

## Examining the Role of Technology Anxiety and Health Anxiety on Elderly Users' Continuance Intention for Mobile Health Services Use

### Abstract

*Mobile health (mHealth) is considered to be an important means of releasing the aging population problem. The efficiency of mHealth service can be increased by incorporating more elderly users and guaranteeing their continued use. However, limited attention has been directed toward investigating elderly users' continuance intention for mHealth service use. Drawing upon the trust theory, we investigated elderly users' characteristics, i.e. health anxiety and technology anxiety, to explain continuance intention. Survey data were collected comprising 261 valid responses to validate the research model and hypotheses. The results revealed that both cognitive and affective trust enhance continuance intention of mHealth services use. Health anxiety strengthens the effect of cognitive trust, but weakens the effect of affective trust, on the continuance intention. Furthermore, technology anxiety strengthens the effect of affective trust, but not that of cognitive trust, on the continuance intention. The limitations of our study and the theoretical and practical implications are discussed.*

### 1. Introduction

The steadily growing aging population is a global issue that has caused a dramatic increase in public healthcare demands and healthcare costs. This situation calls for the implementation of mobile health (mHealth) to assist in providing more efficient health care services to the elderly. mHealth service enables individuals to access ubiquitous health services by removing temporal and geographical restrictions while increasing the coverage and the quality of healthcare services (Akter et al. 2010; Varshney 2014). With the increasing ratio of the elderly in the total population, it is critical for mHealth providers to incorporate more elderly users into the general user group to improve their service efficiency and better serve the elderly. However, this promising technology adoption by elderly users is still limited because this population suffers from

higher levels of morbidity and disability, which hinders their use of information technology (Gracia and Herrero 2009; Heart and Kalderon 2013). Furthermore, elderly users are relatively less competent with IT as compared to the young population (Morris and Venkatesh 2000). Because of the elderly's declining physiological conditions and lower level of technology self-efficacy, it is difficult for them to build trust in mHealth service. Because mobile environment involves great uncertainties and risk, trust is of importance in determining users' continuing and discontinuing use of an IT at the post-adoption stage (Fang et al. 2014; Kim et al. 2009). Unlike a generic technology, mHealth, a personalized and interactive health-related IT, requires more attention by scholars and practitioners on cognitive and affective perceptions to explain users' adoption. Human experience includes both cognitive and affective perspectives (Komiak and Benbasat 2006). Intention to use health services is determined by both cognitive and emotional elements (Rosenstock 2005). Accordingly, based on the work of McAllister (1995), our study conceptualizes trust as comprising both cognitive and affective dimensions, which can predict elderly users' intentions to continue using mHealth services. The effect of trust on intentions to continue using technology is not independent from its context, which has recently led researchers to call for further exploration of an additional area of concern: the contingent role of personalities on the relationship between continuance use intention and trust (Gefen et al. 2008). Prior research confirms that personality, demographic characteristics, and other individual aspects influence system users' beliefs and behavior (Agarwal and Prasad 1999).

Prior research indicates that the eventual success of a promising IT depends on its continued use (Bhattacharjee 2001b). Healthcare IT will increase the efficiency of health services but only when individuals continue to use (Agarwal et al. 2010). Because of the significant influence of continued usage on the long-term viability of an IT, it is important to investigate the factors that influence individuals' post-adoption behavior (Thong et al. 2006). To narrow this research void, we introduce health anxiety and technology anxiety as two aging-

specific characteristics that shape the relationships between trust in mHealth services and continuance use intention. Based on the above statements, we integrate technology anxiety and health anxiety with cognitive trust and affective trust to investigate elderly users' continuance intention towards mHealth services use, and address this research question: To what degree can affective and cognitive trust influence elderly users' continuance intention toward mHealth services use? We examine this question with a research model by using survey data collected from 261 elderly users of a mHealth service company. A structural equation modeling technique is employed to analyze the causality of the variable in the model.

This study fills the research gap in the trust literature by the effect of personality (e.g., health anxiety and technology anxiety) on trust in mHealth services. Our study also extends the extant continuance use literature on mHealth services by introducing two important aging-specific characteristics as moderators in predicting elderly users' continuance intention of mHealth services use. On practical value, mHealth service providers can better develop and adapt their marketing strategies to promote not only elderly users' continuance intention for mHealth services use, but also customized services catering to elderly users' aging-specific personality traits.

The rest of our paper is organized as follows. First, we review the theoretical foundations of the study. Then, we present the theoretical research model and hypotheses related to the research question. Next, research method and data analysis results are reported. Finally, a discussion of our research findings and their theoretical and practical implications are presented.

## **2. Literature review**

### **2.1 Trust**

Trust plays a vital role in promoting consumers' use intention in many academic disciplines including management (Mayer et al. 1995), marketing (Morgan and Hunt 1994), and information systems (Wang and Emurian 2005). Integrating the shared characteristics of trust across different disciplines, Mayer et al. (1995, p.712) defined trust as "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party". McAllister (1995) conceptualized trust with cognitive and affective perceptions. Cognitive trust refers to the

trust attribute that is formed based on performance-relevant cognitions of a trustee, such as competence, responsibility, reliability, and dependability, while affective trust reflects the trustor's perceptions of emotional bonds and genuine care and concern of the trustee (Komiak and Benbasat 2004; McAllister 1995; McKnight et al. 2002). Following the theory of reasoned action (TRA) (Fishbein and Ajzen 1975), the concept of cognitive trust is consistent with the concept of trusting beliefs (McKnight et al. 2002), which refers to a trustor's rational expectation that a trustee will have the competence and ability to be relied upon (Komiak and Benbasat 2006). Affective trust is defined as trusting attitude which is the extent to which one feels secure and comfortable about relying on the trustee (Komiak and Benbasat 2006).

Based on the conceptualization of trust in people or organizations (Mayer et al. 1995), McKnight et al. (2011) developed the definition of trust in technology, which refers to "people's judgment or expectation that a given technology's helpfulness, reliability, and functionality will support them in their work". As trust can reduce uncertainties and risks involved in usage of IT, trust has been found to positively affect user adoption of various services, such as Internet store (Jarvenpaa et al. 1999), purchasing books on the Internet (Gefen 2000), e-government services (Carter and Bødø 2005; Lim et al. 2012), e-commerce (Gefen et al. 2003; Palvia 2009; Pavlou 2003), mobile payment (Gao and Waechter 2017).

In the research of mHealth services, Akter et al. (2011) theoretically conceptualized trustworthiness (trusting belief) in mHealth services research, and indicate that trustworthiness positively influences consumer trust (trusting intention) which directly affects consumers' continuance intention for mobile health service use. Akter et al. (2013) demonstrated that perceived trust positively affects satisfaction with mHealth services and continuance use intention. Guo et al. (2016) indicated that trust can reduce individuals' privacy concern and increase their adoption intention. From the above review, we can conclude that even trust has been widely explored in the mHealth domain; little research has paid attention to how affective trust and cognitive trust determine use intention simultaneously.

### **2.2 Characteristics of elderly users**

Age is often taken as a significant variable for studying elderly populations because the elderly's physiological and psychological characteristics are distinct from their younger counterparts (Morris and Venkatesh 2000). Elderly users' declining physical and cognitive capabilities possibly cause them to

suffer a high level of technology anxiety and health anxiety, which adversely affect their intention for innovative technology use. Focusing on mHealth services for the elderly population, we aim to explain the roles of these two unique features of elderly users in shaping their continuance intention for mHealth service use.

Technology anxiety, as a negative affective reaction toward computer use, refers to individuals' apprehensive feelings when they have the choice to use computers, and technology anxiety weakens their intention for the use (Compeau et al. 1999; Venkatesh 2000). Prior studies indicated that the elderly have significantly higher computer anxiety than the younger generation due to declining physiological condition of the former that leads to decrease of sensory and motor systems (Dyck et al. 1998; Laguna and Babcock 1997; Xue et al. 2012). Particularly, studies focusing on mHealth adoption among elderly users show that technology anxiety as an aging-specific factor is not favorable for elderly users' intention for mHealth services use (Deng et al. 2014; Guo et al. 2012).

Health anxiety is defined as an individual's apprehension or fear that results from her/his bodily symptoms as indicating severe illness (Asmundson et al. 2001; Salkovskis et al. 2002). Elderly users' health anxiety occurs because of comorbidity with physical health conditions in the aging process, and the elderly have a higher level of health anxiety than the younger generation (El-Gabalawy et al. 2013). Individual's health condition is closely related to their negative moods such as worry, fear, and anxiety; for example, one who has contracted a serious disease such as cancer or lung disease will be more anxious about their health status (Dalton et al. 2009; Trumbo et al. 2007). Individuals with health anxiety tend to undertake safety behaviors including checking and reassurance-seeking presumably to reduce their health-related fears (Abramowitz and Moore 2007). Similarly, health anxious individuals actively engage in health-related activities online such as searching for health information online, posting of health-related messages and responses (Baumgartner and Hartmann 2011). Recent works indicated that health anxiety is positively associated with online health information seeking (Lagoe and Atkin 2015; te Poel et al. 2016). However, few empirical studies have explored how elderly users make decisions when facing technology anxiety and health anxiety.

### 3. Research model and hypotheses

Based on preceding discussion, we develop a research model which incorporates cognitive and affective trust, and two aging-specific characteristics (technology anxiety and health anxiety) to predict elderly users' intention to continue using mHealth services as shown in Figure 1. First, we propose that cognitive trust and affective trust have significant effects on elderly users' continuance use intention. Second, we empirically test the moderating effects of technology anxiety and health anxiety on the associations of the two components of trust in mHealth services with continuance use intention.

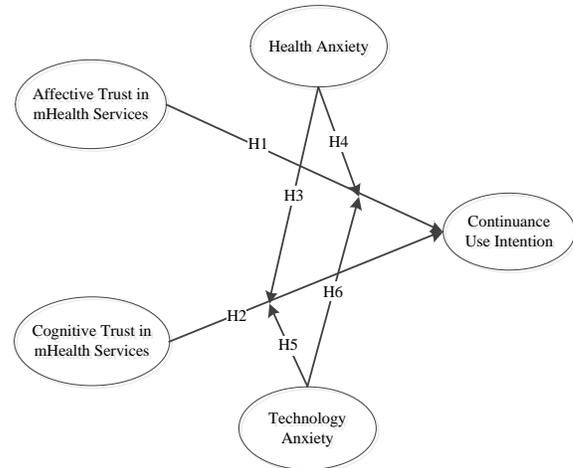


Figure 1. Research model

#### 3.1 The effects of cognitive trust and affective trust

Trust in technology has two cognitive and affective dimensions (Komiak and Benbasat 2006; McAllister 1995). Cognitive trust positively influences affective trust, thus influencing behavioral intention (McAllister 1995). Since mHealth services are characterized as a credence product and personalized service, a combined effect of cognitive and affective trust should be examined to better account for how people actually make decisions whether to trust or not (Komiak and Benbasat 2006). Previous studies indicate that trust plays a significant role in predicting one's continuance use intention toward IS in the post-use phase (Belanche et al. 2014; Fang and Chiu 2010; Susanto et al. 2016; Venkatesh et al. 2011).

Cognitive trust in mHealth services refers to a user's confidence or willingness to rely on mHealth service provider's internal trust-related characteristics, such as competence and integrity. For elderly users, they could check health records, consult with health professionals, and receive personalized health service

and information through using the mHealth services. Elderly users develop their cognitive trust based on their calculations of mHealth's advantages in the process of using mHealth services. Cognitive trust is conceptualized as trusting beliefs thus influencing elderly users' continuance intention of mHealth services use. Affective trust in mHealth services is defined as the extent to which users feel secure and comfortable about relying on the mHealth service provider. Elderly users develop their positive or negative attitude toward mHealth services based on attributes of mHealth services. According to TRA (Fishbein and Ajzen 1975), attitude toward a behavior positively affects the intention to perform the behavior. Affective trust is conceptualized as a trusting attitude which predicts the intention to perform the behavior.

Based on the above statements, elderly users are more likely to continue to use mHealth services when they have a high level of cognitive and affective trust in mHealth services. Thus, we propose:

Hypothesis (1): Affective trust in mHealth services increases continuance intention of mHealth services use.

Hypothesis (2): Cognitive trust in mHealth services increases continuance intention of mHealth services use.

### **3.2 The moderating role of technology anxiety**

Technology anxiety, an aging-specific characteristic, is negatively associated with adoption of mHealth services (Deng et al. 2014; Guo et al. 2012). Technology anxiety in the mobile environment is higher than in other channels (Bahli and Benslimane 2004). Elderly users' technology anxiety may be increased since using mHealth services is closely related to their health. Elderly users have a higher level of technology anxiety and are less familiar with IT relative to the younger generation because of their declining physiological conditions (Laguna and Babcock 1997; Xue et al. 2012). Elderly users with a higher level of technology anxiety may spend more efforts and take longer to evaluate the advantages of mHealth services prior to developing cognitive trust in mHealth services. However, elderly users may develop a higher level of affective trust in mHealth services since emotional bonds and genuine care from mHealth services could reduce their technology anxiety toward using mHealth services. Therefore, elderly users with a higher level of technology anxiety are more likely to develop a higher level of affective trust in mHealth services.

Based on the above statements, we hypothesize that:

Hypothesis (3): Technology anxiety weakens the relationship between cognitive trust and continuance intention of mHealth services use.

Hypothesis (4): Technology anxiety strengthens the relationship between affective trust and continuance intention of mHealth services use.

### **3.3 The moderating role of health anxiety**

Health anxiety, another aging-specific characteristic, positively associated with health behavior (Abramowitz and Moore 2007; El-Gabalawy et al. 2013). Because of declining physical conditions caused by the aging process, elderly users have more severe health anxiety than younger adults (El-Gabalawy et al. 2013). Elderly users with a higher level of health anxiety are more likely to conduct safety behaviors, such as online health information seeking, to reduce their apprehension and fears toward their health conditions (Eastin and Guinsler 2006; Lagoe and Atkin 2015; te Poel et al. 2016). Elderly users with health anxiety are more likely to undertake the cognitive effort to evaluate characteristics of mHealth services. Therefore, elderly users could develop cognitive trust, and thus continue to use mHealth services in order to reduce their health anxiety. However, elderly users with higher health anxiety may feel less secure and comfortable when using mHealth services. Hence, we hypothesize that:

Hypothesis (5): Health anxiety strengthens the relationship between cognitive trust in mHealth services and continuance intention of mHealth services use.

Hypothesis (6): Health anxiety weakens the relationship between affective trust in mHealth services and continuance intention of mHealth services use.

## **4. Methodology**

A survey was conducted in China to test the research model. The survey participants are users of a large mHealth application company providing health services targeting elderly users. However, elderly users may find it difficult to complete the questionnaires by themselves due to their declining physiological conditions. Six postgraduate students were employed to assist elderly users to complete the questionnaires in the data collection process. Finally, all respondents were given 20 RMB (3.1USD) supermarket coupons for survey participation. Of 500 distributed questionnaires, 261 usable questionnaires were obtained, with a response rate of 52.2%. The

demographic profile of the respondents is summarized in Table 1.

**Table 1. Demographic profile of the respondents**

Characteristics	Statistics	
	N	Percentage
Gender		
Male	92	35.24
Female	169	64.76
Age		
60-65 year-old	115	44.07
66-70 year-old	90	34.48
71-75 year-old	43	16.47
Educational level		
Primary school	72	27.59
Secondary school	85	32.57
Pre-university	61	23.37
University	33	12.64
No formal education	10	3.83

Commonly-used measures from the literature were adapted to promote content validity. Multiple-item perceptual scales were used for evaluating all the theoretical constructs. According to pre-validated instruments from prior studies, all constructs in our study were reworded to relate especially to the context of mHealth adoption. The measures of cognitive trust in mHealth services and affective trust in mHealth services were adapted from (Sun 2010). The measures for continuance use intention were adapted from the work of Bhattacharjee (2001a). Furthermore, the measures for technology anxiety were adapted from the work by Xue et al. (2012). Health anxiety scale was adapted from the work by Salkovskis et al. (2002). After developing the preliminary questionnaire, we received feedback from two academic mobile health researchers for improving the questionnaire. Additionally, we conducted a pretest for the questionnaire with 20 elderly users. According to their suggestions and feedback on the questionnaire, we revised questions and deleted items with similar semantic meaning. All items included in the survey were measured on a 7-point Likert scale ranging from 1 to 7, with “1” for strongly disagree and “7” for strongly agree. The theoretical constructs and their measurements are presented in the Appendix.

## 5. Analysis and results

### 5.1 Method of data analysis

Partial Least Squares (PLS), a structural equation modeling technique, was used to test our research model. PLS was chosen because it can predict all loadings and weights of indicators and causal relationships among constructs in multistage models (Fornell and Bookstein 1982; Gefen et al. 2011). Furthermore, compared with covariance-based (CB) SEM, PLS is the most suitable technique for models with formative constructs and is appropriate for relatively small samples (Hair et al. 2011), which is the case in our study. Additionally, PLS provides a good approximation of covariance-based (CB) SEM in terms of final estimates (Gefen et al. 2011; Hair et al. 2011). Given these considerations, we adopted PLS to analyze our research model.

The data analysis was conducted in two stages. In the first stage, the measurement model was assessed to ensure its appropriateness; in the second stage, the structural model was examined and the stated hypotheses were tested (Hair et al. 1998).

### 5.2 The measurement model

To establish the reliability and validity of the measurement model, we examined the reliability, convergent validity, and discriminant validity of the measurement model as indicators of the goodness of the measurement model. To test for reliability of the measurement, we assessed Cronbach’s alpha, composite reliability (CR), and average variance extracted (AVE). As shown in Table 2, all constructs satisfied the criteria for convergent validity. Specifically, the values for composite reliability ranged from 0.716 to 0.971 which exceeded the threshold of 0.700 (Chin 1998). The AVE ranged between 0.692 and 0.899, which were greater than 0.500 (Nunnally and Bernstein 1994). Cronbach’s alpha values were greater than the threshold value of 0.700 (Hair et al. 2011). To examine the discriminant validity, we assessed the cross-loadings of the measurement items and the square root of AVEs. Table 2 shows that all item loadings on expected constructs were greater than their cross-loadings on other constructs, and the correlations of the constructs were significantly smaller than the square roots of the AVE of each construct, thus indicating that the constructs have good discriminant validity.

### 5.3 The structural model

As shown in Figure 2, all the hypotheses that we proposed were supported with the exception of H5. The research model explained 72.30 percent of the variance in continuance use intention. Affective trust in mHealth services ( $\beta = 0.198$ ,  $t = 2.397$ ) and

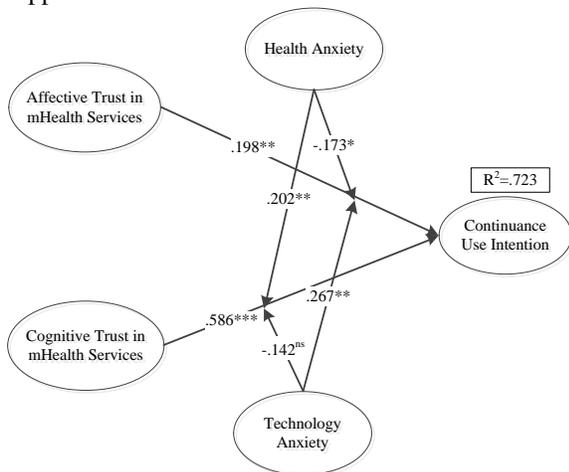
cognitive trust in mHealth services ( $\beta = 0.586, t = 6.805$ ) were found to have direct significant effects on continuance use intention. Therefore, H1 and H2 were supported.

**Table 2. Correlations and discriminant validity**

	CA	CR	AVE	A	B	C	D	E
A	.808	.886	.722	<b>.849</b>				
B	.941	.962	.899	.714	<b>.948</b>			
C	.928	.949	.830	.734	.886	<b>.911</b>		
D	.961	.971	.882	-.407	-.316	-.340	<b>.939</b>	
E	.873	.716	.692	.076	.060	-.001	.149	<b>.831</b>

Note: A=Continuance use intention; B=Affective trust; C=Cognitive trust; D=Technology anxiety; E=Health anxiety; CA=Cronbach's alpha; CR=Composite reliability; AVE=Average

From the perspective of moderating effects, health anxiety was found to have a positive moderating effect on the relationship between cognitive trust in mHealth services and continuance use intention ( $\beta = 0.202, t = 2.204$ ). However, health anxiety weakens the positive relationship between affective trust in mHealth services and continuance use intention ( $\beta = -0.173, t = 1.958$ ), thus H3 and H4 were supported. Technology anxiety strengthens the positive relationship between affective trust in mHealth services and continuance use intention ( $\beta = 0.267, t = 2.333$ ), thereby supporting H5. Contrast to our hypotheses, technology anxiety had no influence on the link between cognitive trust in mHealth services and continuance use intention. Thus, H6 was not supported.



Note: \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ ; ns: not significant

**Figure 2. Results of the research model**

## 6. Discussion and implications

### 6.1 Key findings

This study develops and empirically tests an integrated model to explain elderly users' health services adoption behavior based on trust theory and aging-specific characteristics. There are several major findings from this study. First, the results indicate that both affective trust and cognitive trust have significant effects on continuance intention for mHealth services use. Especially, cognitive trust has a stronger effect than affective trust in predicting elderly users' continuance intention for mHealth service. One possible explanation is that, in the post-usage stage, elderly users become familiar with the characteristics and functions of mHealth services, which lead to better evaluations of competence and reliability of mHealth services.

Second, health anxiety strengthens the positive relationship between cognitive trust in mHealth services and continuance use intention. Meanwhile, it weakens the positive relationship between affective trust in mHealth services and continuance use intention. Elderly users with high health anxiety are more prone to spend efforts to evaluate characteristics of mHealth services presented to them under problematic and insecure situations (Bohner et al. 1992). However, elderly users with high health anxiety may feel less comfortable and secure for mHealth services use, thus compromising the development of affective trust in mHealth services.

Third, technology anxiety strengthens the positive relationship between affective trust in mHealth services and continuance use intention but makes no influence on the relationship between cognitive trust in mHealth services and continuance use intention. Elderly users with high technology anxiety may find it difficult to evaluate mHealth services' advantages. Therefore, they are more likely to rely more on affective factors to develop trust in mHealth services such as emotional bonds and genuine care from a mHealth service provider through the usage process. Although elderly users are expected to be anxious when they are presented with the option of mHealth services use and rely less on the evaluation of its competence and ability, they are getting more familiar with and willing to use information technology in the digital age. This result also is supported by the work of (Eastman and Iyer 2004), which indicate that elderly consumers have favorable attitudes towards using the Internet.

### 6.2 Theoretical and managerial implications

This research yields four theoretical contributions. First, in a response to the call for research from the

work of Gefen et al. (2008), which calls for exploration of the moderating effect of personality on the relationship between trust and continuance use intention. We introduce two personalities of the elderly including health anxiety and technology anxiety in order to comprehensively understand elderly users' the mHealth adoption behavior. Health anxiety was found to strengthen the positive relationship between cognitive trust and continuance intention for mHealth services use, but weaken the positive relationship between affective trust and continuance intention for mHealth services. Furthermore, we found that technology anxiety has no influence on the relationship between cognitive trust and continuance intention for mHealth service use. One plausible reason is that elderly users may be able to have a good command of IT and have favorable intentions towards usage of IT, although this finding requires further verification.

Second, this study confirms the significant roles of affective trust and cognitive trust in predicting IS continuance use intention. In the post-use stage, cognitive trust has a stronger impact on continuance use intention than affective trust for mHealth services. Since readiness of using health services are determined by both cognitive and affective elements (Rosenstock 2005), we have taken both affective and cognitive trust into consideration to comprehensively understand elderly users' acceptance of mHealth services.

Third, in contrast to previous studies focusing solely on the general population, we particularly choose the elderly as study target to gain insight into mHealth adoption behavior. By doing so, our model adds to existing knowledge in mHealth services adoption of the elderly population group.

Several practical implications from this study are valuable for mHealth practitioners to gain higher continuance use of their e-services amongst the elderly. First, in the post-use phase, cognitive trust in mHealth exerts more significant effects on continuance use intention than that of affective trust. mHealth services providers should increase their investment in functions design and better present the advantages of their services when marketing to elderly users. Additionally, mHealth services providers are advised to invest in resources to acquire personal data and develop sophisticated data-mining and tracking of software with the aim of delivering highly personalized content. In doing so, these suggestions will increase the competence and ability of mHealth provider, thus positively associated with the development of cognitive trust in mHealth services.

Second, although the mHealth service is increasingly being incorporated into the elderly individuals' daily routines, younger and older users are urged to use the mHealth in different ways. As a result, mHealth practitioners and marketers will benefit by incorporating marketing strategies targeting the different age groups in an attempt to prompt users of different age groups into involvement with mHealth service usage.

Third, mHealth service practitioners and marketers should engage in public health behavior campaigns to decrease elderly users' anxious attitudes to their health condition when delivering healthcare services through the mobile channel. These marketing strategies could contribute to the diffusion of mHealth services by delivering age-friendly healthcare services to the elderly population.

## **7. Limitations and further directions**

When interpreting the findings from this research, several limitations need to be recognized. First, the study did not cover all age groups of users. Elderly users were taken as the sample in the study because this specific group accounts for a large portion of the whole mHealth services. The study results should be interpreted with caution for interpretation in other populations. Second, this study only considers health anxiety and technology anxiety as aging-specific characteristics. Other aging-specific characteristics, such as human contact, self-actualization, and resistance to change (Deng et al., 2014; Phang et al., 2006), were not considered. These characteristics may also significantly influence the extent of trust and the adoption and usage of mHealth services. Third, the generalizability of this study is questionable. Since the data was collected from elderly users in China, the elderly population may have distinctive characteristics compared with those living in Western countries, and the results may be applicable in China. Future study should validate the research model in other cultural contexts to ensure the validity of findings.

## **8. Conclusion**

Although mHealth services are currently evolving dramatically on a global scale, the usage rate of mHealth services among elderly users still remains at a low level. Our study proposes a unified model that integrates the trust theory and aging-specific characteristics to investigate elderly users' continuance intention for mHealth services use. Our study results confirm that affective trust and

cognitive trust promote elderly users' continuance intention for mHealth services uses. Health anxiety and technology as two aging-specific characteristics respectively influence the effects of both cognitive and affective trust in mHealth services on continuance intention of elderly users for mHealth services. Based on extant literature, there is limited knowledge that is related to the role of aging-specific personality traits in the research of mHealth implementation. Thus, our research can serve as a reference not only for making decisions related to mHealth design, adoption, and implementation but also as a basis for future research in mHealth adoption and diffusion.

## 9. Appendix

### Measurement items

Continuance use intention: (Bhattacharjee 2001b)

CUI1. I intend to continue using mobile health services rather than discontinue its use.

CUI2. My intentions are to continue using this mobile health services than use any alternative means.

CUI3. I prefer to use this mobile health services again.

Cognitive trust in mHealth services: (Sun 2010)

CTM1. I know mHealth services are honest.

CTM2. I know mHealth services care about its customers.

CTM3. I know mHealth services are not opportunistic.

CTM4. I know mHealth services are predictable.

Affective trust in mHealth services: (Sun 2010)

ATM1. I feel secure about relying on mHealth services for my health management.

ATM2. I feel comfortable about relying on mHealth services for my health management.

ATM3. I feel content about relying on mHealth services for my health management.

Technology anxiety: (Xue et al. 2012)

TA1. Using mobile health services would make me very nervous.

TA2. Using mobile health services may make me worried.

TA3. Using mobile health services may make me feel uncomfortable.

TA4. Using mobile health services may make me feel uneasy and confused.

Health anxiety: (Salkovskis et al. 2002)

HA1. I am afraid that I have a serious illness.

HA2. I worry about my health.

HA3. If I hear about an illness I think I have it myself.

HA4. I usually feel at risk for developing a serious illness.

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