of "Emotion-Cognition-Behavior". He signified that emotion impacts cognition (e.g., reasoning, attention and memory), biases judgment and reason, and then influences decision-making and behavior.

The above findings indicate that the interactions among emotion, cognition and behavior have been scrutinized and emphasized by researchers. As suggested by Brooks et al. (2020) and Gery et al., (2020), when home quarantine or social distancing is conducted to stop the spread of the epidemic (e.g., COVID-19), those who suffer it often have an unpleasant experience and easily produce negative emotions. Considering the potential costs of mandatory social distancing and social isolation, measures to reduce the negative effects associated with them are required. Therefore, particular efforts should be taken to care for individuals' negative emotion and pessimistic thinking during COVID-19. In this study, we examined the mitigation effect of online social support on the public's negative emotions and pessimistic thinking.

2.3. Belief

Belief represents individuals' perception of reality (Fu et al., 2004), such as belief about other people, moral goods, and events. Different types of belief and its impact on people's behavior have been investigated. For example, consumers' environmental beliefs were focused by Gadenne et al. (2011), they examined its influence on the public's energy saving behavior. The results indicated that those with stronger pro-environmental beliefs are more likely to engage in environmental oriented behavior. Wang, Torelli, & Lalwani (2020) investigated the effect of power distance belief (PDB)- the extent to which accept and endorse hierarchy- on consumers' preference for national brands. Regarding the pandemic, Wang, Wang, Liu et al. (2020) concerned the general belief in a just world (GBJW), which means the belief that the world is fair to everyone. In this study, we focus on the public's belief to overcome COVID-19; namely, their trust and confidence to conquer the epidemic.

When researchers initially explored the influence of emotion and cognition on the formation of belief, one reaction was to label cognition and emotion as contributing to two separate aspects of belief; namely, emotion makes people believe in things first, and cognition provides the content of what people believe. However, the contribution of emotion and cognition to belief is actually somewhat more complex. Three points are stressed by Spezio & Adolphs (2010): first, cognitive evaluation of a stimulus can continue over time while emotional reactions are being induced, providing the chances for the emotion elicited to modulate the cognitive evaluation of the stimulus. Specifically, after the first perception of the stimulus, emotional reaction starts to modulate people's cognitive evaluation and appraisal of it. At this moment, the meaning and value of the stimulus is specified by both cognitive inference and emotional effect. Second, emotional responses to stimuli influence ongoing cognitive evaluation and the subsequent behavior. That is, the emotional responses imbue the ongoing cognitive evaluation of the stimulus, which is a temporally extended process. Last, from the first two points, the outcome of the cognitive evaluation and the emotional response toward a stimulus in phenomena such as belief depends on the time at which they are sampled.

With this brief preview, it can be concluded that individuals' cognitive evaluation and emotional reaction toward a stimulus are temporally extended processes. This influences the variation of people's beliefs because both cognition and emotion contribute to the formation of beliefs. Based on this, we deem that the public's belief to overcome COVID-19 is a dynamic process that is impacted by their cognition and emotion states at that moment.

3. Hypotheses development

Although analyzing subtypes of social support on certain conditions have been the subject of a number of studies (e.g., Braithwaite, Waldron, & Finn, 1999; Coulson, Buchanan, & Aubeeluck, 2007; Yao, Zheng, & Fan, 2015), facing the COVID-19 emergency, the specific social supports people exchanged when they were in home quarantine are not widely clarified. Therefore, besides the reference of existing forms of supports, through content or thematic analyses, we sought to determine the category of online social support conveyed by the public in online social media during their home quarantine. Specifically, we initially assumed five forms of online social support that were most likely to be perceived by the public when under home quarantine, namely informational, emotional, companionship, esteem and tangible supports. *Informational support* involves the process of information transmission such as advice, situation appraisal, teaching, and referrals (Coulson, Buchanan, & Aubeeluck, 2007; Yan & Tan, 2014). *Emotional support* is to share one's happiness or sadness, communicating love, concern, caring or empathy (Coulson, Buchanan, & Aubeeluck, 2007; Yan & Tan, 2014). Through group meetings, chatting, and other social activities, *companionship support* makes people feel that they are valuable

and that they are with others who are pleased by their presence (Wellman & Wortley, 1990). *Esteem support* validates individuals' self-concept, importance, competence, and rights as a person and communicates respect and confidence in one's ability (Braithwaite, Waldron, & Finn, 1999; Coulson, Buchanan, & Aubeeluck, 2007). *Tangible support* refers to concrete, physical actions, such as assistance with goods, services, or money (Coulson, Buchanan, & Aubeeluck, 2007; Oh et al., 2013). The following hypotheses were developed based on of the initially assumed five types of online social supports.

3.1. Social support and belief, emotions and cognition

Numerous studies have indicated that social support is a contributor to better health and well-being (Saltzman, Hansel & Bordnick, 2020; Gery et al., 2020; Ni, Yang, Leung et al., 2020; Tengku Mohd et al., 2020). In theory, these results could be interpreted by two different models, namely, the main-effect model and the buffering model (Cohen & Wills, 1985). The main-effect model contends that social support conducts a beneficial effect, regardless of whether individuals are experiencing stressful events. This generalized beneficial effect could happen because social networks provide people with positive experiences and positive affect, avoiding negative experiences that increase the probability of disorder. The alternative buffering model proposes that social support buffers people from the potential influence of stressful events. The possible buffering mechanisms of social support (Cohen & McKay, 1984; Cohen & Wills, 1985) are that first, support may alleviate or prevent individuals' reactions of stress evaluation by providing the necessary resources to redefine the potential harm or to bolster one's perceived ability to deal with particular situation. Second, support may attenuate the influence of stressful things by providing a solution or by distracting attention from the problem so that people pay less attention to the perceived stress (House, 1981). Generally, stressful events lead to negative emotions and elevation of physiological responses. Based on the above influential mechanisms of social support, when negative emotions and cognition are induced by COVID-19, we posited that online social support may play a buffering role and prevent the negative impact of the stressful event.

Regarding specific forms of online social support, we argued that they function differently in influencing the public's cognition, emotion and behavior as validated by previous studies (e.g., Oh, Ozkaya, & LaRose, 2014; Yao, Zheng, & Fan, 2015; Wang, Wang, Yao et al., 2020). Specifically, although tangible support is usually not available in online settings, we contended that there was tangible support when Chinese people fought COVID-19. The reason is that many media outlets have reported Chinese people exemplified their virtues with sacrifice by giving to their countrymen in need. Via online social media, people in need could post their demands, and anyone who was available and able could provide their assistance, such as money, face masks, and disinfectant by mailing or offline connection. These practical material aids definitely help people in need and increase their belief in overcoming the epidemic. On the other hand, esteem support emphasizes respect and confidence in one's ability and corroborates individuals' importance and competence (Braithwaite, Waldron, & Finn, 1999; Coulson, Buchanan, & Aubeeluck, 2007). Regarding the COVID-19 emergency, in the beginning, for normal people, their capacity to prevent the pandemic was limited. Public understanding of COVID-19 is evolving continuously. Gradually, some people have increasingly come to know and understand the infectious disease, and they are voluntarily devoted to disseminating knowledge and methods of epidemic prevention via online social media. When their sharing helps individuals in need, the appreciation and confidence they perceive from those they help make them feel empowered to confront the infectious disease, increasing their belief of overcoming the epidemic. Thus, we developed the following hypotheses:

H1. : During COVID-19, people who receive tangible support report stronger belief in overcoming the epidemic.

H2. : During COVID-19, people who receive esteem support report stronger belief in overcoming the epidemic.

Additionally, cognitive processing includes information processing and inferring. During the initial stage of COVID-19, in which the virus had just been discovered and the cause was unclear, the public easily developed pessimistic thinking. To better protect themselves, people are likely to acquire suggestions, guidance, appraisal, teaching, and referral, as founded by Zhao, Cheng, & Yu (2020). Thus, reception of informational support from online social media could influence individuals' cognition toward diseases (Yao, Zheng, & Fan, 2015). When informational support is adequate for people, their pessimistic thinking can be changed. Moreover, faced with stressful events, people need to talk out their negative emotions with families or friends. When quarantined at home, they can still express their affects via online social media so that their sadness, helplessness or nervousness might be mitigated by online fellows' love, concern, caring or empathy. Therefore, online emotional support plays an important role in relieving the public's negative emotions. For example, it significantly improves patients' healthy state (Yan & Tan, 2014) and quality of life (Yao, Zheng, & Fan, 2015). Similarly, companionship support can help alleviate individuals' negative emotions. As indicated by Oh, Ozkaya, & LaRose (2014), companionship support is positively related to life satisfaction. Home quarantine is boring and tedious, and companionship support helps reduce the sense of isolation, making people feel they are valuable and needed. Therefore, we developed the following hypotheses:

H3. : During COVID-19, people who receive informational support report mitigated pessimistic thinking.

H4. : During COVID-19, people who receive emotional support report mitigated negative emotion.

H5. : During COVID-19, people who receive companionship support report mitigated negative emotion.

3.2. Emotions, cognition and belief

The unpredictable and uncontrollable outbreak of COVID-19 has led to the public's psychological stress, which reduces their subjective well-being and increases their negative emotions and psychological conflicts (Zhao, Cheng, & Yu, 2020; Brooks et al., 2020; Wang, Wang, Liu et al., 2020; Ni, Yang, Leung et al., 2020). However, according to social cognitive theory (Bandura, 1997), if people receive emotional encouragement and affirmation, they may obtain reinforced self-efficacy, which may influence their belief in overcoming the pandemic. As indicated by Ge, Qiu, Liu et al. (2020), emotion is powerful in generating the biased belief. Spezio & Adolphs (2010) highlighted that emotion induced by stimuli modulates and influences the cognitive reaction to the stimuli, which is a temporally extended process. As a result, the outcome of cognitive evaluation and emotional reaction determines individuals' beliefs at certain time. Zhao, Cheng, & Yu (2020) reported that the emotional trend of the public toward COVID-19 changes from negative emotions (during the initial stage) weakening to positive emotions (during the later stage) increasing. Similarly, due to a lack of knowledge concerning the infectious disease in the beginning, the public's cognition toward the epidemic was pessimistic and belief to overcome the epidemic was insufficient, which gradually evolve to relieve pessimistic thinking and enhance deficient belief. Thus, we formulated the following hypothesizes:

H6. : During COVID-19, people with stronger negative emotion report stronger pessimistic thinking.

H7. : During COVID-19, people with stronger pessimistic thinking report weaker belief in overcoming the epidemic.

H8. : During COVID-19, people with stronger negative emotion report weaker belief in overcoming the epidemic.

These hypotheses and the theoretical model are summarized in Fig. 1, where gender, age, marriage and education are regarded as control variables.

4. Methods

4.1. Acquisition and identification of online social support

To determine the specific aspects of online social support acquired or provided by the public during COVID-19, we extracted and analyzed posted messages related to COVID-19 on the social media site "Baidu COVID-19 bar". This online bar started at the beginning of the epidemic and has been active during the epidemic. Through the data collection period, there were 210,000 users and 1,200, 000 posts in "Baidu COVID-19 bar". The reason for using this online medium is that it was specifically created for the public to communicate information about COVID-19, so most messages posted here are related to COVID-19, which is more concentrated and convenient for the purpose of identifying the specific types of online social support. By discerning titles of the posts, we collected 723 posts from February 5, 2020 to February 20, 2020 using Houyicaiji 3.5.3[6], including all interactive posts. After deleting repeated, nonsense and abnormal content, 13,806 messages remained and served as the basis for subsequent analysis.

The first step was to preliminarily screen all posts for evidence of social support. At this stage, social support postings were broadly defined as those offering caring, belonging, referral, esteem, appraisal or assistance to others (Cohen, 2004). By using the sentiment analysis of Gooseeker[7] and referring to the coding system chosen by Braithwaite, Waldron, & Finn (1999) and Yan & Tan (2014), we segmented and classified words to identify emotional and esteem support. Regarding informational, companionship and tangible support, first word segmentation and word frequency statistics were performed by using Gooseeker to develop lexicons for each online social support, as shown in Fig. 2. In Fig. 2, high-frequency words of informational support included hospital, infection, fever, virus, quarantine, influenza, body temperature, symptom, pneumonia, doctor, etc., while those of companionship support included now, bat, ancient, grasshopper, home, outdoor, work, feeling, pet, groceries and so on. Due to the limited volume of tangible support, there was no word cloud generated for it. Thereafter, retrieving feature words and coding, posts were matched with the lexicons to be categorized into specific types of social support. The results of online social support categories are shown in Table 1.

4.2. Questionnaire design and data collection

Based on the above content analysis of posts on "Baidu COVID-19 bar", existence of all 5 assumed online social supports was validated. In line with previous research (e.g., Liang, Ho, Li, & Turban, 2011; Oh et al., 2013; Yan & Tan, 2014; Yao, Zheng, & Fan, 2015), informational and emotional support were the major forms of online social support during COVID-19. Due to measures of home quarantine, the frequency of companionship support was significantly increased. Esteem and tangible support were relatively less frequently occurring types, as indicated by Braithwaite, Waldron, & Finn (1999), Coulson, Buchanan, & Aubeeluck (2007), and Oh et al. (2013), but were still available during COVID-19. Therefore, the research model based on the initially assumed online social support is practicable. Subsequently, we examined the influential mechanisms of online social support on the public's emotions, cognition and beliefs.

[6] http://www.houyicaiji.com
[7] http://data.gooseeker.com/res/softdetail_13.html

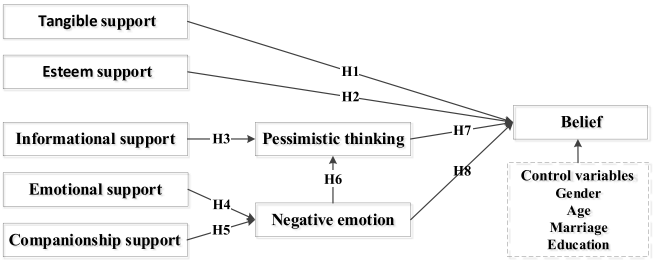

Fig. 1. Research model

Fig. 2. Word cloud of informational support (left) and companionship support (right)

Table 1
Results of social support classification

Subtypes	Frequency	Examples
Emotion	973	
Encouragement	748	Let us fight together!
Understanding/empathy	73	I can understand. I feel the same.
Affirmation/validation	94	Good job, man. Cheer for you.
Esteem	153	
Compliment	92	I hope for good news on your RNA testing result.
Caring	61	Are you ok? Why haven't you been around recently?
Information	765	
Advice	427	More water and more ventilation are good for your cold.
Referral	352	You can refer to this link for checking symptoms of COVID-19.
Teaching	66	The number of white blood cells will increase if you are infected by the virus.
Companionship	1318	
Chatting	1270	Prices of vegetables in my city have gone up again.
Humor/teasing	83	The slogan of home quarantine in that county is so funny.
Groupness	6	Does anyone want to play online games together?
Tangible	69	
Buying for others	8	Group buying for meat, come soon.
Material aid	5	Provide free face masks for people in need at the entrance A of the Conghui building.
Sharing purchase channels	56	Face masks are now available at Taobao.

4.2.1. Measures

Most measures were adopted from prior studies and were adapted to suit the context of our study. Specifically, measures of informational and emotional supports came from Liang, Ho, Li, & Turban (2011) and Hajli (2014). Esteem support was measured by items adapted from Eastin & LaRose (2005) and Oh et al. (2013). Tangible support items were adapted from Oh et al. (2013). Companionship support was developed based on its definition. Negative emotion was measured by referring to Watson, Clark, & Tellegen (1988). Pessimistic thinking items were referred to by its definition and were adapted from Boelen et al. (2007). Regarding belief, its measures were developed based on the definition. A 7-point Likert scale ranging from "definitely disagree" to "definitely agree" was used. The scales of all final items are presented in Appendix A. Moreover, since the study was conducted in China, the back-translation method proposed by Bhalla & Lin (1987) was followed in this study. The wording, legibility and suitability of the questionnaire was also checked by several graduate students before online delivery of the questionnaire. The background of all questions was set as "During home quarantine for COVID-19".

4.2.2. Data collection

The questionnaire was delivered via online social media (e.g., WeChat and Weibo in China). People who received and were interested in it were potential respondents. They were required to answer the questionnaire based on their actual experiences. The sampling process was conducted for 7 days in March 2020. In total, 356 questionnaires were collected, and after deleting questionnaires filled to quickly or not properly, 334 valid samples were obtained. Among the valid samples, 40.7% were male and 59.83% were female. Respondents' ages ranged from 18 to 60 years old, and 62.64% of them were between 18 to 30 years old. Regarding marriage, 48.31% of respondents were married, and 51.69% were single. For educational level, 62.64% had undergraduate degree or above. Respondents were from 27 provinces in China.

5. Data analysis and results

The partial least squares structural equation modeling (PLS-SEM) was employed to evaluate the measurement and structural model. Data analysis was performed using SmartPLS 3 software.

5.1. Measurement Model

Reliability and validity of the measurement model were assessed by indexes of Cronbach α, composite reliability (CR), factor loading and average variance extracted (AVE). Referring to the criterial proposed by Hair, Ringle, & Sarstedt (2013), reliability coefficients above 0.7 indicate good reliability; when between 0.35 and 0.7, it is acceptable; when lower than 0.35, it indicates poor reliability. Table 2 shows that Cronbach α was between 0.678 and 0.936, and CR ranged from 0.861 to 0.59, suggesting satisfactory reliability. Factor loading and AVE should exceed 0.7 and 0.5, respectively, for convergent validity testing. The square root of each AVE should be greater than the corrections between constructs for discriminant validity testing. Table 2 and Table 3 indicate that AVEs for the full sample exceed 0.5, factor loadings are larger than 0.7, and square roots of AVEs (figures on diagonal of the matrix) were greater than the inter-construct correlations in all cases, validating adequate convergent and discriminant validity.

5.2. Hypotheses testing

Structural model analysis results are shown in Fig. 3. The results indicate a significant negative relationship between informational support and pessimistic thinking (β=-0.127, p=0.002) as well as pessimistic thinking and belief (β=-0.42, p<0.001). Significant positive relationship between tangible support and belief (β=0.208, p=0.003), esteem support and belief (β=0.153, p=0.05), as well as negative emotion and pessimistic thinking (β=0.678, p<0.001) were also identified. Therefore, hypotheses H1, H2, H3, H6, and H7 are supported. Hypotheses related to online social support and negative emotion (H4 and H5), as well as negative emotion and belief (H8), were not supported. With regard to control variables, education had a significant influence on belief. From this research model, 34% of the variance in the public's belief to overcome the epidemic were explained.

5.3. Further analysis and discussion

As hypotheses related to negative emotion (H4, H5 and H8) were not supported, we further discussed the relationships among online social support, negative emotion, and belief. Besides, the moderating role of education level on the relationship between online social support and belief was examined.

5.3.1. The influence of negative emotion on belief

When examining the hypotheses, we found that a relationship between negative emotion and belief was not supported. To test their relationship further, referring to Zhao, Lynch, & Chen (2010), we investigated the mediating effect of pessimistic thinking. First, the significance of the indirect effect of "negative emotion → pessimistic thinking" × "pessimistic thinking → belief" was explored, namely, the mediating effect of the pessimistic thinking on the relationship of negative emotion and belief. We bootstrapped the sampling distribution of the indirect effect (sample size=3000). The results showed a significant mediating effect of pessimistic thinking (95% confidence interval (-0.390, -0.202), β=-0.285, p<0.001). Thereafter, the direct effect of negative emotion on belief was tested. This result indicates that the direct effect is not significant (95% confidence interval (-0.102, 0.142), β=0.021, p=0.739). Therefore, there is a full mediating effect of pessimistic thinking for the influence of negative emotion on belief. That is, the public's negative emotions elicited during COVID-19 impact their cognition and then influence their belief to overcome the epidemic.

5.3.2. The influence of online social support on negative emotion

The initial structural model analysis indicates that the influence of companionship support and emotional support on negative emotion was not significant. To explain this result, the research background should be noticed. This study concerns the period in which the public was quarantined in home for controlling COVID-19. During this phase, people relied primarily on online social media (e.g., Webo, Wechat, Baidu bar) to obtain epidemic information, to communicate with others, and to express their inner feelings. Due to this realistic condition, people gradually and spontaneously formed online communities to keep in touch with the outside and to spend their spare time. The influence of online social support in online communities has been investigated by researchers, especially online health communities (e.g., Yan & Tan (2014); Yao, Zheng, & Fan (2015)). In fact, this study also highlights the effects of online social support in online communities that developed during home quarantine during the pandemic.

Table 2
Reliability and convergent validity analysis

Construct	CR	*a*	AVE	Factor loading	
Belief (BE)	0.861	0.678	0.756	BE1	0.853
				BE2	0.885
Informational support (IS)	0.907	0.856	0.764	IS1	0.920
				IS2	0.831
				IS3	0.870
Emotional support (EMS)	0.959	0.936	0.885	EMS1	0.892
				EMS2	0.964
				EMS3	0.965
Companionship support (CS)	0.916	0.878	0.785	CS1	0.931
				CS2	0.864
				CS3	0.862
Esteem support (ESS)	0.940	0.905	0.840	ESS1	0.910
				ESS2	0.917
				ESS3	0.922
Tangible support (TS)	0.920	0.870	0.794	TS1	0.869
				TS2	0.880
				TS3	0.922
Pessimistic thinking (PT)	0.880	0.817	0.648	NC1	0.824
				NC2	0.798
				NC3	0.695
				NC4	0.891
Negative emotion (NE)	0.955	0.930	0.785	NE1	0.929
				NE2	0.948
				NE3	0.932

Table 3
Discriminant validity analysis

Construct	BE	IS	EMS	CS	ESS	TS	PT	NE
BE	**0.869**							
IS	0.301	**0.874**						
EMS	0.309	0.790	**0.941**					
CS	0.284	0.636	0.753	**0.886**				
ESS	0.345	0.721	0.792	0.748	**0.916**			
TS	0.351	0.536	0.602	0.557	0.667	**0.891**		
PT	-0.446	-0.197	-0.117	-0.193	-0.139	-0.055	**0.805**	
NE	-0.295	-0.103	-0.083	-0.079	-0.058	-0.035	0.691	**0.936**

Note: Bold figures are the square root of AVEs.

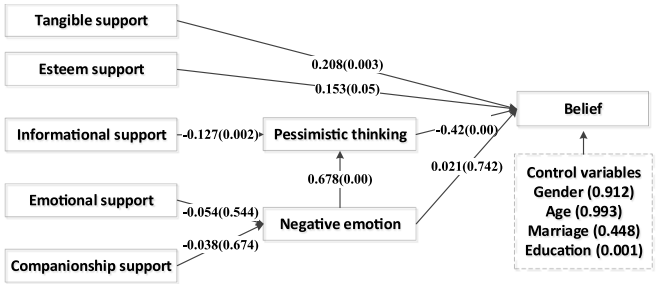

Fig. 3. Results of hypotheses testing

However, our findings were not consistent with previous research pertaining to the impact of emotional support and companionship support in online health communities. These online communities were built specifically for patients who were experiencing chronic illnesses. Research has indicated that individuals' interactions via online health communities benefit their health management and disease control (Der Eijk, Faber, & Aarts, 2013). Generally, members in these online health communities have specific illness problem and are objective-oriented, and the reason they enrolled is that they want to communicate disease information, share disease experience and deliver social support. The online communities voluntarily developed by the public during COVID-19, however, are distinct from the above discussed online health communities. One difference is that most people in online communities for COVID-19 were healthy people, so their interactions were not limited to the pandemic. This leads to factors that may impact individuals' emotions becoming complex. In addition to online social support, other aspects related to the epidemic can contribute to people's

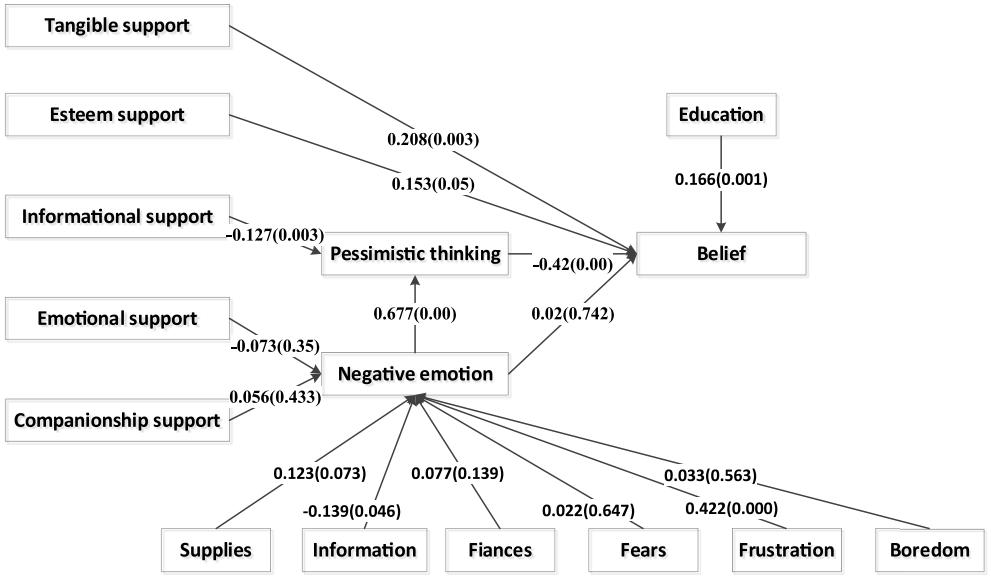

Fig. 4. Results of Revised Model

negative emotions, such as supplies and finances. Therefore, we contend that in addition to emotional and companionship support, more complicated factors influence the public's negative emotions.

Brooks et al. (2020) conducted a rapid review on the negative psychological effects of quarantine, and reported several factors that psychologically influence individuals who are quarantined, namely, duration of quarantine, fears of infection, frustration and boredom, sufficient supplies, adequate information, finances and so on. Referring to their work, the impact of these aspects on the public's negative emotions was examined in this study. Reconnecting the participants via e-mail, we obtained data from a supplementary questionnaire related to measurement of the above factors, which are shown in Appendix B. Seven-point Likert scales were used, ranging from "definitely disagree" to "definitely agree" or "not very much" to "very much". In China, because the time that quarantine began was almost the same (except for cities in Hubei Province, such as Wuhan), which was controlled by the central government, the duration of quarantine was excluded in this study. The result of the revised model adding the remaining factors is shown in Fig. 4. It indicates that sufficient supplies, adequate information and frustration significantly impacted individuals' negative emotions. Since the period of the epidemic crossed the Chinese Spring festival, mass home quarantine caused supplies fluctuate from sufficiency to insufficiency and back to sufficiency again. Meanwhile, when supplies returned to being relatively adequate, the nationwide outbreak of the pandemic came, so the relationship between sufficient supplies and negative emotions appears to be positive. Regarding finance, it did not influence individuals' negative emotions. This is because most Chinese people have savings which can support them at a short time. As discussed before, online social media help individuals who were quarantined at home to relieve their boredom, so boredom did not impact people's negative emotions either.

5.3.3. The influence of education on belief

The results show that education has a significant influence on the public's beliefs (p=0.001). Specifically, people with lower-level education had more belief in overcoming the epidemic. Compared to people with lower-level education, those with higher-level education paid more attention to the pandemic. They were more concerned with information related to COVID-19, and they were more likely to develop their appraisal and judgment toward the condition of the pandemic based on their knowledge and experience. When the state of the pandemic was unclear, they easily become uncertain, resulting in less belief toward the epidemic. Individuals with lower education level, however, were not focused as much on the pandemic, so they were less influenced by the state of change in the pandemic. This finding is supported by the "Report on the public's participation in prevention and control of COVID-19[8]" issued on May, 2020. The report indicates that people with higher-level education had negative or neutral attitudes toward the pandemic information released by the media, while those with lower-level education were satisfied.

To further analyze the effect of education on the public's beliefs, education level was divided into high-level (bachelor and above) and low-level (below bachelor) groups. A Multi-Group Analysis (MGA) was conducted with SmartPLS. The results showed that for the high-level group, the influence of tangible support on belief was significant (p_{high}=0.002 vs. p_{low}=0.539), but the influence of esteem support on belief was not significant (p_{high}=0.65 vs. p_{low}=0.003). Regarding the low-level group, the results were reversed. This finding was also supported by the above report that stated people with high-level education deemed that their measures of prevention

[8] The eHealth Research Institute of Harbin Institute of Technology, Data Science and Business Intelligence Institute of East China University of Science and Technology, and the Hong Kong Polytechnic Universityhttps://mp.weixin.qq.com/s/HKpB8HI-3Yv1pol4a5yAPg

and control were not good or safe enough, whereas those with low-level education were satisfied with their self-prevention (with high confidence).

6. Conclusions

6.1. Primary findings

In the context of COVID-19, to interrogate the approach to reduce the negative effects of quarantine, this study investigated the influential mechanism of online social support on the public's belief to overcome the pandemic. The effects of cognition and emotion were embraced. Based on the content analysis of messages posted on "Baidu COVID-19 bar", we identified specific subtypes of online social support that people were giving or receiving during home quarantine for COVID-19. Conducting online surveys, we further examined the proposed research model and hypotheses. The main findings of this study are summarized below.

First, the content analysis of 13,806 messages posted on "Baidu COVID-19 bar" revealed that five forms of online social support were primarily exchanged by the public during their home quarantine, namely, informational support, emotional support, companionship support, esteem support and tangible support. Among them, informational and emotional supports were very common, as indicated by Coulson, Buchanan, & Aubeeluck (2007), Liang, Ho, Li, & Turban (2011) and Yao, Zheng, & Fan (2015). Different from most previous research, we found that companionship support was the most frequently offered support during COVID-19. In a similar vein, Zhong, Huang & Liu (2021) reported tremendous peer support (a type of support satisfying the needs of individuals who are willing to connect with others and share a sense of belonging), which is compatible with companionship support stressed in this study. The reason of increased companionship support was closely related to the context of home quarantine. Esteem support and tangible support are usually not common in online settings but were still available during COVID-19.

Second, after ascertaining the constructs of online social support during COVID-19, we examined the influence of specific support on the public's cognition, emotions and beliefs. By collecting data online and analyzing through SmartPLS, we found that informational support significantly improved the public's pessimistic thinking, and esteem support and tangible support directly enhanced the public's belief to overcome the epidemic. Additionally, the positive relationship between negative emotion and pessimistic thinking, as well as the negative relationship between pessimistic thinking and belief, were also significant. The impact of negative emotion on belief was not a direct effect but occurred through a full mediating effect of pessimistic thinking. There was also a significant influence of education on belief.

Finally, the public's negation emotions during COVID-19 were more complicated, so we further examined this. The results indicated that rather than online social support, other factors related to the pandemic, such as information disclosure, frustration, and supplies influenced the public's negative emotions.

6.2. Theoretical and practical implications

This study examined the public's belief to overcome the pandemic by considering online social support, motion, and cognition, which provides a deep insight into how to relieve the side effects of quarantine. Theoretically, referring to theories pertaining to social support, cognition and emotion, this study enriches the theoretical foundation of research on public belief, especially when encountering major public emergencies with home quarantine. In such conditions, the public's strengthened belief is necessary and important to support them while going through the emergency. However, there are few studies that focus on the public's general beliefs under such emergency context. Therefore, our research makes important theoretical contributions toward how to understand the influential factors and mechanism of the public's belief. It also provides a theoretical reference for the government on how to employ online social support to handle similar emergencies and to mitigate the potential negative effects of quarantine. Moreover, concerning the effects of the public's cognition and emotion provides theoretical support for the authorities to improve their capacity for social governance.

In practice, our research provides important implications for individuals on how to use online social support to modulate their pessimistic thinking, how to relieve their negative emotions, and how to develop beliefs to go through emergencies. Regarding to the government, our findings also shed light on how to deal with the epidemic and how to conduct social governance during major public emergencies. Specifically, first adequate information disclosure should be guaranteed. Poor information results in insufficient guidance on actions to take and confusion on how to deal, leading to stress. A lack of clarity about risks leads to fears and creates dramatic effects (Brooks et al., 2020) because adequate information helps relieve uncertainty. Additionally, the finding that informational support improves the public's pessimistic thinking and further enhances their beliefs suggests that besides information disclosure from official media sources, informational support delivered by the public should also be supported by the media and the government, which is beneficial for developing the public's positive and rational cognition. For example, online media could set specific forums for individuals' interactive communication on epidemic information, facilitating them to give and receive informational support.

Second, the authorities should encourage the public to convey esteem support and tangible support. The findings in our research demonstrate that esteem support and tangible support directly affect the public's belief. Even though Yan & Tan (2014) stated that tangible support is usually not available in online healthcare communities because individuals do not want to reveal their real identities, we identified several tangible supports when conducting content analysis of the messages posted on "Baidu COVID-19 bar", but the quantity was limited. Chinese people are generally introverted and implicit, so they usually do not express their respect, confidence, or praise to others but keep these in mind. This is why esteem support was relatively scarce as well. Under the pandemic context, however, individuals need to support each other to fight the disease together, so the government could call for the public to

provide tangible support to people in need and esteem support to help each other. Moreover, for people with higher-level education, tangible support exerts more influence on them, while for those with lower-level education, esteem support affects them more. The specific approach to facilitating the delivery of tangible support may be to open a certified material assistance online platform that allows people in need to post their requirements and people who are able to help to respond. Regarding esteem support, official media outlets could widely report exemplary deeds to create a virtuous environment that encourage individuals to express their love and appreciation toward others. Meanwhile, online social media could provide easier methods for the public to express their respect, for example, by developing additional emotion icons, such as thumbs up, hug, handshaking and so on and setting them in places that are easy to find and use.

Third, developing a multilevel information mining system to analyze the public's negative emotions could be helpful. It has been admitted that mass quarantine could help stop the spread of the infections, but it should not ignore that quarantine also easily leads to negative psychological impacts (Brooks et al., 2020). This research reveals that negative emotions did not exert a direct influence on the public's belief but through a full mediating effect of pessimistic thinking. That is, if people have negative emotions that could disturb their cognition, the elicited pessimistic thinking further intervenes in their belief. Therefore, it is necessary and important to know the public's emotions. There have been studies that focus on public opinion mining to obtain immediate feedback of the public's opinion and emotions (for reviews, see Piryani, Madhavi, & Singh, 2017; Lee, Ha, Lee, & Kim, 2018; Lin, Chen, Li et al., 2019). Findings in our research highlight that emotional support and companionship support delivered in online communities developed during COVID-19 did not significantly impact people's negative emotions. This means that relying only on messages posted online is not sufficient to evaluate individuals' emotional states. Other factors related to the pandemic may also modulate the public's emotions. Therefore, a multilevel information mining system for emotion analysis should be developed by considering more integrated aspects, such as transparent and adequate information, sufficient supplies and so on.

6.3. Limitations and future research

This study investigated what factors influence the public's belief to overcome COVID-19 and how these factors exert that influence. Under the mass quarantine context, online social support, emotion, and cognition were embraced. Although this study has initial and promising findings, there are some limitations. First, we collected data online, and the online questionnaires were diffused randomly. This leads to a deficiency that most of our respondents were from areas with middle or low risk for the pandemic because these areas are in higher proportion in China. The number of people in high-risk areas in this study was limited. Undoubtedly, individuals located in areas with different risk levels have different cognition, emotions or behaviors toward COVID-19. Therefore, the results from this study are more beneficial and practical for areas with middle or low risk, while generalization of the results to areas with high risk requires further validation. Future research could focus specifically on citizens in high-risk areas to reveal the perception and behavior of people there.

Second, this paper included online social support to investigate its effects on individuals' pessimistic thinking, negative emotions and beliefs. We conducted a content analysis to identify specific subtypes of online social support. But we used a professional commercial software (i.e. Gooseeker) to perform the analysis and did not contribute to methodological innovation of content analysis. Future studies which are particularly interested in research of social support under different contexts or content analysis on online social media (e.g., Li, Zhang, Wang et al., 2020; Carvajal-Miranda, Mañas-Viniegra & Liang, 2020) can further investigate categories of online social support during COVID-19 to validate or supplement our results. Additionally, the results in this study reveal that people's negative emotions during COVID-19 were more complex and required more integrated aspects to understand. Understanding the public's emotions during major public emergencies is necessary and vital for the authorities to conduct social governance. Thus, future studies could specifically investigate how to mine and analyze the public's emotions during COVID-19 or other public emergency events to further understanding and effectively alleviate the public's negative emotions.

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Appendix A. Constructs and measurements

All questions start with "During home quarantine of COVID-19".

Constructs	Items	Source
Informational support	1. When faced with difficulties pertaining to COVID-19, some people on online social media offer suggestions when I need help. 2. When faced with difficulties pertaining to COVID-19, some people on online social media help me discover the cause and provide me with suggestions. 3. When I encountered a problem pertaining to COVID-19, some people give me information to help me overcome the problem.	Liang, Ho, Li & Turban (2011), Hajli (2014)
Emotional support		

(*continued on next page*)

(*continued*)

	1. When faced with difficulties pertaining to COVID-19, some people on online social media are on my side with me. 2. When faced with difficulties pertaining to COVID-19, some people on online social media comforted and encouraged me. 3. When faced with difficulties pertaining to COVID-19, some people on online social media expressed interest and concern for my well-being.	Liang, Ho, Li & Turban (2011), Hajli (2014)
Companionship support	1. When I needed, some people on online social media provided online entertainment activities for me, such as playing online games together. 2. When I needed, some people on online social media chatted and communicated with me. 3. When I needed, some people on online social media accompanied me and enjoyed my presence, which makes me feel a sense of belonging.	Definition
Esteem support	1. Some people on online social media showed confidence in my ability to deal with COVID-19. 2. Feedback from some people on online social media make me feel that I am capable of handling my health problems and preventing COVID-19. 3. Some people on online social media had confidence in me, which makes me feel that I am good at maintaining a health state and preventing COVID-19.	Oh et al., 2013; Eastin & LaRose, 2005
Tangible support	1. If I asked, some people on online social media would provide me with supplies for epidemic prevention such as masks and disinfectants. 2. If I needed, some people on online social media would offer me money to help me solve my problem. 3. If I needed, some people on online social media would be likely to help me seek medical advice.	Oh et al., 2013
Negative emotion	1. I had a sense of fear and nervousness. 2. I felt angry and irritable. 3. I was perceived as withdrawn and negative.	Watson, Clark, & Tellegen (1988)
Pessimistic thinking	1. If I had suspected symptoms, I would think that I had catch the infection and be difficult to cure. 2. I have no confidence in the development tendency of the epidemic in the future and the return to normal life. 3. I feel insecure about the outside. 4. I struggled with the negative news about the epidemic.	Cadinu et al 2005; Boelen et al., 2005; 2007
Belief	1. I am confident in defeating COVID-19. 2. I strongly believe that the epidemic will end soon.	Definition

Appendix B. Measurements of other factors that affect negative emotion

Constructs	Items
Supplies	In my area, the supplies were sufficient.
Information	In my area, the epidemic information was transparent and adequate.
Finances	To what extent, my financial situation was affected by COVID-19.
Fears	To what extent, I worried about COVID-19.
Frustration	To what extent, I felt frustrated.
Boredom	To what extent, I was bored.

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