Examining the Effects of Health Belief and Affection on Continued Teleconsultation Use in the Post-COVID-19 Era: Evidence from China

Yaxi Liu  
*XIDIAN University*, 804573848@qq.com

Chunxiu Qin  
*XIDIAN University*, cxqin@xidian.edu.cn

Xubu Ma  
*XIDIAN University*, xbma@xidian.edu.cn

Wenjing Pian  
*Fuzhou University*, wpian1@e.ntu.edu.sg

Jian Mou  
*Pusan National University*, jian.mou@pusan.ac.kr

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Examining the Effects of Health Belief and Affection on Continued Teleconsultation Use in the Post-COVID-19 Era: Evidence from China

Completed Research Paper

Yaxi Liu
School of Economics and Management, Xidian University
No.2 Taibai Road, Xi’an, Shaanxi, 710071, China
804573848@qq.com

Chunxiu Qin
School of Economics and Management, Xidian University
P.O.B.231, No.2 Taibai Road, Xi’an, Shaanxi, 710071, China
cxqin@xidian.edu.cn

Xubu Ma
School of Economics and Management, Xidian University
P.O.B.231, No.2 Taibai Road, Xi’an, Shaanxi, 710071, China
xbma@xidian.edu.cn

Wenjing Pian
School of Economics and Management, Fuzhou University
No.2 Xueyuan Road, Minhou County, Fuzhou, Fujian, 350116, China
wpian1@e.ntu.edu.sg

Jian Mou
College of Business, Pusan National University
2, Busandaehak-ro 63beon-gil, Geumjeong-gu, Busan, 46241, Republic of Korea
jian.mou@pusan.ac.kr

Abstract

The COVID-19 pandemic has led to a high demand for teleconsultation to protect doctors and patients from infection while maintaining healthcare services. As public mobility is no longer strictly restricted in the post-COVID-19 era, the number of teleconsultation users has declined. However, promoting continued teleconsultation use still matters as it not only helps manage public health crisis during recurrent outbreaks, but also helps solve long-term challenges rooted in healthcare system. Against this backdrop, we proposed a research model based on protection motivation theory and expectation-confirmation model to examine post-acceptance of teleconsultation from the perspectives of health belief and affection. We conducted an online survey on Chinese teleconsultation users and found that health belief and affection significantly influenced continuance intention of teleconsultation. Providing richer perspectives, this study advances the understanding of user post-acceptance of teleconsultation, and provides guidance for its sustained use in post-COVID-19 era.

Keywords: Teleconsultation, Online medical consultation, Post-COVID-19, Continuance intention, Protection motivation theory, Expectation-confirmation model
Introduction

The outbreak of Coronavirus Disease 2019 (COVID-19) was a humanitarian public health emergency, which was first reported in Wuhan, Hubei province in China (Sheng et al. 2020). It caused unprecedented threats to individual health worldwide. To limit the spread of this fast-moving virus, experts issued multiple guidelines, e.g., avoiding crowds, instructing socially distance and home isolation (Sheng et al. 2020). These protective measures have caused massive, immediate and remarkable changes in the public’s use of digital technology (Ouimet et al. 2020), especially telemedicine technology. As a relatively mature application of telemedicine, teleconsultation was widely adopted during the pandemic. Teleconsultation, also known as online medical consultation or “Ask the Doctor” service, provides an opportunity for patients to consult health issues directly with online doctors they have never met (Abdaoui et al. 2015; Umefjord et al. 2003). In China, patients access a teleconsultation platform via its mobile application or official websites. By paying the corresponding fees, patients can anonymously describe their physical condition and health needs to doctors in different forms (e.g., text, voice, photos and videos). During the pandemic, teleconsultation enabled the public to access professional diagnosis or medical advice online, effectively reducing emergency room congestion (Sun et al. 2020) and avoiding cross-infection.

As the pandemic in some countries has been controlled and public mobility is no longer strictly restricted, the number of teleconsultation users has naturally declined. Nonetheless, promoting continued teleconsultation use in the post-COVID-19 era still matters. Due to the mutation and infectivity of COVID-19 virus, outbreaks have been unexpectedly recurring. In the short term, teleconsultation protects care providers and patients from COVID-19 infection while maintaining healthcare services (Khairat et al. 2020), thus suppressing recurrent outbreaks. On the other hand, teleconsultation is regarded as a critical impetus for addressing long-term healthcare system challenges, e.g., reducing emergency room congestion, advancing accessibility and continuity of care delivery, reducing care cost (Sun et al. 2020; Ouimet et al. 2020). Thus, promoting continued teleconsultation use is of great significance in both public health emergencies and sustained healthcare development. Many people have adopted teleconsultation during the COVID-19 pandemic, which provides an opportunity to capture user post-acceptance behavior and thus promotes their continued use.

In the context of teleconsultation, numerous studies investigated factors associated with its acceptance (Alkmim et al. 2015; Baudier et al. 2021; Jiang et al. 2020; Li et al. 2017). Considering continued telemedicine use, Wu et al. (2022) emphasized IT traits, while Ouimet et al. (2020) focused on system performance (e.g., quality, usefulness). Given that the current understanding about teleconsultation continuance is very limited, it is necessary to introduce mature and appropriate theories to better explain user post-acceptance from more diversified perspectives, especially in the post-COVID-19 era.

Protection motivation theory (PMT) explains individuals’ motivation to cope with health threats (Rogers 1975), while expectation-confirmation model (ECM) helps understand user continued use of IS (Bhattacherjee 2001). These two theories are among the most cited in healthcare and IS fields. PMT explains patients’ continued teleconsultation use to avoid health threats from the perspective of their own health beliefs, whereas ECM clarifies users’ continuance intention of teleconsultation from the lens of users’ affections on system performance. Thus, these two theories were fused to form our theoretical model. An online survey was conducted to address the research question: What factors derived from PMT and ECM may drive a patient to continue using teleconsultation in the post-COVID-19 era?

This study makes several contributions. Theoretically, we disentangle and integrate different paths that can shape continuance intention of teleconsultation through richer perspectives, i.e., health beliefs and affections. Second, this research advances the understanding of PMT and ECM in continued teleconsultation context. The merging of an IS theory (ECM) with a healthcare theory (PMT) contributes to interdisciplinary research about teleconsultation continuation. Practically, we provide teleconsultation providers with suggestions on shaping personal health belief and improving actual system performance, thus promoting continued teleconsultation use.
Literature Review

Related Work on Teleconsultation

Teleconsultation, a type of health information technology, provides patients with healthcare services and clinical information remotely through the Internet (Sun et al. 2020). Figure 1 shows a typical example of an online medical consultation. Current teleconsultation research puts emphasis on two aspects. On the one hand, prior studies applied text mining and natural language processing to analyze online needs of doctors and patients (Abdaoui et al. 2015; Himmel et al. 2009). Machine learning is adopted for intelligent triage, contributing to the accurate matching of doctor-patient online needs. Teleconsultation usage is another important research topic. These studies adopted qualitative and quantitative methods to explore behavioral motivations or influencing factors of using teleconsultation from various perspectives, e.g., patient payment (Jiang et al. 2020), online doctor-patient trust (Li et al. 2017), and online consultation satisfaction (Chen et al. 2020). Main motivations to use teleconsultation include meeting information needs, eliminating doubts, reducing uncertainty, gaining security, being convenient and saving time (Umefjord et al. 2003). Considering the adoption/initial use of teleconsultation, some studies adopted data mining and found that user adoption of teleconsultation is affected by many factors, e.g., sufficient training, system complexity, service delivery quality, patient source and patient involvement (Alkmim et al. 2015; Jiang et al. 2020). From the trust perspective, Li et al. (2017) found that trust positively influenced intention to use, and disease type moderated this relationship. Integrating UTAUT2 with contamination avoidance, Baudier et al. (2021) emphasized the significant effect of performance expectancy, perceived risk and contamination avoidance on intention to use teleconsultation.

Moreover, several studies have investigated continued telemedicine use (Ouimet et al. 2020; Wu et al. 2022). Based on an extended model by integrating two IT traits with ECM, Wu et al. (2022) revealed that satisfaction, IT identity and IT mindfulness were significant related to mobile health technology continuance intention. Ouimet et al. (2020) identified four constructs by searching three databases for relevant literature published between 2015 and 2017. Their results highlight the role of expectation confirmation, quality and usefulness in continuance intention. Our research differs from these studies in
three respects. First, our survey was conducted among Chinese patients who used teleconsultation during the COVID-19 pandemic. Given that China is now in the post-epidemic era, the sample is suitable for studying continued teleconsultation use in the post stage of public health emergencies. Second, instead of focusing on system performance, we provide a new perspective (i.e., health belief) to reveal how users' threat and countermeasure appraisal influence their continued teleconsultation use. Third, our constructs are derived from two theories (i.e., PMT and ECM) most cited in their respective domains. The introduction of two mature theories not only provides a solid theoretical foundation for this research, but also helps disentangle different paths or mechanisms that shape users’ continuance intention to use teleconsultation.

**Theoretical Backgrounds**

Protection motivation theory (PMT) aims to clarify the relationship between individuals' fear appeal and health protection intention, which is a special case of a more general category of theories that use concepts of expectancy and value (Rogers, 1975). According to PMT, whether an individual takes protective measures depends on two different paths, i.e., threat appraisal and coping appraisal (Johnston et al., 2010; Ruthig, 2016). Threat appraisal is an assessment of the severity and possibility of an individual’s health being threatened by risk events, including perceived severity and perceived vulnerability (Rogers, 1975; Maddux et al., 1983). Coping appraisal is an assessment of perceived efficacy of corresponding protective measures, including response efficacy, self-efficacy and response cost (Maddux et al., 1983). PMT has been widely used in the fields of seasonal influenza, cancer, education contexts and environmental protection (Babazadeh et al., 2016; Li et al., 2020; Ling et al., 2019). Previous studies have also adopted PMT as a framework for predicting individuals’ health-related behavior in various public health emergencies, e.g., SARS, H1N1 and H7N9 (Cho et al., 2015; Cui et al., 2017; Jiang et al., 2009). Moreover, PMT has been introduced to the IS field. For example, Liang and Xue (2009) integrated the PMT into the technology threat avoidance theory. Vance et al. (2012) combined PMT with habit theory to explore how the cognitive mediating processes influence user intention to comply with IS security policy.

Yet, to our knowledge, PMT has not been introduced into exploring user post-acceptance of digital care delivery in the post stage of public health emergencies.

Expectation-confirmation model (ECM) was developed to explain how users’ cognitive beliefs and affections influenced their intention to continue using IS (Bhattacherjee, 2001). ECM was derived from expectation-confirmation theory (ECT), which is used in the consumer behavior research to investigate consumer satisfaction and post-purchase behavior (Anderson et al., 1993; Oliver, 1980). Bhattacherjee (2001) integrated ECT with prior IS use study to build a post-acceptance model of IS continuance, i.e., ECM. According to ECM, satisfaction and perceived usefulness are considered as the antecedents to IS continuance intention, while confirmation and perceived usefulness are important determinants of satisfaction, and perceived usefulness is influenced by confirmation (Bhattacherjee, 2001). ECM has been used to explain user continuance intention in various contexts, e.g., video-on-demand services (Pereira et al., 2021), mobile instant messaging (Oghuma et al., 2016), and online learning environments (Daghan et al., 2016). Generally, in specific research contexts, the original ECM model was combined with other theories to make it more explanatory (Bhattacherjee and Lin, 2015; Gupta et al., 2020; Pereira et al., 2021). Drawing on expectation-disconfirmation theory (Oliver, 1980), Bhattacherjee and Premkumar (2004) refined the ECM model by replacing confirmation with disconfirmation. To our knowledge, ECM has not been used in the context of continued teleconsultation use, which is our focus. Given our research context, we integrate PMT with ECM to develop a post-acceptance model of teleconsultation continuance.

**Conceptual model and hypotheses**

We merged PMT and ECM to develop our conceptual model for several reasons. First, teleconsultation is an application of digital delivery of healthcare (Ouimet et al., 2020). Its continued use involves not only the system per se, but also users’ health beliefs (Mou et al., 2016). We thus select relevant theories from IS and healthcare field. Second, PMT and ECM are the most cited and relatively mature theories in their respective fields. Both theories have been well studied and tested in various contexts (Li et al., 2020; Ling et al., 2019), thus demonstrating a satisfactory explanatory power. Third, from the perspective of health belief, PMT explains how users’ health protection intention is affected by their sensitivity to risk events and perceived efficacy of protective measures. The virus is in constant mutation in the post-epidemic era.
Perceived severity and vulnerability effectively reflect individuals' risk awareness. Moreover, patients used teleconsultation during the pandemic, and they have a deeper understanding about response efficacy, self-efficacy and response cost of using teleconsultation. Thus, these five constructs of PMT were chosen to predict protection intention. From the perspective of personal affections, ECM explains how users' continuance intention is influenced by their cognitive beliefs about IS. User perception (i.e., perceived usefulness and satisfaction) after using IS has always been the determinant of their continuance intention. Note that we changed the confirmation to disconfirmation. In original ECM, confirmation means that expected benefits of IS use are realized, whereas disconfirmation implies failure to achieve expectation (Bhattacherjee 2001). In refined ECM, disconfirmation can be positive or negative, which depends on whether the actual performance is above or below initial expectations (Bhattacherjee et al. 2004). Hence, we adopted disconfirmation to describe a deviation from initial expectations. Figure 2 illustrates the research model which considers 10 key constructs of PMT and ECM. Note that response efficacy in PMT is similar to perceived usefulness in ECM. In this research, both were retained to reflect two different aspects. Response efficacy highlights perceived effectiveness of teleconsultation in preventing a risk event (i.e., COVID-19), while perceived usefulness emphasizes perceived effectiveness of teleconsultation in addressing health information needs.

Continuance intention (CI) refers to users’ intention to continue using teleconsultation (Bhattacherjee 2001). Protection intention (PI) refers to the willingness to protect themselves from health threats (Johnston et al. 2010; Maddux et al. 1983). Previous studies show that individuals are more likely to take protective measures when they have a strong desire to protect themselves against health threats, e.g., breast cancer, skin cancer (Babazadeh et al. 2016; Ralph et al. 2014). In our context, teleconsultation is considered as an effective protective measure, as it reduces the probability of COVID-19 infection by reducing in-person visits to crowded places or institutes (e.g., hospitals, clinics). We thus assume that existing users with strong PI are more likely to continue using teleconsultation. Formally stated: \( H_1: \) Protection intention positively influences continuance intention.

Perceived severity (PS) refers to the degree to which one perceives that the virus causes serious damage to health (Ruthig 2016). According to PMT, individuals experience intense fear when they are aware that a virus can seriously harm their physical health (Teasdale et al. 2012; Ruthig 2016). The fear further stimulates their willingness to protect health and take countermeasures (Johnston and Warkentin, 2010; Li et al. 2020). Previous studies on various public health emergencies (e.g., SARS, H1N1, and H7N9) suggest that PS positively affects individuals’ PI (Jiang et al. 2009; Cho and Lee, 2015; Cui et al. 2017). In the fight against the COVID-19, the virus poses a serious threat to the public’s health (Sheng et al. 2020). In the post-epidemic era, individuals conduct threat appraisal of available risk information to form their PS of COVID-19. If they have a clear understanding of its severity, they are more willing to protect their health. Formally stated: \( H_2: \) Perceived severity positively influences protection intention.
Perceived vulnerability (PV) refers to the degree to which one perceives that he/she is easily infected with the virus without performing adaptive behaviors or changing existing behavioral tendencies (Ruthig 2016). Similar to PS, PV also induces strong fear in individuals, which affects individuals’ self-protection behavior by stimulating their PI. In various pandemics (e.g., SARS, H1N1 and H7N9), individuals' PV to the virus significantly increases their PI (Jiang et al. 2009; Cho et al. 2015; Cui et al. 2017). COVID-19 is mainly transmitted through respiratory system and is highly infectious (Sheng et al. 2020). In the post-epidemic era, when individuals aware that they are vulnerable to COVID-19 infection, their PI increases accordingly. Formally stated: H3: Perceived vulnerability positively influences protection intention.

Response efficacy (RE), one of the core elements of coping appraisal, refers to the belief that performing a certain behavior protects one from health threats (Johnston et al. 2010). Evidence suggests that RE positively affects PI in public health emergencies (Jiang et al. 2009; Cho et al. 2015; Cui et al. 2017). In our context, RE is the degree to which users, post-acceptance, believe that using teleconsultation reduces health threats (i.e., COVID-19 infection). If users recognize that their health issues can be addressed without being exposed to risks, their awareness to protect health would increase. Formally stated: H4: Response efficacy positively influences protection intention.

Self-efficacy (SE) refers to the belief that one has the ability to perform a certain behavior in response to health threats (Maddux et al. 1983). SE is proved to positively influence PI (Cho et al. 2015; Cui et al. 2017; Ling et al. 2019). In our context, SE is the cognitive degree to which one is familiar with teleconsultation and is confident to use it. Strong SE in using teleconsultation enables the public to respond confidently to health threats, thus promoting their health protection intention. Formally stated: H5: Self-efficacy positively influences protection intention.

Response cost (RC) refers to the cost of one performing a certain behavior in response to health threats (Ruthig 2016). RC involves with any costs related to protective measures, e.g., effort, money, time or side-effects. These costs, to some extent, impose a burden on individuals’ lives and psychology (Rogers 1975). Some scholars believe that RC is negatively correlated with PI (Teasdale et al. 2012; Babazadeh et al. 2016). However, some suggest that there is no significant relationship between RC and PI (Ruthig, 2016; Ling et al. 2019). In our context, RC involves time, money and efforts spent on teleconsultation, as well as the increased psychological burden. The burden comes from the cost of using teleconsultation per se and negative emotions (e.g., worry and anxiety) caused by the lack of timely and useful feedback. Moreover, patients may concern about whether their personal medical information will be leaked due to technical security issues of teleconsultation. The psychological burden, coupled with the time and money spent, reduces users’ PI. Formally stated: H6: Response cost negatively influences protection intention.

Satisfaction (S) refers to users’ feelings about prior teleconsultation use (Bhattacherjee 2001). According to ECM, satisfaction is an important antecedent to CI (Bhattacherjee 2001). Users’ satisfaction with prior IS use drives their continued use, which has been proved in many contexts, e.g., mobile instant messaging (Oghuma et al. 2016) and online learning environments (Daghan et al. 2016). In our context, when users feel satisfied with their experience in using teleconsultation, they are more willing to continue using it. Formally stated: H7: Satisfaction positively influences continuance intention.

Disconfirmation (D), a deviation from initial expectations, refers to users’ perceptions of the inconsistency between teleconsultation use expectation and actual performance (Oliver 1980). According to ECM, satisfaction arise when users compare their actual IS usage with pre-usage expectations (Bhattacherjee et al. 2015). In our context, if users consider the actual teleconsultation performance higher than initial expectations, positive disconfirmation and satisfaction is formed; if users consider the actual teleconsultation performance lower than initial expectations, expectations are negatively disconfirmed and they feel disappointed. These have been demonstrated in consumer behavior research (Oliver 1980) and IS continuance research (Bhattacherjee et al. 2015). Formally stated: H8: Disconfirmation positively influences satisfaction.

Perceived usefulness (PU) refers to users’ perceptions of the benefits of IS/IT use (Bhattacherjee 2001). According to technology acceptance model (TAM), PU and perceived ease of use (PEOU) are determinants of users’ affections (Davis 1989). Yet, in continuance contexts, the effect of PEOU on satisfaction tends to decline over time as users are gradually familiar with the system, whereas post-acceptance PU exerts a persistent effect (Bhattacherjee et al. 2015; Gupta et al. 2020; Oghuma et al. 2016). Thus, PU, the degree to which users believe that using teleconsultation addresses health information
needs, is still an important determinant of users’ post-acceptance affections (satisfaction). That is, when users perceive teleconsultation beneficial, they feel contented with using teleconsultation. Formally stated: H9: Perceived usefulness positively influences satisfaction.

In IS acceptance contexts, TAM suggests the usefulness-intention relationship (Davis 1989). ECM posits that this relationship may hold true in IS continuance contexts, since the human tendency to subconsciously pursue rewards is independent of the timing/stage of such behaviors (Bhattacherjee 2001). That is, users’ PU will promote their continued teleconsultation use. Formally stated: H10: Perceived usefulness positively influences continuance intention.

In IS acceptance contexts, cognitive beliefs (i.e., PEOU and PU) are positively related (Davis 1989). Similarly, cognitive beliefs in IS continuance contexts (i.e., D and PU) may also be related (Bhattacherjee 2001). As users become familiar with IS from their first-hand experience, they may adjust their pre-usage expectations over time (Bhattacherjee et al. 2015). Since users are not sure what to expect from initial teleconsultation use, their PU may be relatively low, which is easily confirmed. When initial expectation was positively disconfirmed, they felt that their initial teleconsultation PU was low and would increase PU. Conversely, if their initial expectation was negatively disconfirmed, PU was deemed too high and may be adjusted lower. Formally stated: H11: Disconfirmation positively influences perceived usefulness.

Methodology

An online survey was conducted to collect user data. The questionnaire consists of two sections. The demographic section has 5 questions to profile the respondents. The construct section include 31 items used to measure 10 reflective constructs, all of which were adapted from previous studies to ensure the content validity. And each item is measured by a seven-point Likert scale, from “strongly disagree” (1) to “strongly agree” (7). Before the formal data collection, two professors and thirteen postgraduates with experience using teleconsultation platforms participated in a pilot study. They provided comments that helped improve the content validity and clarity, which formed our final measures (see Table 1).

<table>
<thead>
<tr>
<th>Measurement items</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Continuance intention:</strong> CI1: I intend to continue using teleconsultation rather than abandon it in the post-COVID-19 era. CI2: I will keep using teleconsultation as regularly as I do now. CI3: My intention is to keep using teleconsultation than any alternative means (offline health consulting) in the post-COVID-19 era.</td>
<td>Bhattacherjee (2001); Gupta et al. (2020)</td>
</tr>
<tr>
<td><strong>Protection intention:</strong> PI1: I want to protect myself from risk events. PI2: I intend to take protective measures. PI3: I have a strong intention to protect my health.</td>
<td>Rogers (1975); Ruthig (2016)</td>
</tr>
<tr>
<td><strong>Perceived severity:</strong> PS1: I am well aware of the main symptoms of COVID-19 infection. PS2: I am well aware of the harm COVID-19 can cause to my health. PS3: The COVID-19 infection would seriously threaten my health.</td>
<td>Maddux et al. (1983); Ruthig (2016)</td>
</tr>
<tr>
<td><strong>Self-efficacy:</strong> SE1: I am familiar with various functions of teleconsultation. SE2: I am able to use teleconsultation for consulting health information. SE3: I have confidence in using teleconsultation.</td>
<td>Maddux et al. (1983); Qin et al. (2019)</td>
</tr>
<tr>
<td><strong>Response cost:</strong> RC1: Using teleconsultation costs a lot of money. RC2: I spend a lot of time using teleconsultation. RC3: Using teleconsultation has greatly increased my psychological burden (e.g., concerns about system security).</td>
<td>Rogers (1975); Ruthig (2016)</td>
</tr>
<tr>
<td><strong>Response efficacy:</strong> RE1: Teleconsultation reduces the adverse effects of COVID-19 on my health. RE2: Teleconsultation protects me from COVID-19. RE3: Teleconsultation reduces the probability of COVID-19 infection.</td>
<td>Rogers (1975); Maddux et al. (1983)</td>
</tr>
<tr>
<td><strong>Satisfaction:</strong> S1: I am satisfied with my experience in using teleconsultation. S2: I feel contented in using teleconsultation. S3: My experience of teleconsultation use is pleasant.</td>
<td>Bhattacherjee (2001)</td>
</tr>
</tbody>
</table>
Examining the effects of health belief and affection

### Disconfirmation
D1: My experience with using teleconsultation was better than what I expected. D2: The service level provided by teleconsultation was better than what I expected. D3: The teleconsultation was more helpful for my life than I expected.

### Perceived usefulness
PU1: Teleconsultation solves my health information needs. PU2: Teleconsultation provides useful feedback on my health issues. PU3: Teleconsultation is beneficial for my life.

### Table 1. Constructs and Measurement Items

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Measurement Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disconfirmation</td>
<td>D1: My experience with using teleconsultation was better than what I expected.</td>
</tr>
<tr>
<td></td>
<td>D2: The service level provided by teleconsultation was better than what I expected.</td>
</tr>
<tr>
<td></td>
<td>D3: The teleconsultation was more helpful for my life than I expected.</td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td>PU1: Teleconsultation solves my health information needs.</td>
</tr>
<tr>
<td></td>
<td>PU2: Teleconsultation provides useful feedback on my health issues. PU3:</td>
</tr>
<tr>
<td></td>
<td>Teleconsultation is beneficial for my life.</td>
</tr>
</tbody>
</table>

### Table 2. Demographic Profile of Respondents

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Value (Frequency, Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male (133, 35.85%), Female (238, 64.15%)</td>
</tr>
<tr>
<td>Age</td>
<td>18 and below (7, 1.89%), 18-25 (120, 32.34%), 26-30 (48, 12.94%), 31-40 (60, 16.17%), 41 and above (136, 36.66%)</td>
</tr>
<tr>
<td>Education</td>
<td>College diploma and below (141, 38.01%), Bachelor degree (123, 33.15%), Master degree (93, 25.07%), Doctor degree and above (14, 3.77%)</td>
</tr>
<tr>
<td>Occupation</td>
<td>Government officials/ public institution staffs (75, 20.22%), Enterprise staffs (88, 23.72%), Students (97, 26.14%), Private business owners (27, 7.28%), Freelance workers (42, 11.32%), Others (42, 11.32%)</td>
</tr>
<tr>
<td>The experience of teleconsultation usage</td>
<td>Use occasionally (205, 55.26%), Use as needed (107, 28.84%), Use frequently (59, 15.90%)</td>
</tr>
</tbody>
</table>

### Results

**Common Method Bias and Social Desirability Bias**

Given that all data were collected from user’s self-perception report, common method bias (CMB) and social desirability bias (SDB) might exist. Both procedural and statistical remedies were adopted to minimize their influence. To reduce evaluation apprehension (Podsakoff et al. 2003), we promised all participants that their responses would be anonymous and confidential. To further reduce SDB (Carter et al. 2020), all participants were informed that there were no right or wrong answers, and that they could answer all questions as honestly as possible. These measures is suggested to minimize the influence of CMB and SDB. Moreover, three statistical remedies were adopted to test whether there was a threat of CMB. First, we performed Harman’s single-factor test through SPSS 26.0. CMB is severe when a single factor either (1) emerges or (2) explains most of the covariance of all measures (Podsakoff et al. 2003). Our results show that the cumulative variance of extracted eight components with eigenvalues greater than 1.0 is 74.32%. The largest single factor explains 30.42% of the variance, below the threshold of 50% (Podsakoff et al. 2003). Second, all correlations between constructs were lower than 0.69, while CMB
would lead to extremely high correlations \((r > 0.90)\) (Pavlou et al. 2007). Finally, we conducted a test using a common latent factor (Podsakoff et al. 2003). We tested the measurement model without a common latent factor (Model A), and then added a common latent factor (Model B). CMB is severe when (1) a difference in RMSEAs is greater than 0.05, or (2) a difference in CFI/TLIs is greater than 0.1 (Ayyagari et al. 2011). For our data, \(\Delta\text{RMSEA} = 0.006, \Delta\text{CFI} = 0.011\) and \(\Delta\text{TLI} = 0.010\). Overall, there is no strong evidence of CMB in this study.

**Assessment of the Reflective Measurement Model**

AMOS 26.0 and SPSS 26.0 were adopted to test the model and hypotheses. Note that PV4 was removed due to its low loading. We report the goodness-of-fit statistics guided by Hair et al. (2014) who based these statistics and appropriate levels on the sample size and the number of observed variables. Our model belongs to the category where the sample size is greater than 250 and the observed variables are greater than 30 (Hair et al. 2014). For the reflective measurement model, the Chi-Square/df = 1.766, RMSEA = 0.046, CFI = 0.961, TLI = 0.953, and IFI = 0.961 meet the recommended criteria (Hair et al. 2014), suggesting a satisfactory model fit. Table 3 presents the model fit statistics related to our measurement model, as well as our structural model discussed in Section 5.3.

<table>
<thead>
<tr>
<th>Model</th>
<th>Chi-Square</th>
<th>Chi-Square/df</th>
<th>RMSEA</th>
<th>CFI</th>
<th>TLI</th>
<th>IFI</th>
</tr>
</thead>
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<tr>
<td>Measurement model</td>
<td>635.855</td>
<td>1.766</td>
<td>0.046</td>
<td>0.961</td>
<td>0.953</td>
<td>0.961</td>
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<tr>
<td>Structural model</td>
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<td>2.546</td>
<td>0.065</td>
<td>0.914</td>
<td>0.905</td>
<td>0.914</td>
</tr>
</tbody>
</table>

**Table 3. Model Fit Statistics**

Composite reliability (CR) and Cronbach’s alpha (\(\alpha\)) are adopted to test the reliability of measurement model. As shown in Table 4, CRs are between 0.77 and 0.91, exceeding the recommended value of 0.7 (Hair et al. 2014). \(\alpha\) ranges from 0.77 to 0.91, well above 0.7 (Hair et al. 2014). Therefore, reliability is suggested to be adequate. Moreover, average variance extracted (AVE) of each construct is above 0.5, suggesting satisfactory convergent validity (Hair et al. 2014). All inter-construct correlations between two constructs are well below 0.69, and below the square root of AVE of each construct, indicating satisfactory discriminant validity (Hair et al. 2014).

<table>
<thead>
<tr>
<th>CR</th>
<th>AVE</th>
<th>(\alpha)</th>
<th>CI</th>
<th>PI</th>
<th>PS</th>
<th>PV</th>
<th>SE</th>
<th>RC</th>
<th>RE</th>
<th>S</th>
<th>D</th>
<th>PU</th>
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<tbody>
<tr>
<td>CI</td>
<td>0.91</td>
<td>0.77</td>
<td>0.91</td>
<td>0.88</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>PI</td>
<td>0.91</td>
<td>0.77</td>
<td>0.91</td>
<td>0.88</td>
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<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>PS</td>
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<td>0.55</td>
<td>0.78</td>
<td>0.88</td>
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<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>PV</td>
<td>0.85</td>
<td>0.66</td>
<td>0.85</td>
<td>0.88</td>
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<tr>
<td>SE</td>
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<td>0.89</td>
<td>0.88</td>
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<tr>
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<td>0.79</td>
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<td>0.79</td>
<td>0.88</td>
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<tr>
<td>RE</td>
<td>0.77</td>
<td>0.53</td>
<td>0.77</td>
<td>0.88</td>
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<tr>
<td>S</td>
<td>0.90</td>
<td>0.75</td>
<td>0.90</td>
<td>0.88</td>
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<tr>
<td>D</td>
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<td>0.91</td>
<td>0.88</td>
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<tr>
<td>PU</td>
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<td>0.88</td>
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<td></td>
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</tr>
</tbody>
</table>

**Table 4. Reliability, Convergent Validity and Discriminant Validity**

Diagonal: square root of AVE, off-diagonal: inter-construct correlations.

**Assessment of the Structural Model**

For the structural model (see Table 3), the Chi-Square/df = 2.546, RMSEA = 0.065, CFI = 0.914, TLI = 0.905, and IFI = 0.914 are all within the recommended criteria (Hair et al. 2014), indicating a satisfactory model fit. The path coefficients (\(\beta\)) and p-values are presented in Table 5 and Figure 3. The 11 hypotheses are all supported. Specifically, protection intention positively affects continuance intention (\(\beta = 0.457, p < \))
Examining the effects of health belief and affection

Perceived severity (β = 0.256, p < 0.001), perceived vulnerability (β = 0.241, p < 0.001), response efficacy (β = 0.485, p < 0.001) and self-efficacy (β = 0.325, p < 0.001) positively influence protection intention, whereas response cost (β = -0.182, p < 0.001) negatively influences protection intention, supporting H1-H6. Satisfaction positively affects continuance intention (β = 0.475, p < 0.001), supporting H7. Disconfirmation (β = 0.118, p < 0.05) and perceived usefulness (β = 0.565, p < 0.001) positively influence satisfaction, supporting H8-H9. Finally, perceived usefulness positively influences continuance intention (β = 0.140, p < 0.05), and disconfirmation positively affects perceived usefulness (β = 0.203, p < 0.001). H10 and H11 are supported. The research model explains 53.2% of the variance (i.e., R²) in continuance intention, 49.7% in protection intention, and 35.5% in satisfaction.

Table 5. Hypothesis Test

<table>
<thead>
<tr>
<th>H#</th>
<th>Hypothesis</th>
<th>β (p-value)</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Protection intention → Continuance intention</td>
<td>0.457 (0.000)***</td>
<td>YES</td>
</tr>
<tr>
<td>H2</td>
<td>Perceived severity → Protection intention</td>
<td>0.256 (0.000)***</td>
<td>YES</td>
</tr>
<tr>
<td>H3</td>
<td>Perceived vulnerability → Protection intention</td>
<td>0.241 (0.000)***</td>
<td>YES</td>
</tr>
<tr>
<td>H4</td>
<td>Response efficacy → Protection intention</td>
<td>0.485 (0.000)***</td>
<td>YES</td>
</tr>
<tr>
<td>H5</td>
<td>Self-efficacy → Protection intention</td>
<td>0.325 (0.000)***</td>
<td>YES</td>
</tr>
<tr>
<td>H6</td>
<td>Response cost → Protection intention</td>
<td>-0.182 (0.000)***</td>
<td>YES</td>
</tr>
<tr>
<td>H7</td>
<td>Satisfaction → Continuance intention</td>
<td>0.475 (0.000)***</td>
<td>YES</td>
</tr>
<tr>
<td>H8</td>
<td>Disconfirmation → Satisfaction</td>
<td>0.118 (0.020)*</td>
<td>YES</td>
</tr>
<tr>
<td>H9</td>
<td>Perceived usefulness → Satisfaction</td>
<td>0.565 (0.000)***</td>
<td>YES</td>
</tr>
<tr>
<td>H10</td>
<td>Perceived usefulness → Continuance intention</td>
<td>0.140 (0.017)*</td>
<td>YES</td>
</tr>
<tr>
<td>H11</td>
<td>Disconfirmation → Perceived usefulness</td>
<td>0.203 (0.000)***</td>
<td>YES</td>
</tr>
</tbody>
</table>

Significance: ***p < 0.001, **p < 0.01, *p < 0.05.

Figure 3. Research Model with Coefficients

(***p < 0.001, **p < 0.01, *p < 0.05)
**Discussion**

First, we discussed results from the perspective of health beliefs. Previous studies suggest that high protection intention encourages individuals to take protective measures (Babazadeh et al. 2016; Ralph et al. 2014). This is also supported by our empirical data ($\beta = 0.457, p < 0.001$). That is, when teleconsultation users possess a strong desire to protect health, they would keep using teleconsultation to prevent themselves from crowded places (e.g., hospitals, clinics). Threat appraisal and coping appraisal are two important paths to form protection intention (Ruthig 2016).

Considering threat appraisal, results demonstrate the positive effect of perceived severity ($\beta = 0.256, p < 0.001$) and perceived vulnerability ($\beta = 0.241, p < 0.001$) on protection intention. These relationships are consistent with studies on other public health emergencies, e.g., SARS, H1N1, and H7N9 (Cho et al. 2015; Cui et al. 2017; Jiang et al. 2009). In the post-COVID-19 era, the virus is in constant mutation, with a high level of uncontrollability and uncertainty. When the public aware that COVID-19 is still taking a serious toll on health and is highly contagious, they form a strong protection intention. PMT highlights the role of risk awareness, as it greatly motivates individuals to conduct threat appraisal (Rogers 1975; Maddux et al. 1983). Risk communication is one of the efficient ways to help raise risk awareness, thus increasing the public’s sensitivity to risk events (Garcia-Retamero et al. 2011). On the other hand, COVID-19 has triggered an unprecedented “infodemic”, leading to a vicious circle of human rumor-spreading behavior and public psychological issues (Pian et al. 2021). Therefore, teleconsultation providers should assume more social responsibility and design efficient communication strategies to guide the public to rationally assess health threats. For example, they can release health information based on science and evidence and disseminated it through public accounts in a calm and comprehensible manner. Moreover, visual content on teleconsultation platforms should be carefully designed or selected to ensure authenticity and persuasiveness. Effective risk communication measures will guide users to conduct rational threat appraisal and maintain vigilance against the epidemic, which enhances their health protection intention.

Considering coping appraisal, its effect on protection intention is higher than that of threat appraisal. This suggests that coping appraisal, in the post-COVID-19 era, plays a leading role in protection intention, which is consistent with prior studies (Cui et al. 2017; Ling et al. 2019; Rogers 1975; Teasdale et al. 2012). In the early stage of public health emergencies, threat appraisal exerts a dominant effect due to the lack of understanding of risk events; in the post-epidemic period, coping appraisal takes the leading position as the public gradually becomes rational (Mo et al. 2014). Thus, in the post-COVID-19 era, more attention should be paid to coping appraisal. Specifically, in line with previous studies (Cho et al. 2015; Cui et al. 2017; Ling et al. 2019), response efficacy ($\beta = 0.485, p < 0.001$) and self-efficacy ($\beta = 0.325, p < 0.001$) positively influence protection intention. That is, when patients consider teleconsultation effective to prevent health threats and have confidence in using it, they may well reduce in-person visits so as to protect their health. On the one hand, teleconsultation providers need clearly explain that online healthcare service is provided by medical professionals of authoritative hospitals. Teleconsultation not only solves immediate health issues, but also avoid potential infection caused by in-person visits. On the other hand, teleconsultation providers need increase users’ familiarity with various functions and improve their confidence in using teleconsultation. The floating window is helpful, allowing users to access more details (e.g., functions and charges) by clicking on each module. Teleconsultation providers can also provide instructions or guidelines on how to use various functions through short video and live broadcast.

On the contrary, response cost ($\beta = -0.182, p < 0.001$) negatively influences protection intention, which is consistent with Teasdale et al. (2012) and Babazadeh et al. (2016). This suggests that a high cost of teleconsultation (e.g., time, money and psychological burden) inhibits health protection intention. Optimizing users’ online healthcare path may help save time (Ouimet et al. 2020), while including teleconsultation in health insurance schemes may help overcome cost or payment barriers (Jacob et al. 2020), both of which increase protection intention. Considering psychological burden, a comprehensive feedback system can motivate doctors to improve service attitude, which helps alleviate patients’ negative emotions (e.g., worry or anxiety). Moreover, there are many complex ethical issues with IT applied to healthcare. Data security and confidentiality is not only a mandatory requirement of teleconsultation (Ouimet et al. 2020), but also a significant psychological burden for online patients. Thus, teleconsultation providers should strengthen system security management to prevent the loss, disclosure, and unauthorized use of personal medical information. These are potential countermeasures that improve protection intention.

*Examining the effects of health belief and affection*
Second, we discussed results from the perspective of affections. Consistent with ECM (Bhattacherjee 2001; Oghuma et al. 2016), our results show that satisfaction is a critical antecedent to continuance intention ($\beta = 0.475$, $p < 0.001$). That is, cultivating users’ positive feelings about teleconsultation is important, as satisfaction contributes to users’ willingness to keep using teleconsultation. Moreover, in continuance context, perceived usefulness has a positive effect on satisfaction ($\beta = 0.565$, $p < 0.001$) and continuance intention ($\beta = 0.140$, $p < 0.05$), which is consistent with previous studies (Bhattacherjee et al. 2015; Gupta et al., 2020; Oghuma et al. 2016). Hence, teleconsultation providers need improve users’ perceived usefulness, which is important for shaping users’ positive feelings about teleconsultation and promote its continued use. Accelerating the development of intelligent platforms is a good approach. For example, teleconsultation providers can attempt to apply new technologies (e.g., text mining, natural language processing and machine learning) to doctor-patient online needs mining and digital front-door features (e.g., e-triage). Moreover, a comprehensive feedback system is warranted, which allows patients to evaluate the usefulness of each consultation from multiple aspects (e.g., professionalism, accuracy, timeliness and service attitude). This helps doctors recognize their shortcomings in online communication with patients, leading to more considerate and meticulous service.

Finally, disconfirmation is an important construct in ECM (Bhattacherjee et al. 2015; Daghan et al. 2016), and our results suggest that disconfirmation positively influence satisfaction ($\beta = 0.093$, $p < 0.001$) and perceived usefulness ($\beta = 0.203$, $p < 0.001$). If users’ expectations are positively disconfirmed, they would increase their perceived usefulness and form satisfaction with teleconsultation. Thus, it is important for teleconsultation users to have an experience exceeding their initial expectations, which calls for efficient expectation management. Teleconsultation providers need control users’ expectations in a rational level. Using exaggerated advertising, publicity or other improper ways may increase the user base in a short term. Yet, once users’ expectations cannot be confirmed, they would feel disappointed and consider teleconsultation a waste of time and money. On the other hand, teleconsultation providers need enhance actual experience through value-added services. For example, making return visit through the platform and providing health protection tips may enhance users’ actual teleconsultation experience.

**Implications**

Our study has several theoretical implications. First, this study provides a theoretical basis for teleconsultation user studies. We contribute to this research stream by combing how users’ health beliefs and affections shape their continuance intention of teleconsultation. Regarding health beliefs, threat appraisal and coping appraisal are important to form protection intention which encourages existing users to continue using teleconsultation to protect health. Considering affections, positive disconfirmation and perceived usefulness contribute to forming satisfaction which is an antecedent to continuance intention. These two different paths provide more insights into the study on continued teleconsultation use. Second, this research advances the understanding of PMT and ECM in continued teleconsultation context. Our conceptual model combining PMT and ECM is proposed to examine user post-acceptance of teleconsultation, which to our knowledge has never been explored in prior studies. This study extends these two theories into the continuance context of teleconsultation, demonstrating their availability and explanatory power. Moreover, the merging of an IS theory (ECM) with a healthcare theory (PMT) contributes to interdisciplinary research about teleconsultation continuation.

This study has several practical implications for teleconsultation providers seeking to retain existing users and promote their continued use in the post-COVID-19 era. Considering shaping personal health belief, since perceived severity and vulnerability positively influence protection intention, we recommend that teleconsultation providers take effective risk communication strategies to raise the public’s threat awareness, which guides them to conduct rational threat appraisal. Moreover, response efficacy and self-efficacy positively influence protection intention, while response cost negatively influences protection intention. Teleconsultation providers may benefit from actions that cultivate countermeasure appraisal. In respect of cultivating positive feelings, since perceived usefulness positively influences satisfaction and continuance intention, teleconsultation providers should increase usefulness by accelerating the development of intelligent platforms and comprehensive feedback mechanisms. And expectation management also matters as disconfirmation positively influence satisfaction and perceived usefulness.
Limitations and Future Research

This work has several limitations. First, cross-sectional data were collected to examine the research model and hypotheses. Note that there are still recurrent outbreaks in the post-COVID-19 era. Perceptions may vary among users at different stages of an outbreak. Longitudinal analysis is still needed to advance the understanding of sustained teleconsultation adoption. Second, since our online survey was conducted among teleconsultation users in China, generalization of our findings to other countries must be made cautiously. Future research may provide more diversified insights by considering cross-cultural or cross-national differences, e.g., digital healthcare inequalities or informatization progresses in medical industry. Third, although suggestions are provided to promote continuance intention through protection intention and attitude, their effectiveness needs to be further examined. Experiment can be conducted to probe the intervention effect of these measures on continuance intention of teleconsultation in future studies.

Conclusion

Through an online survey, this study provides evidence that continuance intention of teleconsultation is influenced by personal health belief and affection. Our results indicate that teleconsultation providers need cultivate the public’s protection intention through threat appraisal and coping appraisal. Note that more attention should be paid to coping appraisal as it takes the leading position in the post-COVID-19 era. Moreover, satisfaction with teleconsultation can be cultivated through disconfirmation and perceived usefulness. Telemedicine is central to healthcare moving forward, and is critical to improve digital delivery of future healthcare (Ouimet et al. 2020). This work investigates user post-acceptance of teleconsultation, a relatively mature digital healthcare application, to provide insights for long-term telemedicine use. We expect that our findings would promote users’ continuance intention to use teleconsultation, including in the wake of the COVID-19 pandemic, to ensure continuity and sustainability of healthcare. This not only enhances preparedness for exceptional public health emergencies, but also addresses persistent healthcare system challenges and improves general care services.

Acknowledgements

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References


Examining the effects of health belief and affection


