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An exploration of determinants of cyberchondria: A moderated mediation analysis

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Abstract

Cyberchondria describes excessive or repeated health-related information seeking on the Internet that is associated with increased emotional distress. Research on cyberchondria is still nascent. This study aims to propose a moderated mediation model to examine the relationships among intolerance of uncertainty, affective responses, e-health literacy, and cyberchondria. Based on an online survey of 426 participants in China, the results suggest that intolerance of uncertainty is positively associated with cyberchondria, and affective responses partially mediate this association. Additionally, e-health literacy negatively moderates the effect of affective responses on cyberchondria. Implications and limitations of this study are discussed.

KEYWORDS

affective responses, cyberchondria, e-health literacy, intolerance of uncertainty, online health information seeking

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human information behavior; information seeking

1 | INTRODUCTION

In recent years, the Internet has become a popular source for individuals to seek health-related information (Prescott, 2016). The reasons for such popularity include low cost, convenience, and anonymity (Starcevic, 2017). A wide range of online health information allows people to understand health-related issues and empowers them to make health decisions. However, individuals who use the Internet to self-diagnose a medical condition might feel lost when being confronted with a plethora of unregulated online information (Starcevic & Berle, 2013). Also, the results on search engines (e.g., Google) may be biased towards rare life-threatening illnesses, which

cause unnecessary worry or anxiety among information seekers (White & Horvitz, 2009).

The term “cyberchondria” describes excessive or repeated health-related information searches that are associated with an escalation of emotional distress (McElroy et al., 2019). As an emerging concept in this digital age, research on cyberchondria is still in its infancy. Among the limited research, intolerance of uncertainty (IU), a dispositional fear of the unknown, has been shown to be positively associated with cyberchondria (e.g., Fergus, 2013, 2015). Also, evidence suggests that IU predicts affective responses, which are negative emotions such as fear and anxiety aroused by a risk (e.g., an illness) (Dugas, Buhr, & Ladouceur, 2004). Nevertheless, a paucity of studies has investigated the relationships among IU, affective responses, and cyberchondria. Untangling the relationships among these variables would allow researchers and medical professionals to better understand the emergence of

cyberchondria so as to propose relevant treatment strategies.

Additionally, as an abnormal state of online health information seeking, cyberchondria might be related to e-health literacy. E-health literacy describes people's ability to seek, process, and evaluate online health information (Norman & Skinner, 2006). Individuals with a low level of e-health literacy are vulnerable to developing problematic search behavior on the Internet, especially for those with negative emotions (Doherty-Torstrick, Walton, & Fallon, 2016). As such, the effect of affective responses on cyberchondria may be contingent on users' level of e-health literacy.

Overall, the objectives of this study are twofold. First, it aims to investigate how IU and affective responses can contribute to cyberchondria. In particular, it examines the mediating effect of affective responses on the relationship between IU and cyberchondria. Second, it seeks to explore the moderating role of e-health literacy on the indirect effect of affective responses on cyberchondria. A moderated mediation model is proposed to achieve the two objectives. Results of this study can shed light on how cyberchondria develops and how it could be alleviated.

2 | LITERATURE REVIEW AND HYPOTHESES

IU refers to individuals' beliefs regarding "the necessity of being certain, about the capacity to cope with unpredictable change" (Group, 1997, p. 678). Individuals with high IU are more likely to overestimate the likelihood of an adverse outcome, even for issues with a low probability of happening (Fergus, 2015). This also holds when they seek medical information online. For example, a user experiencing fever, tiredness, and dry cough may search for these symptoms on Google. For those with high IU, they tend to notice and review the search results concerning the most dangerous conditions, such as the COVID-19 infection. This would increase emotional distress and compulsive searches for more relevant information. Thus, we propose the first hypothesis as follows:

H1 Intolerance of uncertainty is positively related to cyberchondria.

Affective responses refer to people's negative emotions and feelings that might be triggered by IU (Dugas et al., 2004). That is, in a risky situation (e.g., an illness), individuals with high IU can easily experience stress and anxiety. On the other hand, a group of studies has found that health anxiety, as a type of affective responses, is positively related to cyberchondria (Fergus & Russell, 2016; Fergus & Spada, 2018). As such, the effect of IU on cyberchondria may

partially come from the role of affective responses. Thus, we propose the second hypothesis as follows:

H2 Affective responses mediate the relationship between intolerance of uncertainty and cyberchondria.

E-health literacy is defined as "the ability to seek, find, understand, and appraise health information from electronic resources and apply the knowledge gained to addressing or solving a health problem" (Norman & Skinner, 2006, p. 2). People with high e-health literacy are able to discern the reliability and credibility of online health information and are less likely to be affected by some problematic information. As a result, their cyberchondria would not be rampant. In contrast, for those with low e-health literacy, they cannot process a large amount of online health information effectively. They would suffer from increased emotional distress easily after online health searches. Consequently, the effect of affective responses on cyberchondria might intensify. Thus, we propose the third hypothesis as follows:

H3 E-health literacy moderates the indirect effect of affective responses on cyberchondria.

As shown in Figure 1, we propose a moderated mediation model to empirically test the three hypotheses.

3 | METHOD

The sample consisted of 426 participants recruited from an online panel managed by an experienced survey company in China. Nearly half (45.3%) of the participants were aged between 21 and 30 years old, and 60.3% of them were female. The majority of participants had a bachelor's degree or higher (86.2%).

The survey was conducted in Chinese and took approximately 15 minutes to complete. It began with a reference target question to ask participants to indicate some common symptoms (e.g., headache, fever, cough, etc.) they concerned most and had relevant experience of searching for these symptoms on the Internet. The rest of the questions in the survey were based on their searching experience of these common symptoms.

All variables in this study were measured on 5-point Likert-type scales, with items validated in previous research. First, the Cyberchondria Severity Scale short form (CSS-12) was used to measure cyberchondria (McElroy et al., 2019). This is a 12-item scale with four dimensions: excessiveness (e.g., "I read many different web pages about my symptom"), distress (e.g., "I feel more distressed after researching this symptom online"), compulsion (e.g., "researching my

FIGURE 1 Moderated mediation model

symptom online interrupts my daily work”), and reassurance (e.g., “researching my symptom online leads me to consult my doctor”). The 12 items can be summed to get a total score ranging from 12 to 60 (McElroy et al., 2019). In this study, the CSS-12 had a mean total score of 42.5 ($SD = 6.01$). It demonstrated a good internal consistency ($\alpha = 0.75$).

Second, 12 items derived from Carleton, Norton, and Asmundson (2007) measured intolerance of uncertainty ($M = 3.19$, $SD = 0.58$, $\alpha = 0.81$). Sample items included: “Unforeseen events upset me greatly,” and “I must get away from all uncertain situations.” Third, four items adapted from Izard (1977) assessed affective responses ($M = 3.10$, $SD = 0.89$, $\alpha = 0.84$). For example, respondents were asked to indicate the extent to which they felt anxious, worried or concerned when thinking about their symptoms. Finally, e-health literacy was measured using eight items developed by Norman and Skinner (2006) ($M = 3.65$, $SD = 0.66$, $\alpha = 0.87$). Sample items included: “I have the skills I need to evaluate the health resources I find on the Internet.”

The PROCESS macro for SPSS (Model 14) was used to test the moderated mediation model (Hayes, 2017). For mediation analysis, the bootstrapping method was also used to compute the indirect effect for each of 5,000 bootstrapped samples and to obtain the 95% confidence interval of the indirect effect. The conventional “pick-a-point” approach suggested by Hayes (2017) was used to test the moderation effect. This approach allows for choosing representative values (e.g., mean-1SD, mean, mean + 1SD) of the moderator variable and then estimating the effect of the focal predictor at those values. Further, the omnibus test of the conditional indirect effect was used to confirm the moderated mediation effect (Hayes, 2017). Demographic factors, including age, gender, income, and education, were entered as control variables in the model testing.

4 | RESULTS

The full model explained 31% of the variance in cyberchondria. First, IU had a positive and direct relationship with cyberchondria ($\beta = 0.26$, $p < .001$). Thus,

H1 was supported. On the other hand, IU was positively related to affective responses ($\beta = 0.32$, $p < .001$), which further predicted cyberchondria ($\beta = 0.43$, $p < .001$). As such, H2 was supported. The interaction between affective responses and e-health literacy was statistically significant ($\beta = -0.27$, $p < .01$), suggesting that e-health literacy negatively moderated the effect of affective responses on cyberchondria. Furthermore, using the conventional “pick-a-point” approach, at -1SD on e-health literacy, affective responses were a positive predictor of cyberchondria ($\beta = 0.61$, $p < .001$). At the mean of e-health literacy, affective responses were positively related to cyberchondria ($\beta = 0.43$, $p < .001$). At the +1SD of e-health literacy, the effect still remained positive and significant ($\beta = 0.24$, $p < .05$). Nevertheless, the effect was becoming less positive when the level of e-health literacy increased.

The omnibus test of the conditional indirect effect suggested that e-health literacy significantly moderated the indirect effect of affective responses on cyberchondria as the confidence interval (CI) did not include zero (95% CI = $[-0.14, -0.02]$). Specifically, the indirect effect was positive and significant at -1SD (IE = 0.19, 95% CI = $[0.11, 0.27]$), the mean (IE = 0.13, CI $[0.07, 0.19]$), and + 1SD (IE = 0.01, CI $[0.11, 0.14]$) on e-health literacy, respectively. Thus, H3 was supported.

5 | DISCUSSION AND CONCLUSION

Results of the study lend support to the proposed three hypotheses. In brief, affective responses mediate the relationship between IU and cyberchondria, and e-health literacy moderates the indirect effect of affective responses on cyberchondria.

For H1, IU was identified as a significant predictor of cyberchondria. This finding was consistent with previous studies in the domain (Fergus, 2013, 2015). Respondents in our sample might feel uncertain about their health status when they have some common symptoms. Thus, they

tended to use the Internet to search for related information frequently, after which they experienced a higher level of emotional distress.

Focusing on H2, affective responses partially mediated the relationship between IU and cyberchondria. First, the significant linkage between IU and affective responses supports some previous literature that has shown that when people cannot tolerate the uncertainties in their lives (e.g., unexpected health problems), they might develop negative emotions such as worry and fear (e.g., Dugas et al., 2004; McEvoy & Mahoney, 2013). Second, the other significant path between affective responses and cyberchondria indicates that people with a higher level of negative emotions are inclined to develop cyberchondria. The reason might be that highly anxious people attempt to obtain as much information as they can to reduce their uncertainty and worry (Starcevic & Berle, 2013). In this process, they become more anxious after viewing a large amount of online medical information and some information might be even more threatening (Rao & Skoric, 2011).

Turning to H3, e-health literacy could negatively moderate the indirect effect of affective responses on cyberchondria. This finding advances prior work that has called for assessing the role of e-health literacy in the process of developing cyberchondria (Doherty-Torstrick et al., 2016). Specifically, e-health literacy, to some extent, helps users with affective responses to reduce the possibility of developing symptoms of cyberchondria such as unnecessary and repeated searches and escalation of distress. People with a high level of e-health literacy are able to use online health resources to make informed decisions (Fu, Chen, & Zheng, 2020). They might avoid excessive online health searches, although they are anxious about their health status.

This study is not without limitations. First, the sample was limited by participants recruited from an online panel. Most participants were young and well-educated. To make the findings generalizable, future research can examine individuals who excessively search for health information on the Internet from other populations. Second, the moderated mediation model was tested using a cross-sectional, self-report design. The causal relationships among the variables need to be further clarified using a longitudinal and experimental design in the future. Third, this study was conducted in China, where the majority of respondents were using the search engine Baidu for health information seeking. The situation might play differently for people utilizing other search engines (e.g., Google) in other countries. Therefore, it would be interesting to examine the moderation role of e-health literacy in diverse cultures.

Despite these limitations, this study hopes to contribute to the current literature on cyberchondria in two ways. From a theoretical perspective, this study proposed a moderated mediation model to integrate various concepts in order to explain how cyberchondria develops and can be alleviated. While previous studies have mainly focused on testing the relationships between cyberchondria and its associated factors (e.g., Doherty-Torstrick et al., 2016; Fergus, 2013), few of them have explained cyberchondria from a theory-driven lens. Our study could provide preliminary support for the conceptualization of antecedents of cyberchondria, which allows for adding the understanding of how to alleviate this new, but common phenomenon in the digital age.

From a practical perspective, this study attests to the role of e-health literacy in reducing the effect of affective responses on cyberchondria. Healthcare practitioners could design appropriate intervention strategies to enhance e-health literacy skills among Internet users, especially for those who are intolerant of uncertainty and often worry about their health. When people have sufficient ability to gather, evaluate and process various health information online, they are less likely to develop cyberchondria. This is because they are aware that the Internet is just a tool to provide a list of possible outcomes about their search query and it cannot diagnose their symptoms scientifically and objectively.

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