Motivational Factors Influencing Intention to Use Mobile health in Older Adults：An Integrated Model of the Technology Acceptance Model and Uses and Gratifications Theory

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Abstract

Chinese older adults increasingly turn to mobile health technology for health management and communication. Mobile health, as an attractive solution, offers many advantages for the elderly. Little research, however, has examined their motivations for adopting this advanced technology. The study filled the gap by exploring diversified motivations that influence Chinese older adults' intention to adopt mobile health technology in their day-to-day lives. The investigation was guided by a proposed research model developed from the original Technology Acceptance Model (TAM) and Uses and Gratifications Theory (U&G). Two independent and interconnected studies (Study 1a&b and Study 2) were conducted using mixed-research methods and quantitative methods respectively. Specifically, study 1 performed a sequential exploratory mixed-method study, combining qualitative (Study 1a) and quantitative analysis (Study 1b) to develop a reliable, empirically derived instrument to measure older adults' health-related motivations. Study 1a comprised a qualitative stage to generate the primary items of the instrument. This stage provided findings of a qualitative content analysis of 20 in-depth interviews held with Chinese older users. Based on study 1a's findings, study 1b designed a questionnaire that includes all health-related motives identified from study 1a. The motivations were converted to questionnaire items that asked respondents to rate them on a five-point Likert scale. A self-reported online survey was completed by 433 older mobile health users to investigate the factorial structure of the new-developed instrument. The results disclosed six types of health-related motivations, which are health information need,

social support, surveillance needs, technological convenience, social involvement and self-presentation. Study 2 conducted a quantitative analysis to test the predictive and explanatory power of the proposed research model; Specifically, the quantitative phase examined how health-related and technological-oriented motivators and age-specific factors affect older adults' behavioural intention to use mobile health technology. An online self-reported questionnaire was completed by 586 older users. A variance-based Partial Least Square (PLS) method was used to examine the quality of the structural model and the hypothesised relationship between independent variables and dependent variables. The results showed that eleven independent variables explain 72.68 % of the variance in the behavioural intention, which demonstrates that the proposed research model is a model with good explanatory power. Specifically, perceived usefulness, perceived ease of use, health information need, and social support were the most important motivations in mobile health use. Age-related factors such as self-efficacy, technology trust and technology anxiety significantly affected older users' behavioural intention, while resistance to change did not show any statistical significance. This study integrated the TAM model and U&G theory with age-related factors to serve as an innovative and integrated research model to examine use of mobile health technology among older Chinese adults. It also provided recommendations on how to leverage mobile health technology to improve older people's healthcare management and health communication.

Keywords: Mobile health technology, TAM model, U&G theory, Motivations, China, Older adults, Age-characteristic factors

DEDICATION

To my beloved family who always love me and support me,

To my mother who always sacrifices herself for me,

This achievement is yours.

I love you.

Thanks for your love and support.

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Chapter 1 Introduction

1.1 Background

The digital revolution has changed every aspect of people's lives, from how we work, socialize, and shop to how we access banking and healthcare services. Information and Communication Technologies (ICT) growth continues to improve how healthcare is delivered through increased computer process capacity, faster connectivity, and significant storage availability (Van De Belt et al., 2010). Bashshur et al. (2011) highlighted four key ICT health areas: telemedicine, e-health, telehealth, and m-health. E-Health was introduced in the 1990s by business and commercial communities due to the rise of the Internet and electronic data systems. It is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related digital technologies (Oh et al., 2005). Scholars perceived e-health as the software application that promotes and empowers the health and well-being of individuals, families and communities (Liu et al., 2011; Bashshur et al.,2011). As an essential component of e-Health, mobile health (m-Health) was borne out of the advances in wireless technologies and mobile communications tools, including mobile telephone devices and other emergent mobile applications (Deng, 2013). It was defined as the "medical and public health practice supported by mobile technologies" (World Health Organization, 2011, p.13). Mobile health offers a variety of benefits including encouraging healthy behaviours (Free et al., 2013), minimizing the likelihood of health problems happening, assisting individuals with engaging in self-health management (Beratarrechea et al.,

2014), facilitating real-time communication between patients and doctors (Klasnja & Pratt, 2012; Shen et al., 2017); as well as reducing health care costs of public health services (Aranda-Jan, Mohutsiwa-Dibe & Loukanova, 2014).

A report by Statista (2021) estimated that there are currently 6.648 billion smartphone users globally; to phrase this another way, 83.72% of the global population owns a smartphone. Mobile health is characterized by mobile health applications (apps) that can be operated using smartphones (Perry et al., 2019). Compared to health services on the Internet delivered from desktops and laptops, mobile health apps can interact with users more frequently and flexibly, without being constrained by geographical or temporal limitation (Free et al., 2013; Iwaya et al., 2013). Additionally, the initial Internet digital divide has limited the reach of computerized health services for lower socioeconomic groups. In this context, accessing healthcare services using mobile phones and devices looks to be a more appropriate and significant development for those populations that need healthcare the most (Leena et al., 2005; Smith, 2014).

As people are living for longer, "living a healthier independent life" becomes the primary aspiration of older adults (Plaza et al., 2011, p. 1979). The population of China is aging, and it is already the world's oldest region. Statistics published by the China National Committee on Aging (CNCA) in 2020 reported that 18.1% of the Chinese population is older than 60 years old. Further, the CNCA predicted that this figure will increase to 30% between 2025 and 2050 (Zhong, 2020). Older people are more prone to chronic disease and limited in their regenerative abilities (Demiris et al., 2013). One study investigating healthcare for older Chinese adults found that around

79.5% of people over the age of 60 suffer from at least one chronic disease, whilst 50% and 25% have at least two or three or more, respectively (Thomas & Rajagopalan, 2001). Increasing medical expenses for an aging population is a complex problem awaiting a solution (Haux, 2006). Considering the significant healthcare needs of the elderly, mobile health is an effective and efficient means of delivering healthcare to vulnerable groups such as the elderly, children and people with disabilities (Istepanian et al., 2005). Mobile health technology, by offering real-time health information on behavioral changes and health monitoring, bolsters the elderly individuals' independent living and extends their lives (Mercer et al., 2015; Mitzner et al., 2010). As a result, this latest healthcare technology has been readily accepted and adopted by elderly groups. Due to improvements in their features and functions, mobile phones have become the most useful and common piece of technology. Older people use mobile phones at a much higher rate than they use the Internet (Kurniawan, 2007). There is now a prime opportunity to develop mobile health services for older individuals, which will provide a greater degree of control over their health management.

Mobile health is an umbrella term that encompasses networking, mobile computing, medical sensors, and other healthcare communication technologies. Mobile devices, software platforms, and m-health applications are the three main components of mobile health (Rebolj & Menzel, 2004). Mobile health is defined as the technology that assists in administering health care, implementing prevention measures, making diagnosis, treatment, and monitoring services via mobile devices. Mobile devices typically include personal digital assistants (PDAs), tablet computers (i.e., Apple iPads),

and smart mobile phones. In the current study, most of the mobile health services used by the elderly are delivered through smartphone so that the researcher will focus on health-related services provided by WeChat and health apps. In literature review chapter, the researcher will discuss the health services provided by WeChat and mobile health applications in China in detail.

In summary, as the Chinese population continues to age, the associated healthcare costs dramatically increase. This is a pressing issue that requires immediate resolution. Mobile health is one possible solution that may alleviate some of the pressure associated with providing healthcare for the elderly. Such an approach offers a range of benefits: minimizing deferred care and increasing the provision of timely care, improving the efficiency of physicians, increasing the communications between patients and those providing them with care, minimizing the need for patients to travel, and maximizing the provision of health outreach and education programs. Therefore, this study will focus on older people's use of mobile health.

1.2 Research Problems

Mobile health technology is in its infancy in China and requires a user adoption process, especially considering that older users who have unique physical and psycho-physiological characteristics. There have been a few studies on health-related technology adoption for older adults in prior literature, and most of them have assumed that older people are homogeneous group who always lose confidence in the face of new technologies (Ellis & Allaire, 1999; Eisma et al., 2004). Specifically, these studies treat older people as passive consumers of new technologies and have focused on

exploring the barriers they encounter in using such technologies (e.g., Makai et al., 2014; Watkins & Xie, 2014). They are considered “non technological persons” with some extended stereotypes: the lack of ability of the hypothetical users to handle complex devices and their unwillingness to accept them (“older people reject technology”, “technological devices are too difficult for older people to use”) (Abascal and Civit, 2001).

Although many different mobile health solutions have been developed to address older users’ specific needs: advanced diagnostics, biosensors and vital signs measurement, electronic health records, home access to healthcare services, and assistive living services, few studies have specifically investigated their perception towards and behavioural intention to use such innovative technology. Older people, aged 55-75 years old living in an urban area with a better socio-economic status, is the main target of emerging mobile health solutions development as it generates a large share of service demand. Many of them become aware of the importance of daily health management and they are the real advocates and users of innovative and information technology-based health solutions (Goldberg et al., 2022). Compared with people aged over 75 years old, this group of older adults is not a passive consumer of mobile health services. They actively embrace new technologies and have diversified motivations to use them because they believe such technologies have the potential to help and support their autonomy and improve the quality of their life by encouraging them to maintain a healthy lifestyle (Grover, Kar, & Davies, 2018; Lobelo et al., 2016).

Additionally, previous studies investigate mobile health technology adoption and

usage primarily from the technological-orientated perspective, focusing mainly on functional drivers such as perceived usefulness and perceived ease of use. That is, most studies ask users when investigate user experience with digital technology, "whether you think the technology or the product is useful or easy to operate?" . Few studies have explored users' attitude towards and behavioural intention to use technology from the user-centred perspective, like, "what are your motivations for using the technology or product and what kind of satisfaction do you want to get from using it". The researcher suggested that older adults' acceptance and utilization of mobile health technology not only achieve tasks but also fulfill their inner needs. This is because digital technology-based services such as mobile health have mass media features; as a result, older adults use this technology with the goal of satisfying one or more specific inner needs. Successful technology adoption must generate users' involvement and participation (Harbidge & Catchpole, 1993). Similarly, successful mobile health services should be widely adopted with the active involvement of older users. Hence, it is essential to explore older users' behavioural intention to use mobile health technology for different reasons and purposes.

Furthermore, the aging process drives changes in cognition, perception, psychosocial functioning, and movement (Erber, 2010; Whitbourne, 2005). These changes may influence older people's needs and intention to use technology or technical devices. Although previous studies have investigated factors influencing older people's acceptance of technology, only a few studies considered age-related factors. Most studies measured age by referring to 'chronological age,' which is the number of years

or months since a person's birth. Notably, ageing occurs on multiple levels and is classified into five dimensions: chronological, biological, functional, psychological, and social (Erber, 2010; Quadagno, 2008). Therefore, the researcher believed age-specific constructs such as perceived physical condition (physical age), life course events (psycho-social age), perceived user resources, prior similar experience, and computer anxiety will reflect older people's technology usage behaviours. To the best of the researchers' knowledge, no study has incorporated older adults' age-specific characteristics when exploring their use and adoption of mobile health technology. To better predict mobile health technology usage behaviour among older users, it is essential to understand the age-related factors influencing the acceptance and usage of technology among Chinese elder people.

1.3 Research Objective and Approach

This research examined older adults' perceptions toward mobile health technologies and shed light on their diversified motivations to use them as older individuals seek instrumental and emotional gratifications from using mobile health services through digital and mobile devices. The technology acceptance model (TAM) has been widely used in explaining new technology adoption and usage. However, the TAM mainly emphasizes Technological-oriented factors such as perceived usefulness and perceived ease of use (Lee, 2007). These factors play a significant role in the required use of traditional technologies in organizational settings, such as spreadsheets or word processors, where personal preference or the affective experience may not be

important. However, decisions to utilize digital technology may be partly influenced by non-instrumental factors such as perceived enjoyment, cognitive absorption, perceived playfulness, and social influence, along with other related personal factors (e.g., Davis et al. 1992; Lee et al. 2007). As mobile health technology now possesses mass media features and are typically adopted in various settings, decisions about the use of mobile technology may involve diversified motivations. The critical and systematic review has revealed that TAM proposed by Davis overemphasizes the role played by technological-oriented motivations, which limits its applicability in those user contexts where the uptake and use of technology helps to complete tasks and meet emotional needs. This issue can be resolved by integrating Uses and gratifications theory (U&G theory) into TAM. The U&G theory is a mass communication theory that focuses on the needs, motives and gratifications of media users. The theory states that media consumers are not passive consumers of mass communications; rather, they play an active role in media consumption. Diverging from other media effect theories that question "what does media do to people?", U&G theory focuses on " what do people do with media?(Rubin, 1981; Ruggiero, 2000). U&G researchers have generally treated the audience as active participants who search, rank, use, and consume media for different reasons and purposes and in different ways. Modern audiences use media with the goal of satisfying one or more specific needs. Therefore, U&G theory was chosen purposefully to explore older users' diversified motivations in using mobile health technology.

Therefore, the researcher developed a technology adoption model for older adults by introducing certain modifications into the original Technology Acceptance Model

(TAM) and Uses and Gratifications Theory (U&G) as well as adding aging characteristic factors (see Figure 1). Two independent and interconnected studies (Study 1a&b and Study 2) were conducted using mixed-research methods and quantitative method respectively. Study 1 was a sequential exploratory mixed-method study, combing both qualitative (Study 1a) and quantitative analysis (Study 1b) to develop a reliable, empirically-based instrument to measure older adults' health-related motivations. Specifically, study 1a consisted of a qualitative stage that identified older users' motivations (that is, the initial items of instrument) through open coding. This stage yielded the findings from a qualitative content analysis of 20 in-depth interviews conducted with older Chinese mobile health users. Based on study 1a's findings, study 1b designed a questionnaire that includes all health-related motives identified from study 1a. The motivations were converted to questionnaire items that asked respondents to rate them on a five-point Likert scale. A self-reported online survey was completed by 433 older mobile health users. After obtaining a large amount of data, the researcher conducted exploratory factor analysis to determine underlying factors for a set of measured variables as well as evaluated the validity and reliability of the newly developed instrument. The final instrument was then created by averaging the ratings of all items representing the respective factors. After the identification of older users' motivations, study 2 conducted a quantitative analysis to test the predictive and explanatory power of the proposed research model; specifically, the quantitative phase examined how motivations and age-specific factors affected older mobile users' behavioural intention to use mobile health technology. An online self-reported

questionnaire was completed by 586 older users. A variance-based Partial Least Square (PLS) method was used to examine the quality of the structural model and the hypothesized relationship between independent variables and dependent variables.

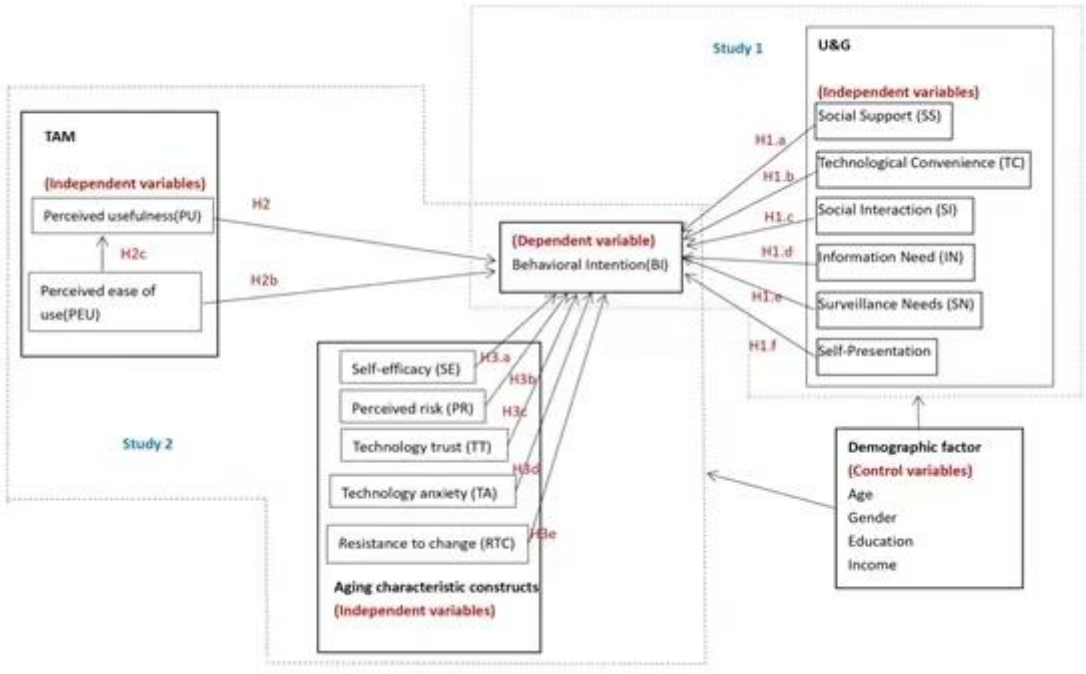

Figure 1. The Proposed Research Model

1.4 Research Questions/Hypothesis

The overarching research question for this study was how older adults' motivations impact their behavioural intention to use mobile health technology. Specific research questions and hypotheses were listed below：

RQ1. What are the motivations for the older adults to use mobile health technology?

RQ2. To what extent do older adults' motivations (i.e., social support, information need, surveillance need, social involvement, self-agency building and technology convenience) affect their behavioural intention to use mobile health

technology?

H1 a). Social support, b). information need, c) surveillance need, d) social involvement, e) self-presentation and f) technological convenience positively affect older adults' behavioural intention to use mobile health technology?

RQ3. To what extent do technological-oriented factors (i.e., perceived usefulness, perceived ease of use) affect their behavioural intention of mobile health technology?

H2 a). Perceived usefulness and b). perceived ease of use positively affects their behavioural intention to use mobile health services.

RQ4. To what extent do aging characteristic factors (i.e., technology trust, perceived risk, resistance to change, self-efficacy, and technology anxiety) affect older adults' behavioural intention to use mobile health technology?

H3 a). Self-efficacy and b). technology trust positively affects older adults' behavioural intention to use mobile health technology.

H3 c). Technology anxiety, d). resistance to change and e). perceived risk negatively affects older adults' behavioural intention to use mobile health technology.

1.5 Significance of the Study

Mobile health service is different from traditional health and medical services. When perceived as medical innovation, it aims to surpass geographical, time, and even organizational barriers and deliver medical services anytime and anywhere (Tachakra et al., 2003). These attributes enable mobile health technology to provide medical care services to a broader range of users at a relatively low medical care cost and a faster

speed. An aging population places a high-cost burden on healthcare systems. Researchers and implementers can deploy mobile health technology to bring about healthcare change and address some healthcare issues, such as healthcare access and delivery disparities and inequalities, prohibitive healthcare costs, geographic barriers, and shortages of healthcare providers. Also, mobile health technology can improve older people's quality of life and address the challenges they face in maintaining their independence (Park & Jayaraman, 2003). Therefore, understanding the intentions and behaviours of the elderly when engaging with mobile health will help to provide better services and reduce the financial burden on public health departments.

Older people are often stereotyped as being resistant to new technologies. Such misunderstanding may result in a "technology divide" that separates older adults from younger adults who use these technologies on a regular basis. Paradoxically, many surveys reported that mobile device adoption is growing at a faster rate in segments of older adults than use in other age groups (Parker et al., 2013; Meng et al., 2019). These trends draw attention to the need to develop a more nuanced understanding of the needs of older people and how mobile health can be effectively utilized to address their needs.

The findings of the current studies may contribute to both academia and industry. Future researchers may use the results of this study as the foundation for future research in this area, yielding a more profound and holistic understanding of older people's technology adoption behaviours. One suggestion is for mobile health technologies developers and m-health service providers to use the results of this study to create and develop services and technologies to better meet the needs of older users, with the

ultimate aim of increasing the adoption rate of mobile health technology amongst the elderly Chinese population.

1.6 Definition of Terms

The key terminology listed below was used throughout this current study. These definitions helped provide the proper context for their use. The key definitions include:

Information and Communication Technology (ICT) is a technology used to facilitate communications processes, including telecommunications, intelligent building management systems, broadcast media, transmission systems, audiovisual processing, and network-based monitoring and control functions (Zuppo, 2012).

Mobile Health (for present purposes) *Mobile Health* (for present purposes) refers to the health care-based mobile computing, medical sensors, and communications technologies. The three key components in mobile health are mobile devices, software platform (providing basic services such as networking and database), and m-health applications (Rebol and Menzel, 2004). In this study, the researcher defined mobile health as the applications regarding the provision of health care, prevention, diagnosis, treatment, and monitoring services via mobile devices. Mobile devices typically include personal digital assistants (PDAs), smart mobile phones, and tablet computers such as the iPad. Mobile phones are the prototype device within this space. Most healthcare services use a mobile phone platform. Additionally, older people use mobile phones far more often than other mobile devices. Thus, this study will focus on health-related technology that are mainly based on mobile phones used by the general older population. In other words, this current study attempted to explore how older adults experience

preventive services provided by healthcare apps and WeChat in their everyday lives.

Mobile health technology is the use of mobile and wireless technologies to facilitate the achievement of health objectives (Kay, Santos & Takane, 2011).

Mobile Health service is defined as the services relating to the provision of health care, and the administration of prevention, diagnosis, treatment, and monitoring services through the use of mobile devices (Deng, Mo & Liu, 2014).

Older people/older adults/ older users are the terms used in this study to refer to those aged 55-75 years old who live in urban areas and regularly use (or have used) mobile health services. Regarding a universal definition of older adults, the World Health Organisation (WHO) notes that most countries regard old age as 60 years and above (Ahmad et al., 20021). The present study's sample consists of individuals aged 55-75 years old as men and women retire in China at 60 and 55 years old, respectively. Additionally, most older adults who are active users of Internet or mobile technologies for social and information gathering purposes are over 55 years old with higher income and education levels (Teng & Joo, 2017). The age threshold was broadened in the present study to help gather accurate, valuable data to answer the research question.

Perceived Usefulness (PU) pertains to the subjective perception of users when they are of the mind that using certain technologies can bolster their performance in a given task or piece of work (Davis, 1986).

Perceived Ease of Use (PEOU) pertains to the degree to which a person believes that a particular method is free of effort (Davis, 1986).

Social Support (SS) is the support that older individuals derive through social

contact with other individuals, groups, and larger communities through the Internet or other mobile terminals.

Health Information Need (HIN) refers to an older individual's desire to find and access health-related information derive satisfy conscious or unconscious health-related gratifications.

Social Involvement (SI) pertains to how older individuals build and strengthen social capital and norms through the Internet and/or mobile terminals.

Technological Convenience (TC) refers to how older individuals can more easily access convenience in Health through the use of the Internet and mobile technology.

Self-expression (SE) is how older people actively present themselves in a manner that allows them to control or shape how others (the audience) perceive them. This involves expressing oneself and behaving in a way that creates the preferred impression.

Technology Trust (TT) refers to people's judgment or expectation that a given technology's helpfulness, reliability, and functionality will support them in their work and daily life (Mcknight et al., 2011).

Self-efficacy (SE) pertains to how an individual judges their ability to arrange and carry out the necessary courses of action to obtain designated types of performance (Bandura, 1986). In the present study, it refers to older people's beliefs about their ability to successfully carry out a specific task that involves the use of m-health technology.

Technology anxiety (TA) refers to the elicitation of a negative emotional response (e.g., fear or discomfort) that an individual experiences when they use or think

about using technology (Hasan & Ahmed, 2010).

Resistance to change (RTC) denotes reticence to adapt to novel circumstances or new ways of doing things. It can manifest with individuals, in relationships, or within organizations. Whilst there are many reasons for resistance, its essence is the fear of the unknown (Aglin, 2003).

Behavioural Intention (BI) refers to the inclination of a user to adapt and continue to use a specific technology (Venkatesh et al.,2003; Venkatesh et al., 2012). Behavioural intention is used in most technology adoption models to determine if a user will adopt and use the technology. In the current study, the researcher conducts empirical studies on the factors that affect older users' adoption of mobile health technology. Mobile health technology is relatively new and is still tentative in most parts of China; hence, we use behavioural intention instead of actual usage as the dependent variable in this study. One thing that needs to be explained here is that the readers may note that study 1a focused on older participants who have used mobile health technology and explored their user experience in the interviews. Those who have not used mobile health technology may have difficulty answering the relevant questions. In study 1b, the inclusion criteria of participants included older adults who had used mobile health technology. As study 1b was designed to identify the type of health-related motivations from a large range of data, older adults who had used mobile health services would have provided more accurate responses than those with no relevant experience. In study 2, older adults who have never used mobile health technology are recruited to fill out self-reported questionnaires. That is because the ultimate research objective was to measure

the behavioural intention of those who have never used this advanced technology.

1.7 Summary

The present study intended to develop and test a model that can be used to explain the motivational factors influencing older Chinese adults' intention to use mobile health technology. To do so, it deploys the Technology Acceptance Model (TAM), Uses and Gratifications theory (U&G), and age-specific constructs derived from gerontological and sociological theories. This chapter put forward a broad overview of the background information on mobile health technology and its application in older populations. Next, the chapter outlined the research problem and proposed the main research question and related hypotheses. In addition, the significance of this study was also analysed in this chapter. This chapter also provide the key terminologies used in this dissertation. Previous studies in mobile health adoption were discussed. The results showed these studies focused mainly on older people aged above 75 years old who were likely to be passive users of mobile health technology. Few studies have focused on older people aged 55-65 years, who are the real champions and users of new, innovative, and information technology-based solutions, which created the need for this study.

The findings of the current studies may have value and significance for both academia and industry. Future researchers may use the outcome of this study as the basis for further research. Additionally, academic researchers and health professionals can use this research to derive a deeper, more holistic understanding of older people's technology adoption behaviours. Moreover, mobile health services providers can use

the present study's results to design and develop processes and technologies that can better attend to older users' requirements, with the ultimate aim of increasing the adoption rates of mobile health technology amongst the older Chinese population. The following chapter conducts a thorough literature review of the factors influencing technology adoption and identifies the research gaps in the existing literature. This includes exploring both current and historical issues in mobile health adoption and reviewing technology adoption models and age-specific constructs.

Chapter 2 Literature Review

This chapter aims to critically analyse the existing literature that focuses on several aspects related to the research topic, including the definition of mobile health technology, its development in the health domains, and a detailed review of mobile health services in China. In the theoretical framework section, technology-related models and age-related factors have been reviewed. This chapter helps the researcher explore the already available information related to the research topic and identify various new research gaps for the current research study.

2.1 Introduction

This study explores the health-related and extrinsic motivations that influence the adoption of mobile health technology by older Chinese people in their daily lives. To examine the motivational factors that influence their behavioural intentions, the researcher aims to develop a research model by drawing on existing literature in information systems, communication and media effects, sociology and psychology. This interdisciplinary approach provides perspectives from different research disciplines that can complement each other in developing a synergistic framework to study people's intentions to use mobile health technology. This chapter presents a comprehensive review of the literature under the specific themes of the theoretical and research literature. First, the literature on mobile health is reviewed. Then the literature on the theories of technology adoption is reviewed. However, as a widely adopted theory of technology processing, TAM over emphasises the role played by extrinsic motivations, such as perceived usefulness and ease of use (Lee et al. 2007; Moon & Kim 2001; Roca

& Gagné, 2008; Shang et al. 2005), at the expense of health-related motivations that also have an impact on people's technology adoption. As health-related motivation is not addressed in TAM, and this limits its applicability in those user contexts where technology uptake and utilisation contribute to task completion and satisfaction of emotional demands. The researcher integrated U&G theory into the TAM model. As mobile health technology now possesses mass media features and is often adopted in different contexts, decisions regarding the use of mobile technology may involve diverse health-related motivations. U&G theory, therefore, provides a theoretical basis for incorporating these health-related aspects into TAM. In addition, it is crucial to consider the age-specific characteristics and issues that older users may encounter when understanding their use of mobile health technology. This chapter reviews all the theories and frameworks of the research topic and summarizes what is known and what is unknown about the topic. The researcher then developed a Technology Acceptance Model for older adults by making some modifications to the original Technology Acceptance Model (TAM) and the Theory of Use and Gratification (U&G) model and adding some age-related factors from gerontological research. Accordingly, the research questions and hypotheses are presented in the summary section.

2.2 Mobile Health (mHealth): Definitions

The extensive use of the Internet and mobile technology has produced new technological forms relevant to almost every area of human existence, one of which is medical care (Van De Belt et al., 2010). Information and Communication Technologies (ICT) growth continues to improve healthcare delivery through powerful computer

processing, fast connectivity, and ample storage (Van De Belt et al., 2010). Modern medical systems use this new technology extensively (Mariani & Fernandes, 2012). Bashshur et al. (2011) identified the four main ICT health domains: telemedicine, telehealth, e-health, and m-health. e-Health was introduced in the 1990s by the business and commercial communities due to the rise of the Internet and electronic data systems. E-Health is an emerging field in the intersection of medical informatics, public health, and business, referring to health services and information delivered or enhanced through the Internet and related technologies. (Oh et al., 2005). Scholars saw eHealth are software that empowers and promotes the health and wellbeing of individuals, families and communities (Liu et al., 2011; Bashshur et al.,2011; Oh et al., 2005). It also enhances professional practice through information management and information communication technology (ICT) (Liu et al., 2011).

The great development of wireless technologies and digital communication tools (e.g., mobile phones and various emerging mobile applications) has overcome the geographical and time barriers between healthcare providers and patients, highly facilitating the development of e-health (Deng, 2013). In this context, the term mobile health (also often written as m-health) has emerged as an essential subset of e-health applications for a growing number of e-health functionalities have been made available on mobile platforms (Mechael, 2009). By 2022, the current number of smartphone users globally is 6.648 billion, meaning 83.72% of the world's population owns a smartphone. China, India, and the United States have the highest smartphone penetration rates (Statista, 2021). Modern people live in the age of electronic gadgets and smartphones,

and communication has never been more accessible; Through social media, no matter where people are, they can always keep in touch with friends and family and millions of others. All we need is mobile devices with internet access. The development of mobile technology and the growing awareness of issues concerning health and 'well-being' contribute to the global expansion of mobile health technology. As smartphones and various other portable devices become deeply ingrained in daily routines and practices, individuals are better able to respond to emergencies, consult health care providers about health issues when they manifest, and access health services, such as remote patient monitoring, online medical consultation, self-health management, that are increasingly being delivered through mobile phone-based systems.

e-Health refers to "health services and information delivered or enhanced through the internet and related technologies" (Oh et al, 2005， p. 4).In a broader sense, this term not only describes the technological medical development, but also "a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology." (Eysenbach, 2001, p. 833). m-Health has become an essential branch of e-health application as a rising number of e-health functions have been made accessible on mobile platforms (Mechael, 2009). "Mobile Health (mHealth)", represents "the evolution of e-health systems from traditional desktop 'telemedicine' platforms to wireless and mobile configurations" (Xiao & Chen, 2008, p. 298). There have been numerous efforts to create a comprehensive definition for this emerging term. The term "mobile health" was first coined in 2003 by Tachakra and Istepanian, who

argued that mobile health can be defined as “emerging mobile communications and network technologies for healthcare”. The Global Observatory for eHealth (GOe) defined mobile health as “medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices. mobile health involves the use and capitalization on a mobile phone’s core utility of voice and short messaging service (SMS) as well as more complex functionalities and applications including general packet radio service (GPRS), third and fourth generation mobile telecommunications (3G and 4G systems), global positioning system (GPS), and Bluetooth technology” (World Health Organization, 2011, p.5). Similarly, Heerden, Tomlinson and Swartz (2012) have defined “mobile health” as “medical and public health practice supported by mobile devices, ranging from the use of mobile phones to improve point of service data collection, care delivery, and patient communication to the use of alternative wireless devices for real-time medication monitoring and adherence support” (p. 393). The three key components in m-health are mobile devices, software platform (providing basic services such as networking and database), and m-health applications (Mechael, 2009). As this study focuses exclusively on mobile health technology and solutions used by older adult users, for present purposes, mobile health is defined as technology or services that relate to the provision of health care, or function to provide prevention, diagnosis, treatment, and monitoring services through mobile devices. Specifically, mobile devices typically include smart mobile phones, personal digital assistants (PDAs), and tablet computers (i.e., Apple’s iPad), with mobile phones assuming the role

of the prototype device within this area. At present, most healthcare services have adopted a mobile phone platform. The most common functionality is using mobile devices to inform users about pre-emptive healthcare services, disease management, epidemic outbreak tracking, treatment access, and long-term chronic disease management.

2.3 Previous Studies on Mobile Health Acceptance and Adoption

Given that mobile health may be an effective solution for a variety of health needs (Plaza et al., 2011), it has been an increasingly prominent area of study in recent years. A great deal of studies have explored the general characteristics of smartphones, with a focus on their functional aspects (e.g., Bender et al.,2013; West et al., 2013; Brannon & Cushing, 2015). They mainly adopted content analysis to scrutinize specific functionalities of mobile health apps in details. For example, Yasini & Marchand (2015) has grouped the mobile health apps into five categories: communicating or sharing the information, educational tools, managing professional activities, consulting medical information reference, and self-health management. Abraham and Michie (2005) outlined the primary purposes of mobile health applications as information provision, goal setting, reminders, feedback, or monitoring and education/training. According to Ahmed et al. (2018), medication adherence apps give pharmacy information, health metric monitoring, medical history recording, and appointment reminders for medical diagnosis. Crane et al., (2015) assess the popular alcohol-reduction apps available in UK's apps store (mainly iTunes and Google) and discovered that the majority of apps included the following features: self-recording, providing information on alcohol abuse

consequences, and offering options for additional and later support. This series of research has, in general, provided valuable taxonomical tools for summarizing the numerous mobile health devices into a manageable number of categories. The most common functions are communication, providing health-related information, medical decision support, health education, and health status monitoring and tracking. These categories also indicated the primary purpose of using mobile health in practice. In addition to classifying functions, another group of studies have further evaluated mobile health devices' functions (e.g., Free et al., 2013; Sama et al., 2014; West, 2013; Brannon & Cushing, 2015; Schnall et al., 2016; McCurdie, 2012). Specifically, these studies have evaluated the design-oriented user interfaces of mobile health devices according to behavior change theories from the perspective of human-computer interaction. For instance, a study by West et al. (2013) found that most diet management apps' content was not guided by health behavior theory in terms of their design and user interface. They provided just general information and assistance so that they failed to provide useful services to users. Guo et al. (2017) developed a novel scoring instrument for evaluating the content of health and fitness apps and used it to analyse twenty-eight apps. The results revealed that the overall quality scores of these apps are low and fails to provide professional guidance for people. Also, Mao et al. (2018) studied the user interface of fitness apps and found that most mobile health systems of fitness apps lack theories to guide the design. They further proposed some theories-based design principles to improve these apps. In sum, these two groups of studies have helped to explain the functional aspects of mobile health devices. However, they do have the main

limitations. Such studies rarely analyse how people feel about the latest technology or how they behave when they use it. More research is needed to explore the behavioural, perceptual and emotional aspects of users' use of mobile health devices.

Therefore, research moved from an evaluation of the technology itself to an assessment of its impacts on users' health behaviour change and health outcomes. Some scholars have examined the efficiency of mobile health technology for addressing health-related needs and purposes such as diabetes, asthma, obesity, smoking cessation, stress management and depression treatment (e.g., Luxton et al., 2011; Årsand et al., 2012; Buis et al.,2013; Donker et al.,2013; Silveira, 2013; Juarascio, 2015; Oh et al., 2015; Jaensson et al., 2015; Firth et al., 2016). Methodologically, they often use an experimental approach: letting participants try out the mobile health technology and review their experiences. For example, in order to examine the mobile health platform and its influence on the health behavior change of patients with chronic diseases, Ghose et al. (2021) designed and implemented a randomized field experiment. The main findings showed that patients who used mobile health apps exercised at a higher level every day, ate healthier and low-calorie foods, walked more and slept longer than those in the control group (e.g., subjects who did not use mobile health apps). Heffner et al. (2020) evaluated the core content of mobile health program for adult smokers who are hesitant to quit smoking. The results show that increasing the action-oriented treatment (self-help and free nicotine replacement therapy, smoking cessation hotline referral) can further support users' efforts to quit smoking and keep quitting smoking.

The main findings from the above studies have helped to develop a better

understanding of users' experience towards mobile health technology. Although these studies can provide meaningful guidelines for developing technologically and functionally efficient mobile health devices, these studies only looked at people's evaluation of the functionality of mobile health devices and ignored their motivation of using this emerging technology. To fill the research gap, other researchers have dug further into the psychological mechanism that may determines users' acceptance and adoption behaviours by applying technology adoption and motivation theories including the theory of reasoned action (Ajzen, Albarracin & Hornik, 2007; Godin & Kok, 1996), self-determination theory (Choi, Noh & Park, 2014), the technology acceptance model (Briz-Ponce, L., & García-Peñalvo, 2015) and theory of diffusion of innovation (Cho et al., 2015; Hoque & Sorwar, 2016). Methodologically, this group of studies adopted quantitative research and have exploited various constructs influencing people's technology adoption behavior. For example, applying the technology acceptance model (TAM), Cho et al. (2014) have studied the impact of health-related perceptions such as health awareness and e-health literacy on people's adoption of health apps. Based on the expectation confirmation model of information system continuance, Sun et al., (2013) employed a unified model of health technology acceptance to investigate the Chinese college students' intention to use mobile health services, the results showed that users' intention is determined by five key factors: performance expectancy, effort expectancy, social influence, facilitating conditions, and threat appraisals. These studies may help health professionals and mobile health services providers find better ways to encourage people to adopt mobile health

technologies for a variety of health and fitness purposes. However, these studies mostly explore people's motivations from the technical perspective which are extrinsic motivations, that is motivations in terms of uses of the technology (Venkatesh, 2000), and the health-related motivations for using a technology have not been well studied.

Thus, previous research have explored mobile health technology mainly concerning the functionalities of mobile health devices and users' preference and evaluation toward devices, as well as their motivations to acceptant and adopt mobile health technology. A critical review of previous literature has revealed that most existing studies exclusively focus on extrinsic motivations, that is, the decision to use mobile health technology is determined on a rational calculation of the benefits (e.g., Brown & Venkatesh, 2005, Saeed & Sinnappan,2009; Wakefield & Whitten, 2006). Venkatesh, a famous scholar who studies technology acceptance model, suggested that the decision to use mobile health technology may also be partly determined by health-related motivations. The motivations from people's hearts are not limited to the pleasure brought by technology. These motives may be varied. Those studies ignored that the health-related motivation refers to the fact of doing an activity for its own sake: the activity itself is interesting, engaging, or in some way satisfying.

2.4 Mobile Health Services in China

Mobile health service is different from traditional health and medical services. When perceived as a medical innovation, it aims to surpass geographical, time and even organizational barriers and deliver medical services anytime and anywhere (Tachakra et al., 2003). These attributes enable mobile health technology to provide medical care

services to a wider range of users at a relatively low medical care cost and at a faster speed. In April 2009, China launched a new medical system reform and plans to achieve the goal of equal access to medical care and guaranteed basic medical and health services among Chinese population by 2020 (Yip et al., 2019). A deficient and unbalanced distribution of health resources was regarded as one of the biggest problems facing China's medical and health system (Zhu, Hsieh & Zhang, 2018). From 2009 to 2011, the government focused on increasing financial investment in the health sector to expand insurance coverage and expand the medical infrastructure. During this period, various policies were promulgated to promote the equality of distribution of health and medical resources, such as the patient referral policy, a national health insurance plan, a medical alliance policy and a zero-price increase policy for drugs. In October 2016, the Chinese government launched "Healthy China 2030" (HC China 2030), setting goals for enhancing the capacity of the health service, for enabling everyone to access high-quality health resources and for distributing health and medical resources in a balanced way among rural and urban areas, enlarging the scale of the mobile health industry, and perfect the mobile health service system. Mobile technology was considered as one of the effective measures to solve uneven distribution of health resources. Another key element of HC 2030 is the use of China's strong telecommunications infrastructure to assist the national medical reform initiatives to provide more people with equal access to basic health care, such as digital hospitalisation, electronic medical records, and next-generation information networks. Thus, it was necessary to realise a virtual medical service and overcome the service gap

between rich and poor areas in order to greatly improve the quality of medical services.

As of December 2021, the number of smart phone users in China has reached about 1.06 billion. The rapid popularization of smart phones users in China has also laid a foundation for the development and growth of specialized mobile apps such as mobile health and medical apps. Mobile health technology has been successful in western countries. However, they are still in the primary stage of development in China. As mentioned above, mobile health service has just emerged in China, which has created great potential for providing medical and health care services for people of all ages.

China's mobile health enterprises provide a variety of mobile health services. The functionalities of these apps can be divided into the following categories: online health and medical consultation; patient engagement and support; online registration; self-health monitor and chronic management; lifestyle and wellness; fitness and dieting (Hsu et al., 2016). For example, the Ping An Good Doctor app developed by Ping An Healthcare and Technology Company Limited in 2005 provides a variety of medical and health services, such as pre-set up appointment, online medical diagnosis, online drug purchase and other online medical services. It recently launched a special service for diabetics which combines the five stages of diabetes control, including diabetes self-examination, diabetes education, diet therapy, diabetes exercise therapy and diabetes medication. It also offers a new platform focusing on doctor-patient communication where diabetics patients can upload their data and doctors can access the data in real time and provide time to time online diagnosis. The Jasmine App is a mobile health management platform based on the family circle. By monitoring and analysing the

health information of family members, it can provide every family member with a customised and tailored health management plan. The Healthy Road app is a mobile application platform launched by Healthy Road (China) Information Technology Co., Ltd., in 2018, which provides health and medical services for patients, doctors, medical institutions and other health organizations. It can provide patients with services such as health consultation, health management, chronic disease management, electronic health records, health education, and doctor-patient communication. It is also a medical assistant platform for health experts and professionals. It provides reliable data to supplement the working knowledge of physicians, the latest medical information, including drug information, pill identification, formularies, provider directories, clinical tables, medical calculators, and important medical news alerts. Epocrates Essentials offers additional access to advanced information and databases on disease, infectious disease, and diagnostics. These lab tests, panels, and disease references save time and aid in medical work. Chunyu Pocket Doctor, developed by Beijing Chunyu Software Co., Ltd., allows users to check symptoms or consult professional doctors for free, and allows professionals to communicate with patients.

With the popularity and use of mobile phones among the general population in China, the Chinese government, telecom companies, Internet technology companies and health care providers are working together to make use of domestic and foreign expertise and innovative technologies to study mobile technology as a means to improve quality of medical care services, reduce drug prices, manage and obtain various health care services. In addition, recent research reports show that Chinese patients are willing

to add mobile health interventions to enhance or even replace their traditional medical care practices.

In addition to healthcare apps, there is a special mobile platform, which is also widely used by people for health-related activities. Here, researchers will introduce WeChat and its health-related functions in detail. WeChat, owned by the Chinese tech company Tencent, is an "all-in-one" application that enables users to send messages, make video or voice calls, and post diverse content (i.e., text, pictures, and videos) through Moment feeds or exclusively to a single WeChat friend or a WeChat group. Today, WeChat has evolved beyond these basic functions, allowing users to complete a wide array of daily tasks: looking for apartments, buying tickets, transferring money, paying utility bills, or even getting access to third-party services through embedded mini-programs on one platform simultaneously. As of 2017, WeChat possessed 1.04 billion active users in over 200 countries, with half of the users using WeChat for up to 90 min per day (Wechat Team, 2016). Now, it has turned to a new area: healthcare management. During the past 10 years, WeChat has become "the biggest online healthcare destination in China" (Guangming Daily, 2018), offering a wide array of online health services to facilitate users' health management, such as health education, health products, online medical diagnosis, as well as health insurance. As of 2019, 38,000 healthcare organizations and companies had opened official public accounts, publishing 500,000 health-related articles in 2020 (Sun et al., 2020), helping users better manage their health and cope with disease in their daily life. WeChat offers online medical diagnosis and telehealth through mini-programs. Users can schedule an online

appointment with doctors for free and identify the appropriate hospital and doctor with the help of a medical virtual assistant on a mini-program. WeChat is now working with public hospitals to simplify operations by moving the process of hospital navigation, checking medical reports, and medical payment all onto WeChat. Moreover, WeChat launched their own healthcare knowledge platform, Tencent Medical Knowledge bank, providing user-directed health and medical education. It also offers group-buying options through a mini-program, allowing users from groups to access volume discounts and buy healthcare products in bulk. Recently, commercial health insurance services were added to the WeChat digital tool belt, allowing users to purchase insurance with a low minimum commitment. Among all the medical and health services provided by WeChat, reading the health-related articles released by the WeChat official account is the most common health activity of WeChat users (Zhang & Jung, 2019). A recent national survey found that over 98% of smartphone users seek health information on WeChat, and one third of them read health education articles regularly offered by public official accounts (Sun et al., 2020). It seems that WeChat has successfully triggered health behaviours among the general public from disseminating healthcare information to assisting in self-health management. In addition, WeChat's unique interactive functions, such as like, share and comment, allow users to seek and share health information and generate health-related content to express their own health experiences and opinions on different health issues. These interactive functions of WeChat constitute an "information-rich environment", making WeChat a popular health platform (Chan et al., 2012).

The researcher conducted a systematic review to characterize current mobile health services in China and identified gaps in the research on mobile health development in China context. The current research focuses exclusively on evaluating the efficiency of mobile health interventions, and most of them use the exploratory research method (e.g., Guan, Wei & Meng, 2010; Chen et al., 2010; Corpman, 2013). For example, Guan, Wei and Meng (2010) used the remote mobile urination diary monitoring system to study the urination of healthy young people. Twenty healthy participants aged 18-23 years old were tested, collecting their urination information through the mobile health diary monitoring system. Urination information is sent through Bluetooth from the collector to the patient's smartphone, then directly stored by mobile health apps and wirelessly transmitted to the workstation of the hospital. The results show that the remote mobile urination diary monitoring system can help healthy young people obtain objective urination information and encourage them to drink more water. As another example, Chen et al. (2010) conducted a pilot study to test whether daily mental health monitoring and intervention through smartphone MMS would be acceptable and feasible to improve the psychological wellbeing of suicide attempters in China. Twenty patients participated in a six-month one-on-one telephone interview. The results indicated that most participants considered MMS contacts an acceptable and helpful method to help the suicide attempters recover psychologically and are willing to continue to receive it.

In the existing literature, there are relatively few studies quantitatively evaluating the efficiency of mobile health interventions. Of those studies that have been

conducted, some adopted a randomized controlled trials design (e.g., Lin et al., 2014; Deng et al., 2015; Liu et al., 2015; Tian et al., 2015), whilst the remainder used a quasi-experimental study design (e.g., Lv et al., 2012; Wang et al., 2014; Ma et al., 2009). Among these studies, the mobile health applications largely pertained to health education and health behavior change. For example, Liu et al., (2015) evaluated the effectiveness of a lifestyle intervention delivered through the study subjects' mobile phones in reducing the broader CVD risk amongst Chinese patients. Through a randomized group design, participants were randomly assigned either to receive the mobile phone-based lifestyle interventions or the care they typically received, with the former reducing the general CVD risk among patients more effectively than the latter. Shi et al., (2013) evaluated the effectiveness of a mobile phone text-messaging-based smoking cessation intervention package among Chinese adolescent smokers. Participants in the intervention group were given tailored information via mobile phone for 12 weeks. Compared with those who have not received information, attitudes towards the disadvantages of smoking were significantly improved, and the level of nicotine dependence and cigarette dependence significantly decreased in the intervention group. The study results indicate that interactive, tailored assistance administered through text messages was effective in assisting Chinese adolescent smokers to alter their smoking behaviours. Chai et al., (2013) utilized a single-blinded, randomized-controlled method to evaluate the effectiveness of using SMSs to improve 2009 H1N1 knowledge, attitudes, behaviours, and self-reported outcomes, as well as looking into the acceptability of SMS in the community. The results indicated that SMS

could be deployed to the self-reported adoption of short-term behaviours (i.e., vaccinations), that have long-term prevention and control impacts on public health. These findings are evidence that SMS can be used to provide knowledge and inform individuals about infection control and prevention measures, and ultimately improve self-reported health outcomes.

In short, such examples and others indicated that mobile health technology has great potential to provide people with more convenient and better medical and healthcare services. It can also improve or maintain people's health status and quality of life. In particular, it can promote the development of a healthy environment in a populous country like China. Based on the above review content, the researcher believes that the application of mobile health technology in China needs to be further popularised. This is because China's medical and health system is facing great challenges, such as lack of medical resources and uneven distribution of health and medical resources. Many distinct and innovative features of mobile health technology make it possible to overcome some of these challenges. In the current study, the researcher chose WeChat and healthcare apps mainly because they are the most frequently used mobile health platforms in China, and of course they are the most widely accepted mobile health platforms by the general older population in China.

2.5 Previous Research on Mobile Health Technology Used by Older People

Smartphones are no longer exclusive to young people, but also indispensable to the older generation. The global population is ageing exponentially. The health

challenge related to this social change is the increasing prevalence of non-communicable diseases among the elderly people. Under the context, the distinct attributes of mobile health technology make self-health management and self-care intervention possible among the older population, thus mobile health technology becomes a promising tool to promote healthy ageing.

Recent research on gerontology has proved that mobile health technology benefits the elderly in terms of promoting their health behaviour changes and improving medication compliance and adherence. Also, it is found that mobile health technology can be used as an intervention tool to prevent age-related diseases and it is effective for the management of cardiovascular diseases and diabetes. For example, by conducting randomised trials, Piette et al. (2015) examined whether mobile health tools can improve management related to cardiovascular diseases and the results showed that mobile health interventions such as interactive voice response and short message service interventions can improve cardiovascular preventive care by addressing risk factors including weight, smoking, and physical activity.

The ageing problem has become a continuous challenge for China in recent years. According to Seventh National Population Census (National Bureau of Statistics of China, 2021), China's population aged 60 years old and above is 264.02 million, accounting for 18.70% of the total population, an increase of 5.44% compared with ten years ago. Fuxian Yi, a researcher at the University of Wisconsin-Madison, made a more pessimistic prediction. He argued that with the economic development, China's fertility rate will decline like Europe or Singapore's. Coupled with the long-term family

planning, the rate of population decline in China will be cliff-like, so the aging crisis will be more serious (Spoon, 2017). David Du Dawei, a senior researcher in China's economy at Brookings in the United States, also argued that that population trends will have a great impact on future development. Coinciding with population decline, the number of people over 65 will increase sharply, with those over 85 years growing even faster. Therefore, by 2049, the number of elderly people in China will exceed that of the United States and the European Union combined. Thus, such long-term population decline combined with an increasingly ageing population will place a serious burden on health care (China Daily, 2019).

As a special group in this society, the elderly face mobility difficulties, many chronic diseases and medical difficulties. Additionally, there is a significant mismatch between where elderly groups are distributed and the medical resources available to them. According to statistics published by China's Ministry of Health as of 2015, 30% of China's urban population had access to 70% of the total health resources, whilst 80% of public health resources were located in the country's larger hospitals. This is problematic, as the elderly population of villages in towns is larger than the elderly population in urban areas. In this environment, it is difficult to meet the needs of the elderly for hospital examination and comprehensive treatment. Thus, due to the ageing population and limited or inequitably distributed medical resources, mobile medical technology, as an effective solution, is encouraged by many health departments (Jian et al., 2022).

Previous technology adoption studies have focused on young people, who are

the main users of innovative technology, while the elderly, even though an important part of modern society, are lagging behind. So far, their needs and preferences for mobile technology have received little attention from practitioners and academic researchers. Older people over 60 years old were born, grew up, and have lived and experienced their adult life under different social and economic conditions from young people. When they slowly enter their twilight years, they are increasingly surrounded by subversive scientific and technological innovations. During their lifetime, they witnessed great technological and social changes and experienced many health problems in their old age, from hearing loss and high blood pressure to Alzheimer's disease and Parkinson's disease and other neurodegenerative diseases. Although the world is becoming more and more digitalised and mobilized and innovative technology can help solve many health-related problems the elderly lags behind in using technology-based innovations, especially mobile technology, mobile health and health care applications (Deng et al., 2015). Thus, having detailed insight into the factors influencing their decisions to adopt and use mobile health technology is of the utmost importance to academic research that can then hopefully provide useful recommendations for progress and improvement in this specific area of health care.

There are several studies in the literature on topics ranging from mobile health, the adoption of technology, technology healthcare interventions, and the use of mobile health services amongst younger individuals. Even so, few researchers have explicitly investigated older people to derive insights into the considerations that influence their decisions relating to the adoption of mobile health services. It should be noted that most

of the existing studies only look at this age group in relation to the barriers they face in adopting related emerging technologies. Many of them are more at risk of falls and related injuries as well as other age-related disorders such as arthritis, heart disease and dementia. Two specific barriers to the uptake of technology have been noted in the existing research: personal-related barriers and technical-related barriers (Kuerbis et al., 2017). Methodologically, most of the studies have adopted a quantitative approach. For instance, by conducting cross-sectional surveys, a number of academics concluded that digital media literacy and knowledge affect older adults' engagement with technology (e.g., LeRouge et al., 2014; Chen & Chan, 2013; Erbes et al., 2014; Zhou, Rau & Salvendy, 2014). Czaja et al. (2008) observed that individuals over the age of 65 possessed a more limited range of computer skills and were less effectively able to use computers than younger adults, which contributes to their reduced use of or intention to use computer technology. LeRouge et al. (2014) investigated the factors facilitating older adults' use of technology for health purposes, concluding that older adults with better digital mobile health technology were more inclined to utilize smartphones and podcasts to achieve their health care aims. Chen and Chan (2011) examined the factors which influence the acceptance of geotechnology by older Hong Kong Chinese. Their results indicated that a range of factors was more decisive than perceived benefits for predicting geotechnology usage behavior of older Hong Kong Chinese, including personal attributes like technology self-efficacy, technology anxiety, IT-related knowledge, and facilitating conditions. Studies further pointed out that older adult users have often experienced great hardship in accepting and adopting mobile health devices

as they lack training in mobile health services. Besides, cognitive decline and change may impact older users' facility to engage with mobile health services as these abilities have declined with age. The elderly may find it challenging to navigate complicated web pages or systems, solve problems in new usage situations and filter extraneous information (Pak, Price & Thatcher, 2009; Chevalier, Dommes & Martins, 2013, Juvina & Taatgen, 2009).

Moreover, mental and physical health influence older people's motivation to engage in mobile health technology. Some experimental studies found that older users with more chronic diseases and depression tend not to use the internet and smartphones or only very partially (Choi & DiNitto, 2013, Elliot, 2014). In general, older adults tend to be more risk averse than younger individuals, slowing down or even abandoning the use of a technology altogether if they make an error. As a result, they are less inclined to trial new methods when their existing ones still work. Alternatively, they may resign themselves to using their existing methods as they do not wish to be a burden on those around them by asking for assistance or instruction (Deng, Mo & Liu, 2014).

Technical-related barriers have been identified by many scholars (Kuerbis et al., 2017). The elderly have always reported they have experienced the fear of using unfamiliar functions of mobile health devices such as small and crammed buttons, complicated operating systems, and ambiguous links (Barnard et al., 2013; Kang-Yi et al., 2010). These characteristics of mobile health devices are particularly disorienting for older adults struggling with cognitive and motor coordination changes (Kurniawan, 2007; Hughes, Done & Young, 2011; Kurniawan et al., 2006; Brajnik, Yesilada &

Harper, 2011). In several mobile health studies, many elderly participants reported a preference for a user manual, much like the detailed instructions that are typically provided with hardware. It is also significant that they tend to prefer hardware buttons and do not immediately take notice of new information or information changes when presented to them onscreen (Kuerbis et al., 2017). The results of previous studies undoubtedly reflect some older adults' perspectives on and adoption behaviours towards mobile health interventions. Even so, the applicability of these results is limited as the study population was elderly individuals with impairments or chronic diseases, which presumably impacted their use of mobile health technology. On this basis, there is a need for studies investigating the perspectives of active, healthy older users.

2.6 Research Gaps in the Literature

From the systematic review of previous literature, some research gaps were identified. Firstly, previous studies focused on barriers to adopting innovative technology among older people. Previous research has always assumed that older people are a homogeneous regarding technology use and adoption (Ellis & Allaire, 1999; Syme & Eisma, 2004). Specifically, these studies treat older people as passive consumers of new technologies. Their study population is usually those over 75 years old who are more at risk of falls, related injuries, and other age-related disorders such as arthritis, heart disease and dementia. These older adults often have to use mobile devices because they need remote care and comply with medical advice. To the best of the researcher's knowledge, few studies have specifically investigated older people aged 55-75 years living in an urban area with a better socio-economic who are aware of the

importance of daily health management. They require extensive health services, training and reinforcement for health education, and constant connection to clinicians and health professionals. For them, being able to continue independent living is a critical issue. Compared with people aged over 75 years old, this group of older adults is not a passive consumer of mobile health services. They actively embrace new technologies and have a solid motivation to use them because mobile health technology has the potential to help and support their autonomy and improve the quality of their life by encouraging them to maintain a healthy lifestyle.

Secondly, the existing studies in this area primarily look into mobile health technology adoption and usage from the instrumental perspective, with a specific focus on functional motivational drivers, including perceived ease of use and perceived usefulness. The researcher believed that motivators grounded on social influence and feelings also play an essential role in explaining users' acceptance and utilization of mobile health technologies. Against this backdrop, as their life expectancies increase, the lifestyles, potential, and expectations of older people are changing. The researcher believed that older adults' acceptance and use of mobile health technology is not only to achieve tasks but also to fulfill their inner needs. The rationale here is that digital technology-based services such as mobile health possess mass media features, meaning that older adults' decision-making may involve diversified health-related motivations. Catchpole (1993) posited that for technology adoption to be successful, it must induce users to become involved, active participants. In much the same way, mobile health services can only be considered effective if they are also widely adopted by older users.

Hence, it is essential to explore older users' diverse motivations when they engage in mobile health services

Thirdly, the general process of ageing cause changes in cognition, perception, movement, and psychosocial functioning (Erber, 2012; Whitbourne, 2005). Such changes may impact elderly individuals' needs or their intention to adopt a given technology or technical devices. As noted above, whilst some of the existing studies have explored the factors influencing older people's acceptance of technology, very few have specifically addressed them in great detail. In most studies, 'age' was measured by referencing the study subject's 'chronological age', namely, the period (typically years) that has elapsed since their birth. Ageing occurs on many levels and can be categorized on five dimensions: chronological, biological, functional, psychological, and social (Erber, 2012; Quadagno, 2008). A variety of age-specific constructs reflect older people's usage behaviours, including but not limited to a perceived physical condition (physical age), life course events (psycho-social age), prior similar experience, and computer anxiety. There has yet to be a study that incorporates the age-specific characteristics of older adults when exploring their use and adoption of mobile technology. To make better predictions of mobile health technology usage behavior, it is necessary to more fully comprehend the age-related factors that mediate the acceptance and usage of technology by elderly Chinese people.

2.7 Summary

The researcher first reviewed the diversified definitions of mobile health and proposed a definition appropriate to the context of the current study. Mobile health was

defined in this current study as the technology or services regarding the provision of health care, prevention, diagnosis, treatment, and monitoring services via mobile devices. Next, a systematic review of relative studies on mobile health adoption shows that previous researchers have explored mobile health technology concerning

- The classification of functionalities of mobile health devices
- User's evaluation of mobile health technology
- The efficiency of mobile health technology for addressing health issues
- Factors that influence users' adoption intention and use behaviours

Besides, the researcher provides an overview of mobile health services in China and points out the challenges China is currently experiencing in the healthcare sector, which can be solved by the broad application of mobile health technology. The researcher then presents a literature review on older people's use of mobile health technology. Although little research has been conducted on this topic， some interesting findings and conclusions help the researcher to identify research gaps and develop the research questions. This research explores the older adults' perceptions toward mobile health technology and sheds light on their motivations to use them. Like any information technology, user acceptance and usage are critical primary measures of technology success. A successful mobile health technology must generate users' involvement and participation. This again calls for a better understanding of the drivers for mobile health adoption.

Nevertheless, previous studies investigate mobile health technology adoption and usage primarily from the instrumental perspective, focusing mainly on functional

or extrinsic motivational drivers such as usefulness and ease of use. Scholars argued that extrinsic and health-related motivators predominantly determine the adoption of new technology (Davis, Bagozzi and Warshaw, 1992). This current study presumes that older individuals seek instrumental and emotional gratifications from using innovative information and communication technology. Therefore, the researcher proposed the research questions about what motivated older people to use mobile health technology. The researcher will review the relevant theories in the next section and propose the research questions and hypotheses. Specifically, the technology adoption-related theories and age-related constructs will be examined systematically.

2.8 Theories on Technology Adoption and Uses

Osanloo and Grant (2016) put forward a theoretical framework as a blueprint that guides and supports studies in this area. This theoretical framework consists of a theory (or theories) that supports researchers in terms of how they conceptualize and organize research on a topic (Eisenhart, 1991). Specifically, this includes the concepts and definitions pertaining to the theory that is related to the given research topic. Varpio et al. (2020) define a theoretical framework as a logically created and related set of concepts and issues developed from one or more theories that guide a researcher in a study. When a researcher creates a theoretical framework, the researcher must explain the concepts and theories used as the foundation of the study. The researcher must also connect the theories and issues to the study that is being performed. Notably, a multitude of theories and models have been articulated to explain users' adoption of new technology (Taherdoost, 2017). In this section, the researcher will review the

Technology Acceptance Model (TAM) and Uses and Gratifications (U&G) and age-specific constructs from gerontology theories and sociology theories.

2.8.1 Technology Acceptance Model (TAM): Development, Extension, and Application

The original TAM (TAM). In the past 30 years, many theoretical models have been put forward to evaluate and explain the use behavior in relation to new media technologies. One of the most widely used models is the Technology Acceptance Model (TAM), which has been proved to be highly predictive of the adoption and use of technology (Davis, Bagozzi, &Warshaw, 1989; Adams, Nelson, & Todd, 1992; Venkatesh & Davis, 2000; Venkatesh & Morris, 2000). Based on the TRA (theory of reasoned action) proposed by Fishbein and Ajzen (1977) and the TPB (theory of planned behavior) proposed by Ajzen (1996), Davis et al. (1989) introduced the technology acceptance model (TAM) to predict information technology acceptance and usage behavior of the users (see Figure 2). Two main influencing factors were put forward in the TAM model: perceived ease of use (PEOU), that is, how easy it is for individuals to believe in using a certain information system) and perceived usefulness (PU), that is, how much individuals believe that using information systems can improve their work efficiency). Scholars argues that these two factors are the major determinants of a user choosing or refusing a new technology (Sharp, 2006; Davis,1989). The third factor, attitude (AT), acts as an intermediary between these two main determinants and behavioural intentions. Perceived ease of use and Perceived usefulness jointly affect the attitude towards using behavior. In addition, Perceived usefulness also mediates the

effect of Perceived ease of use on AT. Although both Perceived usefulness and Perceived ease of use were important determinants of behavioural intention, numerous studies prove that Perceived usefulness is a stronger determinant than Perceived ease of use (Davis,1989; Lee, Kozar & Larsen, 2003; Taherdoost, 2018). The explanation for this phenomenon is that no matter how easy the technology is to use, if it is not considered beneficial or helpful to improve job performance, the ease of use is regarded as irrelevant by users. Later research also found that Perceived ease of use may actually be more the premise of Perceived usefulness than the direct parallel determinant of technology use. Therefore, in essence, the priority of users is practicality and utility, followed by ease of use. Furthermore, it should be noted that although TAM initially included the construct of "attitude", it was later omitted from the model, because attitude was found to play only a weak intermediary role between beliefs and behavioural intentions (Bagozzi, 1981; Fazio, Powell & Williams,1989)

TAM draws extensive attention from the academia soon after it was published. The initial studies overwhelmingly focused on the model validation (e.g., Subramanian, 1994; Sambamurthy & Chin, 1994; Adams et al.,1992). The first study to verify TAM's explanatory power and predictive power was conducted among 120 users of IBM's Toronto Development Laboratory in Canada (Davis, 1989). Participants were asked to rate the usefulness and ease of use of two technology systems: PROFS email and XEDIT file editor. The second study was conducted among 40 MBA students. Participants were asked to rate the usefulness and ease of use of two different mapping tools: Pendraw and ChartMaster. The results of two studies confirmed the important influence of

perceived usefulness and perceived ease of use on users' behavioural intention. Besides, the study also found that perceived usefulness is a stronger determinant than perceived ease of use. Later, Bragozzi, Davis and Warshaw (1992) conducted the same test and 107 MBA students were recruited. This study aims to explore their intention to use a word processing application called WriteOne. Unsurprisingly, the research results once again confirmed the previous findings of Davis (1989). Additionally, they found that attitude only played a partial intermediary role in the relationship between perceived usefulness and perceived ease of use on behavioural intention. Similarly, Adams et al. (1992) also replicated Davis' research in 1989. Their research explored five different software including word processor, graphics, spreadsheet, e-mail and v-mail, and found that, on the whole, TAM maintained its consistency and effectiveness in explaining users' acceptance behavior. Szajna (1994) also replicated Davis 1989 research, and she investigated the predictive validity of TAM that determine whether the measurement can successfully predict future behavior. Through the discriminant analysis of DBMS word processor selection behavior of 47 MBA students, she found that perceived usefulness and perceived ease of use had good predictive validity. In the following years, many studies performed the replication of the TAM, and found that TAM variables showed results consistent with previous studies (e.g., Lederer et al., 2000, Gefen, Karahanna, & Straub, 2003; Mallenius, Rossi & Tuunainen, 2007, Chau & Hu, 2002). Nevertheless, several replication studies appeared to be contrary to the previous results (e.g., Segars & Grover,1993; Barki & Hartwick, 1994). For example, Segars and Grover (1993) found that the explanatory ability of perceived usefulness and perceived ease of

use is not very strong, the research model is more salient only adding effectiveness as a new TAM variable. Barki and Hartwick's (1994) supported the findings of Segars and Grover (1993).

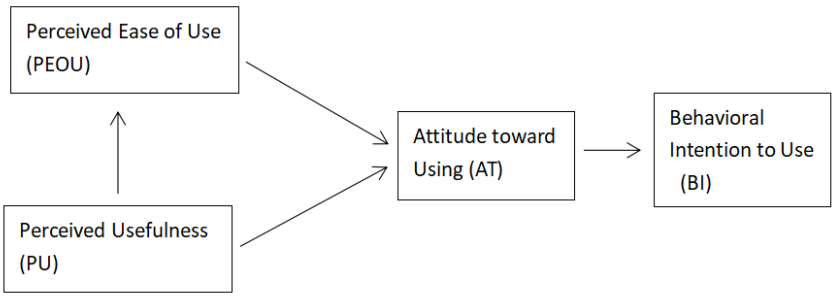

Figure 1. Technology Acceptance Model (TAM) (Davis et al., 1989)

Technology Acceptance Model 2 (TAM2). Based on the consistent research finding that perceived usefulness functions as a key factor determining intention to use (Davis, 1989; Davis et al., 1989), in 2000, Venkatesh and Davis (2000) posited an extended model named TAM2 (see Figure 2). This model was designed to discern the external variables that influence perceived usefulness. To be precise, TAM2 characterizes 'perceived usefulness' and 'intention to use' in terms of two composite variables: social influence processes and cognitive instrumental processes. TAM2 synthesizes the previous efforts and reflected the previous request for the model's elaboration. In response, it offers clear definitions of the external variables of perceived usefulness and perceived ease of use, creating a solid means to progress the multilevel model. The external variables included: Subjective norms: the effect of others on the user's determination to use a given technology; Image: users' desire to maintain a favorable standing among others; Job relevance: how applicable the technology is to the task at

hand; Output quality: the extent to which the technology can perform the required tasks; Results demonstrability: the ultimate output of tangible results. Experience and voluntariness are the factors that regulate subjective norms. Venkatesh and Davis (2000) carried out a longitudinal study consisting of two voluntary and involuntary environments, respectively. These two voluntary environments encompass research conducted on a sample consisting of 38 floor supervisors using proprietary systems and 39 personal financial service employees who migrated to use Windows-based computer systems. Meanwhile, the two mandatory environments encompass research conducted on 43 accounting firm service employees using a Windows-based account management system and 36 investment bank employees using a stock portfolio analysis system. A summary of the research and time period results point to image, job relevance, subjective norms, and result argumentation as the central factors contributing to perceived usefulness. Other studies found that subjective norms (i.e., perceived usefulness and perceived ease of use) directly determine behavioral intention (Venkatesh & Davis, 2000).

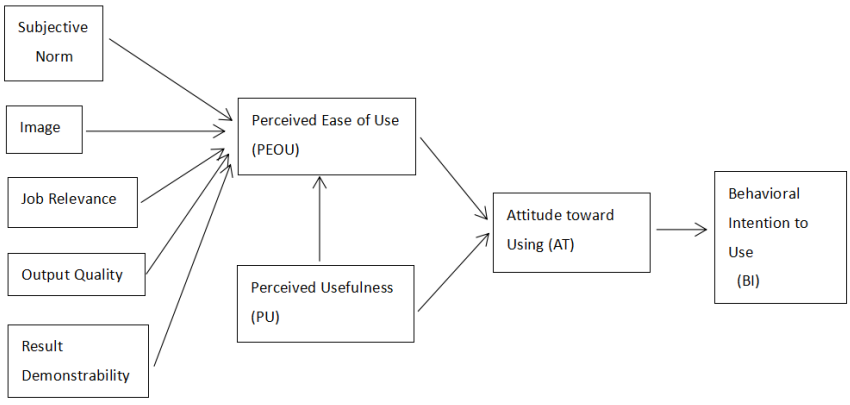

Figure 2. Technology Acceptance Model 2 (TAM 2) (Venkatesh & Davis, 2000)

The Unified Theory of Acceptance and Use of Technology (UTAUT). In the next few years, Venkatesh, Morris and Davis (2003) developed the unified theory of acceptance and use of technology (UTAUT) based on TAM and TAM2 (see Figure 3). The UTAUT theoretical model suggests that the perceived likelihood of technology adoption depends on the direct influence of four key factors: performance expectancy, social influence, effort expectancy, and facilitating conditions. Notably, the impact of predictors is moderated by the study subject's age, gender, experience using the technology in question, and voluntariness of use (Venkatesh et al., 2002).

Performance expectancy refers to "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh, Morris & Davis, 2003, p294). It has been identified as the strongest predictor of use intention, with significance identified in voluntary and mandatory settings alike (Zhou, Lu & Wang, 2010; Venkatesh, Thong & Xu, 2016). Meanwhile, effort expectancy has been defined as "the degree of ease associated with the use of the system" (Venkatesh et al., 2002). Social Influence is characterized as "the degree to which an individual perceives that important other believe he or she should use the new system" (Venkatesh et al., 2003). It is worth pointing out that the impact of social influence is significant when technology use is mandatory (Venkatesh et al., 2002). In such circumstances, users have to utilize a technology in line with a compliance requirement, as opposed to being guided by personal preferences (Venkatesh & Davis, 2000), which may shed light on the inconsistent effect of the construct across other studies conducted to validate the

model (Zhou, Lu & Wang, 2010; Chauhan & Jaiswal, 2016). Finally, facilitating conditions pertain to "the degree to which an individual believes that an organisation's and technical infrastructure exists to support the use of the system" (Venkatesh et al., 2003). Although facilitating conditions directly exert a positive influence on intention to use, following initial use, this influence is rendered nonsignificant. On this basis, the model suggests that facilitating conditions exert a direct significant effect on user's use behavior (Venkatesh et al., 2003).

The moderating influence of age, experience, gender, and voluntariness of use dictate the strength with which predictors impact intention, whilst age moderates the effect of the four predictors. Meanwhile, gender mediates the relationships between performance expectancy, effort expectancy, and social influence. Moreover, experience moderates the robustness of the relationships between facilitating conditions, effort expectancy, and social influence. Voluntariness of use exclusively moderates the relationship between behavioral intention and social influence (Venkatesh et al., 2003).

UTAUT has led to several key contributions to this area of study. To be precise, the model offers an empirical understanding of technology acceptance by conducting a comparison of the most salient technology acceptance theories, which typically put forward competing or partially formed perspectives on the matter in question. Based on UTAUT, it can be concluded that proposed factors account for 70% of the variance seen in use intention (Venkatesh et al., 2003), meaning that it enjoys a stronger predictive capacity than the other models examining technology acceptance (e.g., Davis, 1993; Sheppard, Hartwick & Warshaw, 1988). The interactions between personal and

demographic factors and certain constructs shed light on the complexity of the technology acceptance process, which depends on the study subject's age, experience, and gender (Venkatesh et al., 2003).

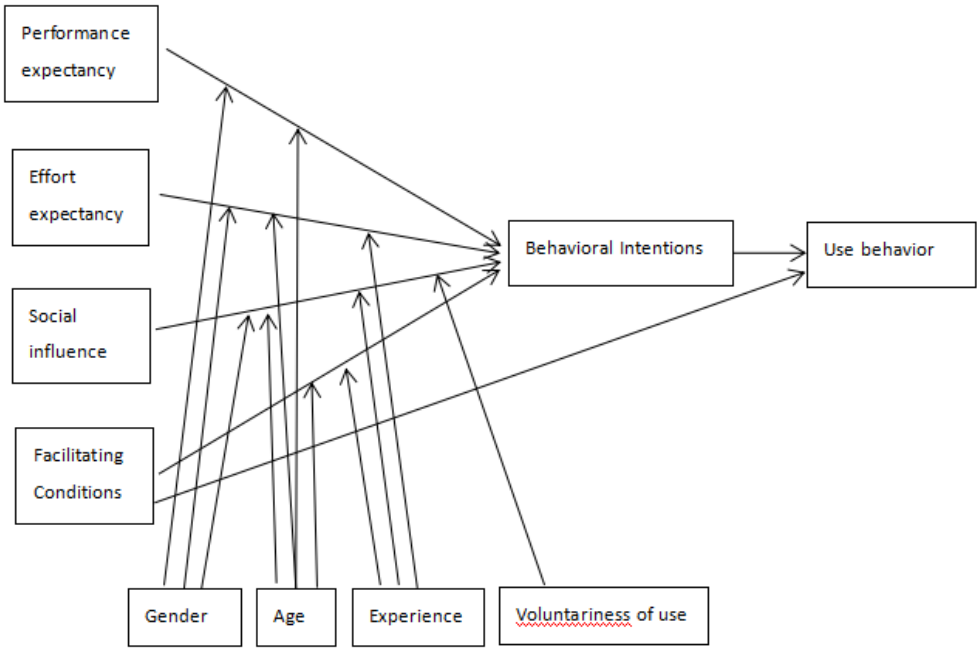

Figure 3. The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris and Davis, 2003)

Technology Acceptance Model 3 (TAM3). Venkatesh and Bala (2008) proposed a novel integrated model for technology acceptance called TAM3 by combining TAM2 and the model of the determinants of perceived ease of use (Venkatesh, 2000). (See figure 4). TAM3 posits three relationships that were not empirically tested in Venkatesh (2000) and Venkatesh and Davis (2000). The relationships between perceived usefulness and perceived ease of use, computer anxiety and perceived ease of use, and perceived ease of use and behavioural intention, according to Venkatesh and Bala (2008), will be moderated by experience. According

to this theory, when deciding whether a technology is useful, people will place a high value on perceived ease of use. The initial barrier to using the system is perceived ease of use, or how simple it is to use the technology. The influence of perceived ease of use on behavioural intention gradually decreases as people become accustomed to a piece of technology and gain practical experience because they are better informed about how easy or difficult the technology is to use. As a result, when making behavioural intentions to use technology, people will no longer consider perceived ease of use (Venkatesh et al., 2003). According to this theory, the level of experience people has with computers may have a moderate impact on how easily they are perceived to be used. With more experience, computer anxiety's impact on perceived ease of use will diminish and system-specific beliefs will take its place as a more significant determinant. Additionally, the influence of perceived ease of use on behavioural intention will be moderated by experience, and as experience increases, the influence will diminish (Venkatesh, 2000).

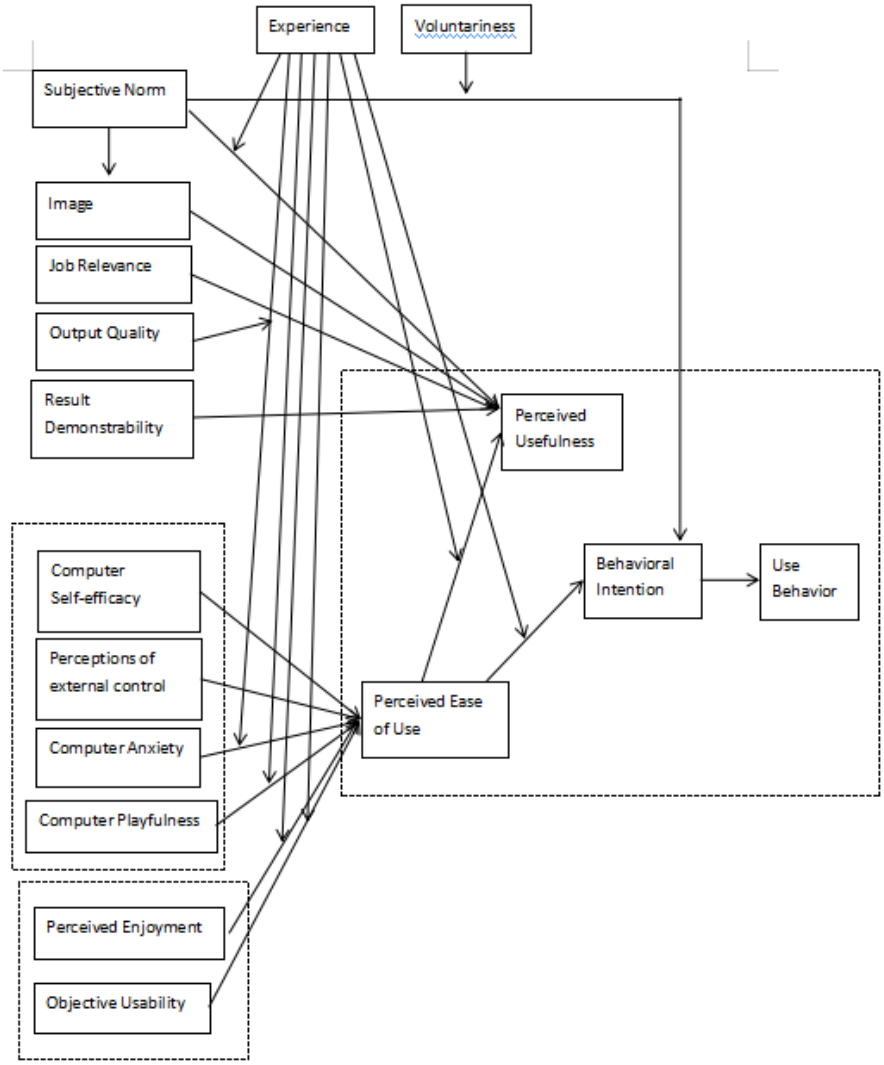

Figure 4. Technology Acceptance Model 3 (Venkatesh and Bala, 2008)

TAM-related models have experienced the evolution of the original TAM, TAM2, UTAUT and TAM3. The original TAM is a relatively simple model, which provides a main line for the follow-up research, that is, the behavior of using information technologies depending on users' behavioural intentions. TAM2 was put forward by researchers on the original TAM, aiming to find other key factors besides perceived usefulness and perceived ease of use and enhance the explanatory power and predictive power of TAM. The social influence process and cognitive instrumental

process are two compound variables to explain the perceived usefulness and use intention. TAM 3 is a comprehensive model for researchers to study why and how employees in the workplace accept and use information technology from the organizational level. It is the integration and improvement of TAM2 and the determinants of perceived usability, and it is a further extension and elaboration of TAM2. Over the past 30 years, TAM and its extended models have been extensively applied to explain people's intention to use information technology across various fields, such as world-wide-web (Lederer et al., 2000), electronic commerce (Gefen, Karahanna, & Straub, 2003), mobile devices (Mallenius, Rossi & Tuunainen, 2007), and telemedicine (Chau & Hu, 2002). Previous scholars also have extended TAM by incorporating other constructs such as perceived risk and trust (Gefen, Karahanna, & Straub, 2003), playfulness (Moon & Kim, 2001), social norms(Venkatesh et al., 2002), the voluntariness of use (Venkatesh & Davis, 2000); or by combining other theories like motivation theory (Ryu, Kim & Lee, 2009), innovation diffusion theory (Mao & Palvia, 2006), and flow theory (Moon & Kim, 2001).

2.8.2 TAM Models Applied in the Research of Technology Adoption by Older Adults

Although technology has been found to offer a range of benefits for older people, a digital divide nevertheless remains. Moreover, even though most older people adopt a positive attitude towards technology, the usage rates of mobile health technologies and the like remain stubbornly low (Ziefle & Rocker, 2010). It is critical to comprehend the factors that affect technology acceptance and usage in order to more accurately predict technology usage behaviour. Here, along with empirical studies looking at older

people's acceptance of technology, the technology acceptance model (TAM), which provides a potent explanation of technology perception and usage, is reviewed. Prior research found that older adults' technology use is primarily for domestic purposes, particularly the use of the internet and smartphones (Mitzner et al., 2010; Ziefle & Rocker, 2010). TAM and its extended models, such as TAM2 and UTAUT, have also been proved to have strong explanatory power among these studies, and TAM-related determinants such as perceived ease of use, perceived usefulness, behavioural intention, and usage behavior were also examined in those studies (e.g., Nayak, Priest &White, 2010; McCreadie & Tinker, 2005). The elderly's acceptance and use of technology is strongly influenced by their perceptions of its usefulness and ease of use. They are more likely to accept and use new technologies if they believe and realize that the technology can be used to improve their quality of life and meet their daily needs. Innovations in technology that support their daily activities, improve communication, and make life easier are usually the reasons for their positive reaction (Mitzner et al., 2010). In addition to perceived usefulness, perceived ease of use is a significant factor that influences elderly users (Pan & Jordan-Marsh,2010; McCloskey, 2006). Notably, apart from its direct influence on attitude and behaviour intention, perceived ease of use is also a significant indicator of perceived usefulness (e.g., Pan & Jordan-Marsh,2010, McCloskey, 2006). According to previous studies, the elderly does not fully accept innovative technology and express ambivalent feelings regarding its acceptance and detachment. On the one hand, the elderly recognize that technology has brought numerous benefits; on the other hand, they are uncertain as to whether they can

benefit from it, as they lack the necessary skills to use these high-tech applications (Karahasanovi et al., 2009; Mitzner et al., 2010). Since older individuals have lower self-efficacy and greater technical anxiety, it is more challenging for them to learn and utilize the functions of new technologies. It is also discovered that the primary barriers to technology use for the elderly are related to the design and usability of these devices and services. Easy-to-understand systems with a straightforward user interface are more likely to be accepted by the elderly. Old age is a time of transition and loss adjustment. This transition involves retirement and resettlement. When the elderly retires, they leave their jobs and social roles that provide material return and social status. Psychological changes of people over 65 include loneliness, fear of illness and death, loss of social status and social isolation (Charles & Piazza,2007). However, biophysical changes, such as the decline of sensory, perceptual, motor and cognitive abilities, may affect their ability to interact with systems such as door handles, microwave ovens and computers (Erber, 2012; Xie, 2007). Additionally, people become more selective in their social relationships when they grow old. Older adults invest more emotionally in ties with family members and established friends but have less interest in forming ties with new acquaintances (Charles & Piazza,2007). Social isolation is more pronounced among older people, accompanied by a decline in health or increased impairment. The key defense against social isolation is to improve communication and develop a network of social support. Negative feelings and attitudes of older people towards post-retirement life can be improved by using the Internet (Xie, 2007).

Two limitations are identified in empirical studies on TAM in connection with

the aging of the population. First, all studies aimed to examine the factors that influence older people's acceptance of technology, but only a minority considered age-related factors. In most studies, 'age' was measured by a person's chronological age, which is the number of years or months since their birth. Ageing can be classified according to five dimensions: chronological, biological, functional, psychological, and social (Erber, 2010; Quadagno, 2008). Chronological age cannot differentiate between individuals with distinct physiological and psychological capabilities (Stuart-Hamilton ,2000). To better predict older individuals' acceptance of technology and usage patterns, additional age-related characteristics or limitations must be considered. Second, previous research investigates mobile health technology adoption and usage primarily from an instrumental perspective, focusing primarily on functional or extrinsic motivational drivers such as usefulness and usability. Scholars have argued that the adoption of new technology is largely determined by both extrinsic and health-related motivators (e.g., Davis, Bagozzi & Warshaw, 1992; Igbaria, Schiffman & Wieckowshi, 1994; Teo, Lim & Lai, 1999). Emotional feeling and social influence also play a significant role in explaining older users' acceptance and utilization of mobile health technologies. Along with their increasing life expectancy, the lifestyle, potential, and expectations of the elderly are transforming. According to the researcher, older adults accept and utilize mobile health technology not only to complete tasks, but also to satisfy their inner needs. Due to the mass media characteristics of digital technology-based services such as mobile health services, older adults may be motivated by a variety of health-related factors when making decisions.

2.8.3 Review of the Main Constructs of TAM

In the current study, the researcher chooses TAM for several reasons. First, TAM can explain user behavior across a broad range of end-user digital technologies and user populations while simultaneously being both parsimonious and theoretically justified. As TAM can be used to explain a broad range of population， this is the most significant advantage as this current study focus on older adults' behavior intention. Based on the review of previous literature, it turns out that the studies based on western populations have indicated that the TAM can be best applied to research focusing on older adults (Ziefle & Rocker, 2010; Pan & Jordan-Marsh, 2010; McCloskey, 2006) Second, TAM has been tested and applied in mobile technology more extensive than either TAM2, UTAUT and TAM 3. Since we attempt to study the behavior of older mobile health users, TAM is a better choice. Thirdly, TAM is considered a parsimonious model. TAM2, UTAUT and TAM 3 consider several belief constructs, external variables, and moderating constructs of technology adoption. They are more complicated than TAM, which has only two belief constructs as predictors of behavioural intention.

Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Studies on technology acceptance and adoption have shown that perceived usefulness and perceived ease of use are the key determinants of TAM (Davis, 1989). Perceived usefulness is regarded as "the degree to which an individual thinks that using a specific system will improve job performance" (Davis, 1989, p.320). It is the most influential determinant for people to choose or refuse a new technology (Sharp, 2006). Prior studies have confirmed Perceived usefulness's explanatory power in the field of new

technology usage (Dwivedi et al., 2014; Cilliers, Chinyamurindi & Viljoen, 2017; Schnall et al., 2015). However, since many older adults have retired, “improving work performance” may not be relevant to defining perceived usefulness in regard to their uses of new media technology (Chen & Chan, 2011). In view of this, it can be hypothesised here that if the elderly realize that new technologies can be used to improve their quality of lives and meet their daily health-related needs, they are more likely to accept and use new technologies (Chen & Chan, 2011). Older people attach more importance to technologies that can make their daily lives easier and safer (Mallenius, Rossi & Tuunainen, 2007). Their positive attitude is mostly related to how technology supports activities, enhances convenience and contains useful functions (Mitzner et al., 2010).

Perceived ease of use is also of great importance for older adult users (Ziefle & Röcker, 2010). It has been defined as “the degree to which a person considers that using a specific information technology system will save effort” (Davis, 1989, p.320). Perceived ease of use has been reported to have a significant impact on technology acceptance and adoption (Chen & Chan, 2011). Older people are more likely to accept technologies that are easy to understand and simple to use (Conci, Pianesi & Zancanaro, 2009). Although they use technology more often than before, older adults have more difficulty than young adults in learning to use and operate modern technologies such as mobile phones and the internet (Renaud & Van Biljon, 2008; McCloskey, 2006), so that perceived ease of use could be an important motivation that affects their behavioural intention. Many studies have confirmed the explanatory power of perceived ease of use

among digital technology use (e.g., McCloskey, 2006; Heerink et al., 2010; Chien & Lee, 2008). For instance, Chien et al. (2008) have examined the motivators behind Hongkong older adults' adoption of health robot assistants. The result has founded that Perceived ease of use contributes greatly to their positive attitudes toward robots. Similarly, Parveen and Sulaiman (2008) also affirmed Perceived ease of use as an important predictor in their empirical research on the mobile healthcare service in Denmark. In addition to direct influence, Davis (1989) also observed a significant correlation between Perceived ease of use and Perceived usefulness, which was later empirically demonstrated by many researchers. For instance, results of previous studies conducted by Wixom and Todd (2005), and Phillips & Shipps (2012) mentioned that Perceived ease of use affects Perceived usefulness. Therefore, if mobile health technology is easily used, its usefulness can be felt.

Behavioural Intention (BI). Behavioural intention is a concept that is often deployed in the research on technology adoption. Specifically, it refers to a user's inclination to adapt and continue to use a given technology (Venkatesh et al., 2003; Venkatesh et al., 2012).

2.8.4 Uses and Gratifications (U&G)

Many studies have investigated older users' acceptance of technology from instrumental perspective with the focus on perceived usefulness and perceived ease of use (Lee, 2007). These factors play a significant role in the required use of traditional technologies in organizational settings, such as spreadsheets or word processors, where

personal preference or the affective experience may not be important. However, decisions to utilize digital technology may be partly influenced by non-instrumental factors such as perceived enjoyment, cognitive absorption, perceived playfulness, and social influence, along with other related personal factors (e.g., Davis et al. 1992; Lee et al. 2007). As mobile health technology now possesses mass media features and are typically adopted in various settings, decisions about the use of mobile technology may involve diversified motivations. The critical and systematic review has revealed that TAM proposed by Davis overemphasizes the role played by technological-oriented motivations, which limits its applicability in those user contexts where the uptake and use of technology helps to complete tasks and meet emotional needs. This issue can be resolved by integrating Uses and gratifications theory (U&G theory) into TAM. The U&G theory is a mass communication theory that focuses on the needs, motives and gratifications of media users. The theory states that media consumers are not passive consumers of mass communications; rather, they play an active role in media consumption. Diverging from other media effect theories that question "what does media do to people?", U&G theory focuses on "what do people do with media?(Rubin, 1981; Ruggiero, 2000). U&G researchers have generally treated the audience as active participants who search, rank, use, and consume media for different reasons and purposes and in different ways. Modern audiences use media with the goal of satisfying one or more specific needs. Therefore, U&G theory was chosen purposefully to explore older users' diversified motivations in using mobile health technology.

Uses and gratifications theory (hereafter, U&G) is a theory commonly used to

determine the motives behind individuals' media use. Tracing back the historical development of this theory, Wimmer and Dominick (1994) suggest that U&G first developed in the 1940s, when researchers investigated why individuals engaged in certain media behaviours, such as reading newspapers or listening to the radio. Subsequently, U&G has been used to study how people use media in certain ways and why they do so instead of investigating what media 'does' to people (Katz, 1959; Ruggiero, 2000). This theory is premised on the assumption that the individual "is active and intentional enough to select media to meet their distinctive demands" (Katz et al., 1973, p.85). U&G researchers usually describe "motivations" when describing why users consume certain media and what satisfaction they eventually receive from media (Rubin, 1981). Initially, U&G scholars sought to identify audiences' motivations and selection patterns for the new mass media. There are a great number of examples of such research: Waples, Berelson, and Bradshaw's (1940) research into reading; Suchman's (1942) research into motivations guiding individuals to listen to serious music; Berelson's (1949) research into the different purposes of reading newspapers; and Lazarsfeld and Stanton's (1949) research into different genres of media. These studies formulated a list of functions that reflect the specific content or the medium in question. For instance, Katz and Foulkes (1962) characterized the use of mass media as a form of escapism. Mendelsohn (1964) discover several general functions of radio listening: conveying relevant information and news, bracketing the day, changing one's mood, companionship, counteracting loneliness or boredom, and allowing for social interaction. Katz, Blumler, and Gurevitch identified six motive typologies people

satisfied via mass media: cognitive, affective, personal integrative, social integrative, and tension release (Katz, Blumler & Gurevitch,1973). Then, McQuail distinguished four gratification categories: diversion, personal relationships, personal identity, and surveillance (McQuail, Blumler & Brown, 1972). Later, McQuail proposed an updated version that included social integration, social involvement, entertainment, information, and personal identity (McQuail, 1984).

Most academics agree that early research lacked theoretical coherence and was primarily behaviourist and individualist in its methodology (McQuail, 1994). The researchers used a qualitative approach to group gratification statements into labeled categories while ignoring their population frequency distribution. Those who first worked in this area made no attempts to investigate the relationships between the identified gratifications and the psychological or sociological origins of the needs satisfied. The researchers frequently failed to look for quantitative or conceptual interrelationships between the various media functions, which could have led to the discovery of the latent structure of media gratifications.

2.8.6 Telecommunications Technology and the Revival of U&G Theory

From 1985 onwards, U&G was no longer used by most academics studying mass communication. This was partly due to the criticisms detailed in the preceding section. However, with the proliferation of telecommunications technologies, U&G found a new lease of life. This is because the combination of mass media and digital technology radically altered media consumers' contact behaviours (Finn, 1997). Accordingly, researchers took a renewed interest in U&G, applying it to the broad range

of issues relating to users' motivations to engage with new forms of digital media technology. In this new media landscape, users had access to a greater range of media choices; as such, their motivations to select a given form of media or content became a central consideration when conducting audience analysis. Lin (1993) investigated the predictive indicators relating to users' VCR satisfaction and utilization. Their study results identified a favourable attitude towards home entertainment as the key determinant, along with perceived video choice. In a similar vein, LaRose and Atkin (1991) researched American adults' choices and attitudes towards pay-per-view movies. Ultimately, they concluded that individuals who adopt a positive attitude towards paying to see a movie are more likely to pay for the service. Donohew, Palmgreen, and Rayburn (1987) investigate how social and psychological factors, including the need for activation and interaction, produce different lifestyles and patterns of media use. They outlined four categories of lifestyle, individuals belonging to which differed on several variables, such as newspaper and magazine readership and the gratification derived from watching cable television. More precisely, they observed that those individuals who demonstrated a strong need for activation pursued lifestyles that involved greater exposure to media sources of public affairs information than individuals with a lower need for activation and less cosmopolitan lifestyles.

In the 2000s, academic attention has been focused on new media and mobile communication technology, specifically looking into how and why people use these new mediums. For instance, Muntinga, Moorman, and Smit (2011) put forward "empowerment" and "social pressure" as two motives with unique relations to the use

of social media that function as additions to the four motives identified by McQuail (McQuail,1984). In addition to the need for information and socialization, Gan and Li (2018) argued that media appeal is another crucial factor affecting a user's utilization of social media such as Weibo and WeChat. Chen et al. (2014) researched information-sharing behaviours relating to WeChat Moments, concluding that the presence of familiarity and identifiability in an interpersonal relationship positively and significantly impact the information-sharing behaviours WeChat users engage in. The existing studies have yielded a wealth of evidence supporting the contention that U&G is a suitable approach for studying new media and mobile communication tools (Alhabash et al.,2012). Thus, the present study applies U&G theory to explain the motivations driving older users' use of mobile health services.

2.8.7 Motivations of Using Mobile Technology for Health-Related Purposes

As each medium has its own unique specific features and functions and therefore offers unique user experiences, many academics have argued that U&G theory must be applied contextually (Kaplan & Haenlein, 2012). Based on the existing research, there are some motivations that are undoubtedly related to health-related needs; even so, as these motivations are likely to be distinct, it is more appropriate to develop a separate health-related motivation typology. Moorhead et al. (2013) proposed five gratifications: access to customized health information, increased social support and involvement, public health monitoring, greater access to a wider range of health information, and the potential to influence health policy. Working in the same area, Zhang, He, and Sang (2013) carried out an exploratory study to explore Facebook users 'motivations to use

the social networking platform to engage in health communication. The researchers analyzed 1352 posts made in a Facebook group for individuals living with diabetes. From this, they identified several different motivations, including emotional support and personal health information exchange. Similarly, Newman et al. (2011) interviewed fourteen people who engaged in online health communities and Facebook, concluding their evaluation of interactions on the topic of diabetes management and weight loss that accessing emotional support was the most valued gratification derived by users. Yet, it should be noted that the motivations applicable to aging populations remain uncertain. The conclusions of some studies have noted that certain motivations are applicable to older individuals; however, again, a separate typology of health-related motivations needs to be put together on the basis that previous studies indicated age-related differences in mobile technology use (Yang et al., 2015).

2.8.8 Aging-Characteristic Factors

Ageing is becoming a worldwide problem, such that older mobile health users have gradually become the focus of academic attention (Spann & Stewart, 2018). Gerontology studies have confirmed that age difference among potential users is closely related to different behaviour intentions (Sani et al., 2020; Schulz et al., 2015). To understand how and why elderly individuals adopt mobile health technologies, it is necessary to understand the changes that take place as individuals age. In this section, the researcher assumes the following constructs would reflect the perception of mobile health technology adoption among older users.

Resistance to Change. The continuity theory of normal aging (Atchley,1989)

posits that individuals tend to sustain the same activities and behaviours they previously maintained in their earlier life as they age. To do so, they employ strategies related to their past life and previous experiences. Chinese people over the age of 60 were born at a time before mobile phones; at this time, professional healthcare services were exclusively delivered in person. Although mobile health services have developed and matured in recent years, many elderly individuals in China nevertheless rely on their existing behaviors and demonstrate a degree of resistance to adapting their medical habits. It should be noted that older people are highly resistant to change. As new technologies will necessitate a change in lifestyle, older people are accordingly reticent to adopt new technologies. Many existing pieces of research, such as Phang et al.'s (2003) research, used a "preference to human contact" framework, "which is relative to resistance to change, to examine senior citizens' acceptance of e-government services" (p28). Bhattacherjee and Hikmet (2007) observed the significant negative influence of physicians who are resistant to change in relation to their behavior intention pertaining to health information technology. Since mobile health technology use requires a change in relevant health behaviors of elderly individuals, they will have to change their existing habits to better manage their health in this new social and technological environment. On this basis, the present study speculates that resistance to change amongst the elderly negatively impacts their intention to adopt mobile health technologies.

Technological Anxiety. Technology anxiety is another age-specific factor associated with behavioural intention. Specifically, it is a negative emotional response

and pertains to the fear or discomfort people experience when they think of using or actually using technology. It also refers to an individual's apprehension when faced with the possibility of using technology. Technology anxiety is derived from social cognitive theory (Bandura, 1999). Older individuals tend to be less technologically adept than younger generations. These limited skills are compounded by their diminishing physical and cognitive capacities, leading to high anxiety levels and further decreasing their intention to engage with innovative technologies. It has been widely published that older individual experience greater technology anxiety than young individuals. Meanwhile, Guo et al. (2003) found that technology anxiety is negatively correlated with the adoption intention of older people, as it diminishes the perceived ease of use and increases resistance to change. Other studies conducted on the elderly have similarly made the case that technology anxiety is a significant barrier to the adoption of innovations by elderly groups (e.g., Tsai et al., 2020; Eisma et al., 2004). On this basis, the present study speculates that technological anxiety amongst the elderly negatively impacts their intention to adopt mobile health technologies.

Technology Trust. Technology trust refers to "people's judgment or expectation that a given technology's helpfulness, reliability, and functionality will support them in their work" (Giffin, 1967; Xu et al., 2014). As technology anxiety reduces perceived risks and uncertainties relating to digital technologies, a positive association has been observed between it and people's adoption behaviours in relation to information and communication technologies. Such an association has been identified in a range of areas, including e-stores, e-commerce, mobile payments, trust in government services and e-

government services, trust in cloud computing, trust in mobile banking applications and software, and trust in online communication and social media. In the research on mobile health technology, Akter et al. (2013) indicated how perceived trust positively influences mobile health service satisfaction and continued intention to use such services. Guo et al. (2016) indicated that trust could effectively alleviate any privacy concerns an individual may have and boost their adoption intention. From the research explored above, it can be concluded that although the issue of trust has been explored in the mobile health domain to a broad degree, very little research has investigated how trust mediates use intention. On this basis, the present study speculates that technological trust amongst the elderly positively impacts their intention to adopt mobile health technologies.

Self-efficacy. Self-efficacy refers to "an individual's judgments of their ability to organize and execute courses of action required to attain designated types of performance" (Bandura, 1986, p. 359). Notably, self-efficacy has come to be viewed as a significant predicting factor within the technology acceptance model. Existing studies have found that self-efficacy, directly and indirectly, affects users' behavioral intention to take up e-government, e-commerce, and mobile apps and services (Irani, Dwivedi, & Williams, 2009; Alalwan et al., 2015; Fox & Connolly, 2018; Rana & Dwivedi, 2015; Shareef et al., 2011; Shaw & Sergueeva, 2019). One of the studies on mobile health conducted by Lim and Noh (2017) explored the adoption of fitness apps. The researchers concluded that self-efficacy is conducive to the uptake of healthy behaviours and the utilization of the related mobile applications. Meanwhile, Fox and Connolly

(2018) observed that self-efficacy exerts a positive influence on users' intention to take up mobile health initiatives. Similarly, many studies conducted in recent years argue that self-efficacy assumes a renewed importance in old age, as this is a time in life that is related to the loss of a range of resources. The present generation of older adults did not have opportunities to learn to use digital and communication technologies, and as a result, they experience low self-efficacy in these areas. Hawthorn (2007) noted that the salient issue in learning to use a computer for older adults was their perceived inability to use a computer or general lack of capacity to do so. Specifically, the research subjects claimed they did not have the requisite knowledge, were too old to use computer technologies, or they believed that attempting to do so was a pointless endeavor. Niu, Willoughby, and Zhou (2021) also found that elderly individuals' intention to seek out health-related information online was related to their health literacy and health-related social media use, as these factors impacted their self-efficacy. Similarly, Peral-Peral, Villarejo-Ramos, & Arenas-Gaitán (2020) found that self-efficacy positively influenced the perceived usefulness and behavioural intention of Internet banking services amongst elderly individuals in Germany. The present study speculates that older mobile health users with higher self-efficacy will be more likely to use mobile health technologies.

2.9 Research Gaps in Literature

Several research gaps have been identified. First, this review revealed that TAM overemphasizes functional motivational factors such as perceived usefulness and ease of use and lacks attention to non-technological factors grounded on personal needs and social and environmental influence. Technological-oriented factors play a significant

role in the required use of traditional technologies in organizational settings, such as spreadsheets or word processors, where personal preference or the affective experience may not be important. However, decisions to utilize digital technology may be partly influenced by non-technological factors such as perceived enjoyment, cognitive absorption, perceived playfulness, and social influence, along with other related personal factors (e.g., Davis et al. 1992; Lee et al. 2007). As mobile health technology now possesses mass media features and are typically adopted in various settings, decisions about the use of mobile technology may involve diversified motivations. The critical and systematic review has revealed that TAM proposed by Davis overemphasizes the role played by technological-oriented motivations, which limits its applicability in those user contexts where the uptake and use of technology helps to complete tasks and meet emotional needs. This issue can be resolved by integrating U& G theory into TAM. The U&G theory is a mass communication theory that focuses on the needs, motives and gratifications of media users. The theory states that media consumers are not passive consumers of mass communications; rather, they play an active role in media consumption. Diverging from other media effect theories that question “what does media do to people?”, U&G theory focuses on “ what do people do with media?(Rubin, 1981; Ruggiero, 2000)[1]. U&G researchers have generally treated the audience as active participants who search, rank, use, and consume media for different reasons and purposes and in different ways. Modern audiences use media

with the goal of satisfying one or more specific needs. Therefore, U&G theory was chosen purposefully to explore older users' diversified motivations in using mobile health technology.

Additionally, both TAM and U&G did not consist of aging-characteristic factors. In section 2.6, the researcher has identified a research gap in previous studies. That is, a few studies considered age-specific factors when investigating older adults' technology adoption. Age differences is discovered to have a significant impact on health-related technology acceptance (Wang, 2014). Therefore, age-related factors from gerontology theories and sociology theories have been reviewed.

2.10 Summary

The researcher reviewed technology adoption models, including the original Technology Acceptance Model (TAM), the Technology Acceptance Model 2(TAM2), Unified Theory of the Acceptance and Use of Technology (UTAUT) and the Technology Acceptance Model 3 (TAM3). Based on the literature review, the researcher determined the TAM was the best theoretical model to investigate older adults' intention to use mobile health technology. It also showed that the major construct of TAM, perceived usefulness and perceived ease of use could be used to predict the behavioural intention to use mobile health technology among older Chinese users.

The researcher reviewed the definitions of extrinsic and health-related motivations and a taxonomy of human motivations proposed by Ryan & Deci (1985). From their definition, health-related motivation which refers to "doing something because it is inherently interesting or enjoyable", and extrinsic motivation which refers

to “doing something because it leads to a separable outcome.” (Ryan and Deci, 2000, p.55). The age characteristics constructs were also reviewed in this chapter as both TAM and U&G did not consist of them. Age differences is discovered to have an important impact on health-related technology acceptance (Wang, 2014).

The next chapter discusses the methodology of this study and why a mixed research approach was used. The identification of the target population and how the study sample was selected are discussed. Chapter 3 also details the methods used to guide data collection and analysis.

Chapter 3 Methodology

This chapter describes the research methods used to conduct the current study. The chapter begins by detailing why mixed research methods were chosen for study 1 and quantitative research methods for study 2, followed by a discussion of the research designs used for each of the two study phases.

3.1 Specific Research Methods Employed

The overall approach of this study was guided by two ideas. First, the idea of methodological congruence, which called for the interconnectedness and coherence of the research objective, research questions, sampling, data collection, and data analysis (Morse & Richards, 2002). Such congruence ensured that the study's aims and methods for achieving them remained on track. The approaches, tactics, and procedures used in the research were carefully considered, and special emphasis was devoted to how well they worked together. In line with Creswell's (2013) recommendation that every complex and rigorous study should include the interaction of these interconnected components - approach to inquiry, assumptions, worldviews, theories, and research design - the idea of documentation rigor requires that the researcher identifies with the philosophy and methodological approaches used. This made sure that the topics, purpose, philosophy, significance, literature review, research questions, hypotheses, researcher credentials, ethical consideration, data collection and analysis strategies, theoretical development, conclusions, implications for practice, and recommendations for further research were all presented in a clear, succinct manner.

When planning research, Creswell (2013) suggested that researchers should first

define which philosophical worldviews they stand by; this stance will help explain why they chose qualitative, quantitative, or mixed methods for their studies. There are four types of philosophical worldviews: positivist, constructive, transformative, and pragmatism (Creswell, 2013). In the positivist worldview, causes determine the outcomes of a research problem. The positivist worldview is used in quantitative research. The constructive worldview is used in qualitative research to obtain participants' views of the object being studied. The transformative worldview is similar to the constructive worldview, but its central idea is research needs to be connected with politics and a political change to fix society's ills. The pragmatic worldview is not tied to any philosophy. This worldview applies to the mixed method, where researchers could use both the quantitative and qualitative methods.

After evaluating in the current study, study 1 uses a pragmatic worldview to identify older adults' health-related motivations to use mobile health technology (RQ1) and study 2 uses a positivist worldview to examine the relationship between their motivations and behavioural intention to use mobile health technology (RQ2, RQ3). In the following sections, the researcher will introduce the research methods used in study 1 and 2, respectively.

3.2. Study 1: Mixed Method Design for Developing Instrument

This section explains why a mixed research method was selected for study 1. Before presenting the research methods chosen for study 1, the researcher will review all the research methods and explain why other methods were not chosen.

Qualitative research is the approach leveraged by a researcher to investigate and

understand how people interpret social or human problems (Creswell, 2002). In a qualitative study, the researcher's primary goal is to understand and explain a group of people's situations, feelings, perceptions, attitudes, values, beliefs, and experiences. Mileu and Queiros (2018) supported the above statements by stating that the qualitative approach is not concerned with numerical representativity but with obtaining in-depth and explanatory information to understand the research problem better. Qualitative study design uses an inductive style to generate new theory by collecting data from participants using open-ended questions (Creswell, 2002). A qualitative approach was not selected for this study because this study was testing an existing theory and not generating a new theory. According to Creswell and Guetterman (2019), a qualitative method is best when the researcher does not know the variables. This study's qualitative method was not used because the variables that predict the behavioural intention to adopt telemedicine are known. Mixed method research combines qualitative and quantitative research and data (Creswell, 2002). When this approach to research is used it provides a better understanding of the research problem than when either qualitative or quantitative method is used by itself (Guetterman &Creswell, 2019). In some mixed method studies, a researcher may perform a qualitative study to develop an instrument or identify variables to test in a quantitative study to be conducted later. Other mixed method studies will want to follow up on a quantitative study by performing a qualitative study to obtain more detailed and specific information about a research problem. Creswell and Guetterman (2019) stated that using a mixed method design requires that a researcher understands both quantitative and qualitative methods because

it requires specific skills. The mixed method is known to be time-consuming, requiring extensive data collection and analysis. It also involves the integration of both qualitative and quantitative methodologies. This study did not use mixed methods due to the time and resource constraints associated with a dissertation. The quantitative research method is used to test theories by evaluating the relationship among variables (Creswell, 2002; Sousa et al., 2007). This is done by deductive reasoning and generalization. Deductive reasoning uses an established theory or framework with concepts representing variables; the researcher then collects data to test if the framework is supported (Sousa et al., 2007). Generalization explains how data collected from a sample could be extended to a larger population (Creswell & Guetterman, 2019).

After evaluating the various available research methods, a mixed method was chosen to answer the research question proposed by this current study for two reasons (Creswell & Guetterman, 2019). First, mixed methods research can be applied to a broad range of disciplines across the behavioural, social, and health sciences (Creswell, 2008). It is a particularly useful methodology for investigating complex health-related topics, which often cannot be properly investigated by a single data source. Recently, public health researchers and practitioners have advocated for the adoption of a "pragmatic approach" to mobile health-related research and health care more generally; in other words, adopting a mixed research approach (Creswell, Fetters and Ivankova 2004, Steckler et al. 1992, Ulin, 2002). Steckler et al. (1992) suggest that "social interventions, such as health education and health promotion programs, are complex phenomena which require the application of multiple methodologies to properly understand or

evaluate them when both methods are used equally, often the results from each approach are used to cross-validate the study findings…". The topic of the present study is concerned with interdisciplinary topics, spanning areas including health communication, technology adoption, media effects research, and social psychology. More specifically, this study investigates the adoption behaviours of older adults in relation to health-related mobile technologies. Therefore, a mixed-method research approach is the best way to carry out this study.

Second, the sequential exploratory design (a specific research design belonging to the mixed research method) with the qualitative component preceding the quantitative component was adopted in the current study. Scholars refer to the exploratory sequential design as an instrument development design (Creswell, Fetters, and Ivankova, 2004). Creswell (2002) suggested that where the researcher is unaware of the variables to be measured and the associated theories (possibly due to the lack of prior research), the topic should first be explored quantitatively to identify what variables need to be studied. Interviews or ethnographic observations can be used to create measurement instruments (Crede & Borrego, 2013) or to help with "the more rigorous (quantitative) investigation" (D'Souza & Yiridoe, 2019, p. 264). Then, a quantitative study is conducted to analyse the data derived from the initial exploration. In chapter 2 (section 2.8), the researcher has already elaborated on the research gap on older adults' technology adoption in detail; That is, there is no instrument to measure older users' health-related motivation to use innovative technology. Without the instrument, the researcher cannot test the effect of mobile health technology on older

users. Therefore, the current study design was shaped by a lack of literature addressing older people's health-related motivations to use mobile health technology. Due to the paucity of a valid, standardised tool to measure the health-related motivation of older Chinese to use mobile health technology, the researcher aimed to develop an instrument to check for the same.

3.2.1 Study 1a-Qualitative Phase[2]

The first stage comprised a qualitative stage to create the questionnaire items.

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[2]An explanation is made here by researcher. Readers may get confused about study 1a. Notably, study 1a only used open coding to analyse the qualitative data and did not use the three-stage coding approach (namely, open coding, axical coding and selective coding) that is usually applied in qualitative research. The reason was listed below. The aim of study 1 a&b was to create an instrument to measure older mobile health users' intrinsic motivations. Study 1a identified older users' intrinsic motivations (that is, the initial items of instrument) through open coding. Study1b convert each motivation to questionnaire items and conducted an online-survey to ask respondents to rate initial items on a 5-point Likert scale. After obtaining a large amount of data, the researcher conducted exploratory factor analysis to determine underlying factors for a set of measured variables; This process amounted to axial and core coding using a machine (i.e. quantitative software: SPSS) instead of manual coding. The results of EFA disclosed several factors (i.e., health information need, social support and social involvement) that could be viewed as "themes" in the qualitative study. From the previous literature, the overarching goal of EFA is to identify the common factors and the related manifest variables. It is required when a researcher designs a scale in conjunction with the literature or interviews or when the scale itself is of unknown latitude and needs to explore to find out which questions belong to a latitude (i.e. a factor) (Norris & Lecavalier, 2010; Fabrigar et al., 1999; Finch & West, 1997; Worthington & Whittaker, 2006; Iantovics, Rotar & Morar, 2019). Usually, researchers would have many measured variables, which are assumed to be related to a smaller number of "unobserved" factors (Hurley et al., 1997). The researcher used EFA instead of coding because EFA procedures are more accurate when each factor is represented by multiple measured variables in the analysis. In previous annual reviews, the researcher has been reminded by qualitative research experts that this step should be explained in detail to avoid confusion for readers who are well-versed in qualitative research but unfamiliar with the scale development.

Results of a qualitative content analysis of 20 in-depth interviews with older Chinese adults (aged 55 to 75) were presented at this stage. Next section will elaborate on the in-depth interviews helped generate an initial item pool of instrument, which then were followed by expert reviews.

Participants. The participants are older individuals (aged 55-75 years old) living in an urban area and regularly using (or have used) mobile health technology. Regarding the definition of older adults, the World Health Organisation (WHO) reports that most countries define older people aged as 60 years old and above (WHO, 2013). It should be noted that the present research selected a sample group between 55 and 75 years old as men and women retire at 60 and 55 years old, respectively, in China (The Economist, 2021). Moreover, many older adults who regularly utilize the internet or mobile technologies for social and informational purposes are over 55 years old and enjoy higher income and education levels (Joo & Teng 2017). It is suggested that broadening the age threshold will allow for the collection of accurate and insightful data.

This study population was selected for several reasons. First, mobile health is increasingly adopted by older adults and there is a pressing need to understand their attitudes towards and perceptions of mobile health technology. Second, with escalating medical care costs, medical expenses are a pertinent issue for an aging population that has yet to be addressed (Haux, 2006). Therefore, an effective solution is urgently required to alleviate the substantial burden of providing healthcare for an increasingly large elderly population.

Data Collection. *Convenience and snowball sampling* are employed in the

quantitative study stage. *Convenience sampling* involves collecting research data from a convenient and available pool of respondents (Etikan, Musa & Alkassim, 2016). This sampling technique is the most widely used amongst researchers as it is quick, simple, and cheap. Due to economic or geographic limitations, it is often impossible or impractical to sample the entire community. Researchers use convenience sampling when additional inputs are unnecessary to complete the principal research effectively (Emerson, 2015). Typically, potential respondents can readily be approached to participate in the study and located where a large population can also be sampled. All members of a population are eligible for sampling so long as they are sufficiently proximate to the researcher. With following this approach, members are selected exclusively based on their proximity, without considering whether they represent the entire population. Based on the above, it can be concluded that convenience sampling allows for opinions, habits, and viewpoints to be observed and recorded in the most straightforward manner. All components of the population are admissible and rely on the researcher's proximity to participate in the sample. The researcher selects participants purely based on proximity and does not take into account whether or not they accurately reflect the total community. This technique makes it simple for them to monitor people's behaviours, viewpoints, and ideas.

Snowball sampling is a non-probability sampling method in which current research participants help the research recruit new study participants. In qualitative research, snowball sampling is one of the most prevalent methods. Networking and referral are two essential characteristics of this approach. Typically, a researcher will

begin with a small number of initial contacts who meet the research criteria. These people have been invited to take part in the study. They are then asked to recommend other contacts who meet the research criteria and may be willing to cooperate. This second round of participants is then asked to recommend other potential participants. Following this sampling approach, researchers leverage their pre-existing social networks to form initial links, increasing the sampling momentum to enlarge the pool of study participants (Goodman, 1961).

Most data collection methods can be used in both qualitative and quantitative research. The difference between data collection methods is the flexibility a researcher has in their use during data collection. Both study 1 and study 2 adopted a cross-sectional design, in which "data on a cross section of respondents chosen to represent a larger population of interest are gathered at essentially one point in time" (Singleton & Straits, 1999, p. 556). A cross-sectional design obtains data at a single point in time, whereas a longitudinal design obtains data at multiple points in time.

Procedures. In study 1a, older participants were sought through convenience sampling and snowball sampling from local senior communities in major cities in China. The researcher first contacted senior universities in four cities: Tianjin, Guangzhou, Ningbo, and Beijing, and explained the purpose of the research and recruitment criteria to the organizers. With the help of the organizers, the researcher recruited the first group of older adults who were willing to participate in the interview, and then through this group of older people, I got to know more older people who met the interview conditions. In terms of procedure, the in-depth interviews were conducted from 9 October 2020 to

21 December 2020. The researcher study first sent an informed consent form to older people who met the study criteria via WeChat. Those who wished to participate in the interview indicated their interest in the consent form. Then, the researcher contacted them directly to arrange for the interview through WeChat videos, telephone calls, or face-to-face communication. The researcher had a drawing for a 600RMB gift card for participants who attended the interview. All eligible individuals were paid a 30 RMB gift card.

Before the formal interview, participants were provided with an interview guide featuring key questions (see Appendix A) to familiarize them with the research objective and questions. During the in-depth interview, open-ended questions were asked relating to the following issues: 1) The interviewee's use of mobile health technology and how it impacts their everyday lives; 2) The reasons why they use mobile health platforms (e.g., WeChat, health care mobile apps, etc.). For instance, the interviewer opened the interview with questions such as "Please talk about your experience of using mobile health platforms such as WeChat health applet and health care apps". The interviewer enjoyed the flexibility to ensure all pertinent issues were covered, while the interviewee was free to speak about their experiences as they saw fit. The participants were asked to fill out a demographic questionnaire following the interview. This included information on their age, gender, educational background, monthly income, and health status (see Appendix B). All the interview transcripts are provided in Appendix C.

Data Analysis. Immediately following the conclusion of each interview, the recording was transcribed verbatim and saved using the appropriate software. In

particular, the transcribed interviews were imported into the Nvivo 12 software, where the data were coded in preparation for content analysis. The purpose of content analysis is to objectively and consistently describe the content of communication messages in order to facilitate their analysis (Stemler, 2000). It is commonly used in research plans that aim to describe a phenomenon. This method aids in the creation of knowledge, new ideas, fact presentation, and practical performance guidance by obtaining variable and stable results from textual data (Stemler, 2000). The interviews were coded by three individuals (the researcher and two trained post-graduate students) who complete this task separately. To be specific, the interview transcripts were aggregated to form a single text that could be subjected to content analysis through the process of open coding. First, open coding was performed, which assisted in guiding the researcher's thought process toward possible emerging codes and assisted in focusing on the emergent themes. Then, categories were created using an axial coding process, which aided in the detailed exploration of codes, linking them together to form themes and categories. (Lichtman, 2012; Strauss & Corbin, 1990).

Strategies for Trustworthiness. The current study employs Creswell's (2013) validation strategy framework to ensure the "accuracy" (p. 250) of the qualitative study. This includes prolonged engagement and observation, triangulation of methods and data, peer review or debriefing, identification and mitigation of researcher bias, member checking, rich and thick description, and external audits. Throughout the process, two strategies were employed to address issues of credibility and ethics: First, the study adhered to the standards of effective, widely accepted research practices; Second the

study was conducted in a way that was considerate of the participants and sensitive to the study setting (Rossman & Rallis, 2012). In the meantime, Davies and Dodd (2002) suggest the following considerations to ensure the rigorous validation of qualitative data: vigilance, empathy, caution, sensitivity, respect, reflection, conscientiousness, engagement, awareness, and openness. In contrast, Anfara, Brown, and Mangione (2002) argue that rigor (quality) in qualitative research can be achieved using credibility, transferability, dependability, and confirmability. It is worth noting that, in accordance with the paradigm, the quality (rigor) criteria for a constructivist inquiry were relativist and subjectivist, thus embodying constructivism's moral, ethical, prudential, aesthetic, and action commitments. As recommended by Guba (1981) and Strauss and Corbin (1998), exhaustive documentation of the research process was kept to further bolster the credibility of the study results (Guba, 1981). By focusing on the credibility of the substantive model itself, the legitimation decisions outlined by Onwuegbuzie and Teddlie (2003) were strictly adhered to: prolonged engagement, persistent observation, triangulation, weighing the evidence, leaving an audit trail, member checking/informant feedback, checking for representativeness of sources of data, making contrasts/comparisons, theoretical sampling, determining the meaning of outliers, using extreme cases, check the meaning of outliers.

Expert Panel Review. Following qualitative interviews, the researcher developed an initial pool of health-related motivation items based on interview responses. After that the initial items were sent to expert reviewers through email.

Participants. Diverse expert reviewers with diverse backgrounds were carefully

selected to provide technical knowledge (experts from the industry), process-oriented knowledge (professors), and explanatory knowledge (participants) of mobile health adoption. Two of the six experts had taken part in the in-depth interviews, while the remaining four had not (they were chosen to provide a external perspective on the items). A panel of six experts was thoroughly selected to represent these areas of expertise: three marketing managers with mobile health technology expertise and three university professors with expertise in mobile studies.

Instrument. Experts were asked to rate (on a scale of 1 to 5) the clarity and difficulty of the scales' items on a 1-to-5 scale. The expert review protocol, please see Appendix D. For each item, the experts decided whether to retain it in its current state, modify, or discard it. Finally, the researcher asked for feedback on the need for further definitions, examples, re-wording, and ordering, along with any other general thoughts, concerns, or feedback that could be used to further refine the present research.

Procedure. The experts were contacted by email and asked to participate on 2nd February 2020. The email included a study description as well as key terms. The expert review protocol was sent to the experts via email in early January 2021, with two weeks to respond. A reminder/follow-up email was sent several days after the protocol. Items were retained/modified/discarded based on the experts' ratings, considering the mean ratings and the researcher's judgment.

3.2.2 Study 1b-Quantitative Phase

Study 1b developed a questionnaire based on the findings of the in-depth interviews, which included all the motivations mentioned in study 1a. Each of the 19

motivations was converted to questionnaire items that asked respondents to rate on a 5-point Likert scale (1 = Strongly disagree, 5 = Strongly agree). The purpose of study 1b was to achieve a simple structure of instrument by identifying the common factors and the related manifest variables, as well as test the reliability and validity of the instrument. From the previous literature, the exploratory factor analysis (EFA) is required when a researcher designs a scale in conjunction with the literature or interviews or when the scale itself is of unknown latitude and needs to explore to find out which questions belong to a latitude (i.e. a factor)(e.g., Fabrigar et al., 1999; Finch & West, 1997). Also, the EFA is a recommended way to measure the reliability of the questionnaire (Iantovics, Rotar & Morar, 2019). The reliability assessment was done using assessing internal consistency (Cronbach's alpha). The following sections and sub-sections detail the various steps within this phase, which includes pilot study, survey development, data collection and data analysis.

Pilot Study. Following the expert reviews and the subsequent adjustments to the items, the pilot study was conducted to further modify the surveys as necessary prior to the main study (Study 1b). From the initial reliability analysis, the pilot study identified poorly performing survey questions as well as scale items. These steps are essential in ascertaining the feasibility of the main study and pre-testing the instruments (Baker, 1994) by allowing for a trial run (Polit, Beck, & Hungler, 2011). Proceeding with a pilot study in this manner yields various advantages. For instance, preliminary testing of the hypotheses that led to testing more precise hypotheses in the main study, changing and dropping some hypotheses, checking of the planned statistical and

analytical procedures, and reducing the number of unanticipated problems. The present research utilized the following procedures put forward by Peat et al., (2002, p. 123): administer the questionnaire to pilot subjects in exactly the same way as it would be administered in the main study, ask for participant feedback, record the time taken to complete the questionnaire to determine whether this is a reasonable amount of the respondent's time to take up, and discard all unnecessary, difficult or ambiguous questions.

Respondents. The pilot study respondents were older adults aged between 55 and 75 years old situated in various major cities in China. The respondents were acquaintances of the researcher who were reached in person. The pilot study was conducted with a study population consisting of 50 older adults, each of whom answered both of the surveys on their health-related motivations to use mobile health technology. The researcher attempted to maximize the diversity of the sample in terms of demographic variables such as age, gender, ethnicity, and socioeconomic classification.

Instruments. The surveys for the pilot study were developed following the analysis of the in-depth interviews. At this point, input was also sought from the expert reviews. The surveys consisted of two main sections: health-related motivations to use mobile health technology and demographic questions. The survey questionnaires used a five-point Likert scale to collect data for various predictive variables. The choices ranged from strongly disagree to strongly agree. When survey instruments are used to measure variables in a scientific study, Likert-type scales are very common (Simon & Goes, 2013). A five-point Likert design was chosen because it is more accurate, easier

to use, and provides a better reflection of participants' responses (Finstad, 2010). According to Rukmana (2010), the Likert scale is an interval scale measurement that is commonly used in experimental research. An interval scale is a type of measurement that bases attributes on specific numerical scores or values with equal distances between the attributes. The pilot survey was designed based on the recommendations of de Leeuw, Hox, and Dillman (2008). In addition, a connection was maintained between the survey and the study's research questions (Anfara et al., 2002). The survey instruments are listed in Appendix E.

Procedure. University of Nottingham, Ningbo, China approves the pilot study and main study. All potential respondents were sent a message on WeChat with all the relevant study information and a link to take the survey on WJX.COM (a famous online survey website). On average, it took the respondents around 15 minutes to complete the survey. Survey responses were solicited in September 2020 using snowballing techniques.

Data Analysis. Data collected during the pilot study were used to determine how accurately the scale items reflected their respective domains. By including this step, the total number of items was reduced to a more manageable number through the deletion of poorly performing items, item discrimination, and initial item and reliability analyses performed with SPSS Statistics 28.0.1 statistics software. As a result, items were grouped according to their domain, followed by an analysis of point-biserial correlations yielding Cronbach's alpha estimates. Items with estimated point-biserial correlations between 0.50 and 0.96 were retained, whereas those falling outside of the desired range

were eliminated. During each iteration, new estimates were evaluated until all the assessed items were within the acceptable range noted above.

The Main Study. After the pilot study, the process of scale refinement and finalization progressed through a self-reported web-based survey with a cross-sectional design.

Respondents and Procedure. A cross-national data was collected from 23 December to 3 January 2021 using online survey. Wright (2005) explained that performing surveys on the internet may be beneficial as it can protect participants' privacy, save cost and time. Additionally, the responses are validated in online surveys, producing cleaner data as a result (Creswell, 2013). As noted above, the present study used WJX.COM (a famous online survey website) to distribute the questionnaires to the research sample. WJX.COM administered the survey instrument featuring closed-ended questionnaire to a randomly selected sample from its pool of survey takers. This approach is similar to those used in other quantitative studies investigating the adoption of innovative technologies (Efuetlateh, 2020).

The sample criteria included are older individuals (aged 55-75), living in an urban area and regularly use (or have used) mobile health platform (i.e., WeChat health applet and health care mobile applications). To meet the inclusion criteria for this study, participants had to answer screening questions about their age and whether they used/are using mobile health technology. Those under the age of 55 who never use mobile health services will be excluded. If participants answered yes, they were informed of the research purpose, research process, voluntary participation, anonymity, expected

benefits and different ethical considerations before the research officially started. Additionally, this study used trap questions, repeated IP detection and time control to eliminate invalid cases in the process of administering the questionnaires.

Instruments. The questionnaire was created after analysing the in-depth interviews and receiving feedback from expert reviews as well as from a pilot study. The health-related motivations discovered in study 1a were converted into questionnaire items that asked respondents to rate them on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). A cross-sectional web-based self-reported survey was conducted. According to Sue and Ritter (2007), a web-based survey has the benefits of being affordable, quick to complete, anonymous, accessible to a sampling frame, and direct data entry. The questionnaire was divided into two sections: health-related motivations for using mobile health technologies and demographic questions. The survey instruments are listed in Appendix F.

Data Analysis. Data analyses were carried out using the SPSS Statistics 28.0.1. First, descriptive statistics (item means and standard deviations) were calculated, and item distributions were checked for normality. Besides, a series of t-tests was performed to test whether there are statistical differences in demographic variables among the subject samples.

Subsequently, as a dimension reduction technique, an exploratory factor analysis (EFA) was used. The EFA helped discover the number of scale items by revealing patterns of correlations among the observed variables and isolating coherent subsets of variables that correlated, distinct from other subsets of variables. EFA was carried out

using principal component analysis (PCA) and varimax rotation. Under the assumption that the factors are uncorrelated and independent, the rotation or orthogonal method and the standard method of varimax were employed. Furthermore, the KMO test is included as part of EFA to determine the suitability of the data and the sampling adequacy. The correlations between items are calculated and evaluated using Bartlett's test of sphericity (Henson and Roberts, 2006). The dimensions' reliability was assessed using internal consistency and Cronbach's alpha.

Ethical considerations. This study has been approved by the University of Nottingham's Ethics Committee in Ningbo, China. After explaining the study's objectives to the participants, informed consent forms were obtained from them. They were informed that the confidentiality of their information and that they have the right to leave the study at any time.

3.3 Study 2: Quantitative Method Design for Model Evaluation

The researchers note here that study 1 identified the health-related motivation of older people through a mixed research approach. Extrinsic motivation and age-specific factors were identified in the literature review chapter. Building on this work, the researchers developed the Technology Adoption Model for Older People, which is presented in the introduction (see Chapter 1, Section 1.3). The aim of study 2 was to test the predictive and explanatory power of the proposed research model. Specifically, the quantitative study aims to examine how will health-related and extrinsic motivations predict older adults' behavioural intentions to use mobile health technology (RQ 2 and RQ 3 and related hypotheses).

Next, the researcher will elaborate on why the quantitative research method is selected for study 2. Qualitative research is a method utilised by researchers to investigate and understand how people interpret social or human problems (Creswell, 2002). In qualitative research, the researcher's primary goal is to understand and explain a group of people's situation, feelings, perceptions, attitudes, values, beliefs and experiences (Kumar, 2019). Mileu and Queiros et al. (2018) supports the above statement by stating that qualitative methods are not concerned with the representativeness of numbers but rather with obtaining in-depth and interpretive information to better understand the research question. Quantitative research methods are used to test theories by assessing the relationships between variables (Creswell, 2018; Sousa et al., 2007). This is done through deductive reasoning and induction. Deductive reasoning uses an established theory or framework with concepts representing variables; the researcher then collects data to test whether the framework is supported (Sousa et al., 2007). An overview explains how data collected from a sample can be extended to a larger population (Creswell & Guetterman, 2019). After evaluating the various research methods available, the quantitative research method was chosen to answer the research question posed in this thesis as it is the best method to describe trends and explain the relationships between variables in the population (Creswell & Guetterman, 2019). In this study, the quantitative approach was chosen because it facilitates the collection of numerical data that can be analysed using statistical procedures (Creswell, 2018). The quantitative approach was appropriate for this study because an integrated research model was tested to determine whether health-related and extrinsic motivations

predicted behavioural intentions to adopt mobile health technology among older Chinese people.

Participants and Procedure. Cross-national data were collected from 23 March 2021 to 5 April January 2021. Except the participants recruiting, all other procedures (i.e., sampling method, participants recruiting and survey-taking) were the same as those in study 1b. In study 2, the inclusion criteria of participants are older individuals (aged 55-75 years old) living in an urban area and have not used mobile health technology.

Instrument. The surveys in study 2 were divided into three sections: 1) Study information: the researcher's information and signature, the rights of research participants, survey instructions, and response time; 2) The motivations for adopting mobile health; 3) Participant demographics: demographic information provided by participants included their age, gender, monthly income, and educational level (Quazi & Talukder, 2011). The first section collected basic information from the respondents to determine if they qualify for the study and request, they provide their informed consent to participate in the study. The respondents who met the inclusion and exclusion criteria and voluntarily agreed to participate in the study proceeded to the second section of the survey, where they answered the core mobile health adoption questions. The second section of the survey was mandatory because it helped prevent partial data collection, thus ensuring the validity and reliability of the study results. The third section asked the demographic background information.

The survey questionnaires utilized a five-point Likert scale design to collect data

for various predictive variables. The choices ranged from strongly disagree to strongly agree. Likert-type scales are very common when survey instruments are used to measure variables in a study (Simon & Goes, 2013). A five-point Likert design was used because it is more accurate, easier to use, and a better reflection of participants' responses (Finstad, 2010). The Likert scale, according to Rukmana (2010), is an interval scale measurement that is commonly used in experimental research. An interval scale is a type of measurement that compares attributes based on numerical scores or values with equal distances between them. The details of all the constructs and items used in the questionnaire can be found in Appendix G.

Study 2 modified and re-used the scale of TAM and several scales of aging-related factors. These scales have been used in numerous technology adoption studies, and their validity has been proven multiple times (e.g., Efuetlateh, 2020; Scott, 2020; Patton, 2014; Fox and Connolly, 2018). Furthermore, the questionnaire items are clear and easy to understand. The questionnaire was used to collect information from participants about the variables that predict the behavioural intention to adopt mobile health technology. The independent variables are perceived ease of use, perceived usefulness, perceived risk, resistance to change, self-efficacy, technology anxiety. The dependent variable is behavioural intention to adopt mobile health technology. Given that health-related motivations are a scale developed by the researcher herself and has been thoroughly described in study 1, no further elaboration on health-related motivations will be given here. Next, the independent variables and dependent variables are elaborated.

Items for perceived usefulness was originally developed by Davis (1989). The researcher adopted it into the current context. It was assessed on a six-item Likert scale. PU1. Mobile health technology (e.g., WeChat health applet and health care apps) can help me manage my daily health more efficiently. PU2. Mobile health technology can make daily health management easier. PU3. WeChat health applet and health care Apps (e.g., We Doctor, JDH, Chunyu Doctor, etc.) can help me record health monitoring data more accurately. PU4. Mobile health technology can make online medical registration more convenient and faster; PU5. Mobile health technology can help me get authoritative health information. PU6. Generally speaking, using mobile health technology can be good for my health. Items for perceived ease of use was originally developed by Davis (1989). The researcher adopted it into the current context. It was measured on a five-item Likert scale. PEU1. I can easily learn to use most functions of mobile health services (i.e., WeChat health applet and health care Apps). PEU2. For me, the instruction and guidelines of mobile health devices (i.e., smartphones and wearable activity trackers) are easy to understand. PEU3. I found it easy to use mobile health devices to do what I want. PEU4. I can easily use most functions of the WeChat health applet and health care Apps. PEU5. Generally speaking, mobile health technology is easy to use. Items for resistant to change was originally developed by Atchley (1989). The researcher adopted it into the current context. It was measured on a four-item Likert scale: RTC1. I will not let mobile health technology change how I used to deal with health-related problems. RTC2. I will not let mobile health technology to change my daily health management. RTC3. I will not let mobile health to change how I interact

with other people on health-related issues. RTC4. Overall, I will not let mobile health services to change the way I currently live. Items for technology trust was originally developed by Gefen (2002). The researcher adopted it into the current context and it was measured on a four-item Likert scale. TT1. Due to mobile health technology, our lives are easier and more comfortable. TT2. Due to mobile health technology, our lives are safer. TT3. I believe that mobile health technology is created for the good of human beings. TT4. Generally speaking, I think mobile health technology is trustworthy. Items for self-efficacy was originally developed by Miltiadou & Yu (2000). The researcher adopted it into the current context. It was measured on a three-item Likert scale. SE1. Even if no one teaches me, I can learn to use most functions of mobile health platforms. SE2. I believe I can use most functions of mobile health technology, even though I have never used similar technology before. SE3. I am confident that I can effectively use mobile health technology for daily health management. Items for technology anxiety was originally developed Loyd & Gressard (1984). The researcher adopted it into the current context and measured it on a four-item Likert scale. TA1. I feel anxious and apprehensive about using mobile health services (technology). TA2. I have avoided mobile health services because it is unfamiliar to me. TA3. I hesitate to use mobile health services for fear of making mistakes I cannot correct. TA4. mobile health services make me feel confused. Items for perceived risk was originally developed by Charlton and Birkett (1995). The researcher adopted it into the current context and measured it on a four-item Likert scale. PR1. I am worried that using mobile health services will disclose personal data. PR2. I am worried that the owner of mobile health services will sell my

personal data to others. PR3. Compared with face-to-face consultation, I am worried about the efficiency and accuracy of online medical consultation services. PR4. I am worried that my credit card/debit card information may be stolen when I pay on the WeChat health applet and/or health care apps. Items for behavioural intention was originally developed Davis (1989). The researcher adopted it into the current context and measured it on a three-item Likert scale. BI1. I intend to use mobile health services to maintain my health. BI2. I believe I will continue using mobile health services to maintain my health. BI 3. I will recommend mobile health services to others.

Additionally, several control variables have been added by the researcher. By adding control variables, the research model will increase the explanatory power in a particular context. Therefore, this study included some demographic variables (i.e., gender, age, education level, monthly income, and health status) as control variables. Furthermore, previous research has indicated that some demographic variables are closely related to people's behavioural intention to adopt new technology (Okrah, 2021; Zhang & Jung, 2019), so the researcher controlled them to isolate the unique association between the investigated variables.

Data Analysis. The researcher used both Statistical Package for the Social Sciences (SPSS) 28 .0.1 and Smart PLS 3 for data analysis. Choi and Kim in their recent works utilized the SPSS software package for the handling and coding of their data and used PLS-SEM to analyse the research model and test the proposed hypotheses (Choi and Kim, 2016). Smart PLS is a software with graphical user interface for variance-based structural equation modelling using the partial least squares path modelling

method (PLS-SEM). Increasingly a number of scholars and academics are using Smart PLS for data analysis in their research studies (e,g., Rouf & Akhtaruddin, 2018; Thaker et al., 2020; Hokororo & Michael, 2019). In SEM, a model is tested for quality of the measures (Measurement Model) and next for the interrelationship between the variables (Structural Model). This section discusses in detail the Measurement and Structural model. According to Hair et al. (2014), the primary goal of PLS-SEM is to predict the dependent variable. Since this is a correlational prediction study, the researcher used Smart PLS software to predict the older adults' behavioural intention to adopt mobile health technology.

The use of Smart PLS for analysing data consist of evaluating the measurement model and structural model (Hair et al., 2014). Evaluation of the measurement model was done to assess the convergent validity, discriminant validity, and construct reliability of the measurement scale. This was followed by evaluating the structural model's quality and testing the hypothesized relationships between the independent and dependent variables. Hair et al. (2014) recommended that the R-squared (coefficient of determination) and path coefficients be used to evaluate a research model's quality.

Ethical Considerations. This study has been approved by the University of Nottingham's Ethics Committee. After explaining the study's objectives to the participants, they signed written informed consent forms and were assured of the confidentiality of their information. All participants were told they could leave the study at any time.

Chapter 4 Results

4.1 Overview

This chapter described the results of study 1 (a & b) and study 2, including the demographic information, initial items generation, the results of exploratory factor analysis, the results of two pilot studies. And most importantly, a detailed analysis of the results of the structural equation model, which contains an analysis of measurement model and structural model. The results were used to answer the research questions and to either accept or reject the hypotheses.

4.2 Results of Study 1a

Demographic Details

A total of 20 participants (50% Males, 55–72 years old) were selected. The gender was quite balanced. The average age was 62.85 (ranging from 55 to 72 years old); 60% received a middle school or higher degree (n=12); 50% had a monthly personal income between CNY 3001-5000 (n=10). Six participants reported they have a bad health condition; Seven participants reported they have a good health condition; Seven participants reported they have moderate health conditions. Table 1 shows the demographic characteristics of the participants.

Table 1

Demographic Information of Participants (Study 1a)

Participants	Age (in years)	Gender	Education	Marital status	Monthly Income	Health Status
P1	65	Male	High school	1	3	4
P2	60	Male	Bachelor	1	2	4
P3	55	Male	Master	1	4	4
P4	57	Male	Bachelor	2	2	4
P5	69	Female	Middle School	1	3	2
P6	66	Female	High school	1	3	3
P7	70	Male	Bachelor	3	3	3
P8	52	Female	Middle School	2	2	4
P9	64	Male	High school	1	2	3
P10	65	Female	High school	1	2	3
P11	72	Female	Middle School	1	2	2
P12	68	Male	Middle School	3	3	4
P13	63	Male	Bachelor	1	3	3
P14	62	Female	Middle School	1	2	3
P15	57	Male	Master	1	4	2
P16	56	Female	Bachelor	1	3	2
P17	58	Female	Middle School	1	2	2
P18	69	Male	Middle School	1	2	3
P19	68	Male	Middle School	1	2	4
P20	61	Female	Master	1	3	2

Note. (1) N=20; (2) Monthly income: 1=1000RMB or below, 2=1001-3000RMB, 3=3001-5000RMB, 4=5001-7000RMB, 5=7001/Above RMB.
(3) Marital status:1=Married; 2=Divorced; 3=Widowed.
(4) Health status: 1=Very bad, 2=Bad, 3=Moderate, 4=Good, 5=Very good

Initial items pool generations. Regarding the data analysis, study 1a identified 30 unique motivations for utilising mobile health technology for health-related gratifications. The open-ended response was analyzed using content analysis (e.g., Barnes, Ponder, & Dugar, 2011; Bitner, Booms, & Mohr, 1994; Bitner, Booms, & Tetreault, 1990; Keaveney, 1995). In order to obtain good reliability, the researcher used two independent coders to analysis the interview transcripts and an expert panel review was conducted to ensure validity. The following section will discuss it in a more detailed way.

To achieve acceptable inter-coder reliability, two independent coders with advanced degrees in Information systems and media and communication studies sorted, coded, and categorised all self-reported responses into categories. The first coder then classified each response. These categories were then given to the second coder, who was able to categorize all the responses. The outcomes from the first and second coders were then compared. Previous research recommended Cohen's kappa, which corrects for the possibility of chance agreement between judges (e.g., Zhang, Xu &Jiang, 2021; Zhang & Jung; 2019; Dugar, 2017). Cohen's kappa should be greater than 0.80 in order to be considered significant (McHugh, 2012). There were a few coding disagreements that were resolved through face-to-face discussions. The agreement level for the subjects in this study was 89 % when using Cohen's kappa, which corrects for chance agreement.

Table 2

Initial Items Pool

Items
1. I have acquired all kinds of medical knowledge and healthcare information through mobile health services (i.e., WeChat health applet and health care apps), which is difficult for me to obtain from other channels
2. convenience
3. mobile health services help me to access tailored and customized healthcare advice from online disease diagnosis
4. It is convenient and time-saving to use WeChat health applet and health care apps to book online medical registration and treatment
5. WeChat offers online medical diagnosis and telehealth, which helps me quickly find famous doctors I would normally struggle to get an appointment with
6. I can get more health education on WeChat health applet and health care apps
7. To get professional drug information
8. WeChat health applet and health care apps provides timely and authoritative coverage of public health issues and health policy
9. I can search for any health information I need from mobile health platform
10. See others 'interested health information
11. mobile health services help me manage my health
12. To filter health-related misinformation and offer high quality information
13. Express care to others through WeChat and healthcare apps
14. To obtain up to date health information
15. Follow health-related official account on WeChat
16. mobile health platforms allow me to monitor and filter health-related rumors and fake news
17. My community uses WeChat health applet and health care apps to issue health notifications such as vaccinations and free clinic information
18. Get others' opinions about purchasing health products
19. It is very efficient and convenient for the community to deliver health notifications through WeChat health applet and health care apps
20. Through the WeChat health applet and health care apps, I can keep abreast of the latest developments in public health events
21. To express personal stance on health issues makes me feel satisfied
22. It makes me feel empowered to share health information and to give health-related advice to friends on WeChat groups and health care apps
23. I can obtain emotional and informational support from others on mobile health platform when discussing some health issues and personal health conditions

24. I often share my experiences and knowledge on medication, daily care, diet and exercise with people with similar health conditions on WeChat health applet and health care apps
25. I often ask my friends to exercise together through WeChat, which improved my enthusiasm
26. Store the needed information
27. Keep up with cutting-edge technology
28. Habitual use
29. Seek professional tips for general health management
30. WeChat sports and health code help me manage my health
31. Get closer with family and friends

Table 2 (continued)

Initial Items Pool

Items
32. I often share my experiences and knowledge on medication, daily care, diet and exercise with people with similar health conditions on WeChat health applet and health care apps
33. I often ask my friends to exercise together through WeChat, which improved my enthusiasm
34. Store the needed information
35. Keep up with cutting-edge technology
36. Habitual use
37. Seek professional tips for general health management
38. WeChat sports and health code help me manage my health
39. Get closer with family and friends

Results from Expert Reviews.

To ensure the validity of initial questionnaire items, subject matter expert review is often a good first step in instrument development to assess content validity, in relation to the area or field researchers are studying. Content validity indicates the extent to which items adequately measure or represent the content of the property or trait that the researcher wishes to measure. Six expert reviewers examined the initial pool of items, rated them on clarity, representativeness, and difficulty, and made a final determination (i.e., keep as is/modify/reject) for each item. Expert reviewers from various

backgrounds were carefully selected to provide technical knowledge (industry-oriented experts), process-oriented knowledge (professors), and explanatory knowledge (participants) of mobile health adoption. The expert review protocols were emailed to them. In overall, the initial items pool scored more than 80% on clarity (>= 20), representativeness (>= 20), and item difficulty (= 5), and the overall decision (keep as is/modify/discard) was made based on an inter-rater agreement of 80% or higher. Experts saw redundancy in the initial items pool, such as “to obtain up-to-date health information” and “to help me to access the newest health news”; “convenience” and “It is convenient and time-saving to use We Chat health applet and health care apps to book online medical registration and treatment”; “Access to more tailored information” and “mobile health services help me to access tailored and customized healthcare advice from online disease diagnosis”. Therefore, similar responses were combined into the same category.

Instruments were finalized after the expert reviews. A total of 23 items were retained as shown in Table 3. Drawing upon the interviews with 20 older adults, the most frequent health-related motivation mentioned was “to acquire health information” (n = 20) followed by “mobile health services help me to access tailored and customized healthcare advice from online disease diagnosis and treatment” (n = 17). Other common motivations included: “I can get more health education on WeChat health applet and health care apps” (n = 15), “To express personal stance on health issues makes me feel satisfied through mobile health platform” (n = 10), and “I feel empowered Detailed descriptions for each motivation are provided below. to sharing health information and

to give health-related advice to friends on WeChat groups and health care apps" (n = 6).

Table 3

Initial Items

Items	Frequency	Items	Frequency
I have acquired all kinds of medical knowledge and healthcare information through mobile health services (i.e., WeChat health applet and health care apps), which is difficult for me to obtain from other channels	20	mobile health platforms allow me to monitor and filter health-related rumors and fake news	9
mobile health services help me to access tailored and customized healthcare advice from online disease diagnosis	17	My community uses WeChat health applet and health care apps to issue health notifications such as vaccinations and free clinic information	9
It is convenient and time-saving to use WeChat health applet and health care apps to book online medical registration and treatment	15	It is very efficient and convenient for the community to deliver health notifications through WeChat health applet and health care apps	8
WeChat offers online medical diagnosis and telehealth, which helps me quickly find famous doctors I would normally struggle to get an appointment with	15	Through the WeChat health applet and health care apps, I can keep abreast of the latest developments in public health events	7
I can get more health education on WeChat health applet and health care apps	15	To express personal stance on health issues makes me feel satisfied	7
To get professional drug information	14	I feel empowered to sharing health information and to give health-related advice to friends on WeChat groups and health care apps	6
WeChat health applet and health care apps provides timely and authoritative coverage of public health issues and health policy	13	I can obtain emotional and informational support from others on mobile health platform when discussing some health issues and personal health conditions	4
I can search for any health information I need from mobile health platform	10	I often share my experiences and knowledge on medication, daily care, diet and exercise with people with similar health conditions on WeChat health applet and health care apps	3
mobile health services help me manage my health	10	I often ask my friends to exercise together through WeChat, which improved my enthusiasm	3
To filter health-related misinformation and offer high quality information	10	See others ‘interested health information	3
Express care to others through WeChat and healthcare apps	9	Keep up with cutting-edge technology	2
Follow health-related official account on WeChat	9		

4.3 Results of Study 1b

Demographic details

There were 433 returned responses, for an overall response rate of 68.85% of the total number of participants; 45 invalid returned responses were eliminated before the final data analysis. The reason for non-participation was mainly due to a lack of time to complete the survey. Overall, 52.19% (n = 266) were female; the average age was 61.76 (ranging from 55 to 75 years old); 84.53% (n=366) received a junior high school or higher degree; 38.09 % (n=165) had a monthly personal income between CNY 3001-5000 and above. 78.5 % (n=340) reported they are in moderate health status or above. To ensure the accuracy and scientificity of the analysis results, a series of t-tests were performed to test whether there are statistical differences in demographic variables among the subject samples. The results indicated that gender has no significant difference with respect to age, $\chi 2$ (2,432) = 0.34, p = 0.79; monthly income, $\chi 2$ (2,432) = 8.98, p = 0.32, health status , $\chi 2$ (2,432) = 0.69, p = 0.67， and education level $\chi 2$ (2,432) = 9.67, p = 0.58. Table 3 provides the detailed demographic information of the participants.

Table 4

Demographic Information of Participants (Study 1b)

Measure	Range	*N (SD)*	Percentage (%)
Gender	Male	167	38.56
	Female	266	61.43
Age	M=61.76	SD=8.71	
Education	Not educated/Primary School	67	15.47
	Junior high School	97	22.40
	High School	172	39.72
	Bachelor's degree	72	16.62
	Master's degree/above	25	5.77
Health condition	Very bad	26	6.01
	Bad	67	15.47
	Moderate	135	31.17
	Good	147	33.94
	Very good	58	13.39
Monthly income	1000RMB or below	93	21.47
	1000-3000RMB	175	40.41
	3001-5000RMB	77	17.78
	5001-7000RMB	68	15.70
	7001/Above RMB	20	4.61

Note. n = 433

The Result of Exploratory Factor Analysis

Study 1b further identifies the types of health-related motivations for using mobile health technology (RQ1); The Kaiser-Meyer-Olkin (KMO) test for each item was greater than 0.5, with an overall value of 0.89, which is greater than 0.7, indicating that the sample size and factorability requirements for conducting EFA have been met (Kaiser & Rice,1974). The Bartlett's Test of Sphericity, converted to a chi-square statistic, was significant at $p< 0.001$. As a result, it indicates adequate collinearity ($p<0.05$) between items, indicating that the correlation matrix did not come from an identity matrix population and that the sample size was large enough to allow

component structure analyses.

Varimax, an orthogonal rotation method, was used to achieve a simple structure (Bryant & Yarnold, 1995). This varimax rotation in conjunction with Kaiser Normalization (Kaiser, 1958) aided in the identification of orthogonal (independent) factors. After rotation, factor loadings greater than 0.10 were examined, even though only item loadings greater than 0.50 were considered relevant for interpretation. Following the deletion of these four items, 19 items were retained for a second EFA run. The researcher identified six types of health-related motivations, which accounted for 68.07 percent of the variance. The instrument was then constructed by averaging the ratings of all items representing the various factors. The researcher will discuss the scales separately.

As for the measurement of reliability and validity of instruments. Validity and reliability are two important factors to consider when developing and testing any instrument (e.g., content assessment test, questionnaire) for use in research. Validity refers to the degree to which an instrument accurately measures what it intends to measure. Three common types of validity for researchers to consider are content, construct, and criterion validities. Content validity indicates the extent to which items adequately measure or represent the content of the property or trait that the researcher wishes to measure. An expert panel review is often a good first step in instrument development to assess content validity in relation to the area or field researchers are studying. Construct validity indicates the extent to which a measurement method accurately represents a construct (e.g., a latent variable or phenomena that can not be

measured directly, such as a person's attitude or belief) and produces an observation distinct from that which is produced by a measure of another construct. Common methods to assess construct validity include, but are not limited to, factor analysis, correlation tests, and item response theory models (including the Rasch model). Criterion-related validity indicates the extent to which the instrument's scores correlate with an external criterion (i.e., usually another measurement from a different instrument) either at present (concurrent validity) or in the future (predictive validity). A common measurement of this type of validity is the correlation coefficient between two measures. In this study, the content validity has been tested by the expert panel review. The construct validity was tested by exploratory factor analysis. The reason why confirmatory factor analysis is not used is that this scale is not a mature scale but a newly-developed instrument. One thing that needs to be explained is that the researcher measured the reliability and validity of the instrument in study 1b. Also, study 2 conducted a pilot study in which the researcher tested the measurement model to verify the reliability and validity of the instrument. See Chapter 4, section 4.5.1 for more details.

Table 5

Exploratory Factor Analysis of Health-related Motivations of Using Mobile Health Services

Motivation Items	Factors Load						*M*	*SD*
	1	2	3	4	5	6		
Social Support								
SS1	0.77	0.12	0.03	0.16	0.14	0.08		
SS2	0.63	0.21	0.12	0.13	0.04	0.00	3.80	0.80
SS3	0.70	0.18	0.11	0.13	0.09	0.08		
Information Need								
IN1	0.22	0.78	0.14	0.10	0.15	0.03		
IN2	0.15	0.75	0.09	0.10	0.13	0.11	3.66	0.83
IN3	0.19	0.74	0.05	0.17	0.18	0.09		
IN4	0.22	0.72	0.10	0.12	0.15	0.12		
Technological Convenience								
TC1	0.12	0.06	0.89	0.05	0.16	0.18		
TC2	0.11	0.12	0.84	0.03	0.18	0.15	3.88	0.88
TC3	0.10	0.15	0.83	0.05	0.17	0.11		
Social Involvement								
SI1	0.31	0.15	0.05	0.21	0.13	0.16		
SI2	0.20	0.27	0.22	0.49	0.17	0.19		
SI3	0.22	0.10	0.14	0.73	0.13	0.13	3.70	0.90
SI4	0.17	0.19	0.18	0.72	0.09	0.12		
SI5	0.18	0.11	0.03	0.73	0.24	0.07		
Surveillance needs								
SN1	0.19	0.18	0.19	0.16	0.74	0.12		
SN2	0.22	0.15	0.04	0.05	0.81	0.06	3.79	0.86
SN3	0.13	0.15	0.06	0.12	0.81	0.07		

Note. Factors determined by item loading of 0.5 or higher and no cross-loadings higher than 0.5. The item SI1, SI2 were highlighted because these items had low outer loading values.

Table 5 (continued)

Exploratory Factor Analysis of Health-related Motivations of Using Mobile Health Services

Motivation Items	Factors Load						*M*	*SD*
	1	2	3	4	5	6		
Self-Presentation								
SP1	0.12	0.134	0.191	0.13	0.14	0.89		
SP2	0.15	0.164	0.175	0.12	0.13	0.88	3.64	0.95
SP3	0.13	0.241	0.071	0.34	0.67	0.87		
Eigenvalue	3.19	2.733	2.487	2.25	2.08	1.78		
Variance explained (%)	15.95	13.66	12.43	11.26	10.42	8.91		
Cronbach's alpha	0.84	0.73	0.71	0.84	0.81	0.89		

Note. Factors determined by item loading of 0.5 or higher and no cross-loadings higher than 0.5.

The first factor, labelled as "social support" factor accounted for 23.07% of the variance and contained three items (e.g., my community uses WeChat and health care apps to issue health notifications such as vaccinations and free clinic information). It is defined as the assistance that older people receive from other people, groups, and larger communities via the Internet or other mobile devices. The mean score for all three questions was 3.80. The mean scores for the items ranged from 3.07 to 3.90. Cronbach's alpha was 0.79, indicating high reliability. Table 6 summarizes the item statistics.

Table 6

Item Statistics of Social Support

	Items	*Mean*	*SD*	Factor loading
SS1	1. I can obtain emotional and informational support from others on WeChat health applet and health care apps when discussing health issues and personal health conditions	3.90	0.83	0.77
SS2	2.I am a member of some online health and wellness groups. When we talked about health-related topics, I felt emotional support and comfort from other group members	3.75	0.76	0.63
SS3	3.My community uses WeChat and health care apps to issue health notifications such as vaccinations and free clinic information.	3.07	0.86	0.70
Mean	3.80			
SD	0.85			
Eigenvalue	3.06			
Cronbach's alpha	0.79			

The second factor, labelled as "health information need", accounted for 14.13 percent of the variance. (e.g., I can get more health education through mobile health services platform). It was defined as an older individual's desire or need to find and obtain health-related information in order to satisfy conscious or unconscious health-related gratifications. The average score for the five items was 3.67. Item mean scores ranged from 2.77 to 3.98. Cronbach's alpha of 0.86 indicated high reliability. Table 7 summarizes the item statistics.

Table 7

Item Statistics of Health Information Need

	Items	*Mean*	*SD*	Factor loading
HIN1	I can get more health education through mobile health services platform	3.66	0.83	0.78
HIN2	mobile health services help me to access tailored and customized healthcare advice from online diseases diagnosis and treatment	3.98	0.76	0.75
HIN3	I have acquired all kinds of medical knowledge and healthcare information through mobile health services, which is difficult for me to obtain from other channels	2.77	0.86	0.74
HIN4	I can search for any health information I need from mobile health services	3.01	0.65	0.72
Mean	3.66			
SD	0.83			
Eigenvalue	3.54			
Cronbach's alpha	0.86			

The third factor, labelled as "technological convenience," accounted for 12.33% of the variance, with three items (e.g., It is convenient and timesaving to use mobile health services to book online medical registration). It was defined as older people having easier access to health convenience through the internet and mobile technology. The average score for all three items was 3.88. Item mean scores ranged from 3.08 to 3.71. Cronbach's alpha of 0.88 indicated high reliability. Table 8 summarizes the item statistics.

Table 8

Item Statistics of Technological Convenience

	Item	*Mean*	*SD*	Factor loading
TC1	mobile health services offer online medical diagnosis and telehealth, which helps me quickly find famous doctors I would normally struggle to get an appointment with	3.71	0.93	0.88
TC2	mobile health services help me to access tailored and customized healthcare advice from online diseases diagnosis and treatment	3.08	0.90	0.84
TC3	I have acquired all kinds of medical knowledge and healthcare information through mobile health services, which is difficult for me to obtain from other channels	3.34	1.22	0.83
Mean	3.88			
SD	0.88			
Eigenvalue	3.06			
Cronbach's alpha	0.88			

The fourth factor, labelled as "social involvement," accounted for 10.57 % of the variance (eigenvalue = 2.69), with five items (e.g., Through mobile health services, I can keep abreast of the latest developments in public health events). It was defined as older individuals who construct and strengthen social capital and norms via the Internet and/or mobile devices. This usually entails activity (doing something), interaction (at least two people), and social exchange (giving or receiving something from others). The average score for the five items was 3.70. Item mean scores ranged from 3.61 to 3.82. Cronbach's alpha of 0.88 indicated high reliability. Table 9 summarizes the item statistics.

Table 9

Item Statistics of Social Involvement

	Items	*Mean*	*SD*	Factor loading
SI3	1. I often ask my friends to exercise together through WeChat health applet and health care apps, which improved my enthusiasm	3.61	1.14	0.73
SI4	2. To show my care to my family and friends by sharing meaningful health information on mobile health services	3.69	1.05	0.72
SI5	3. I often share my experiences and knowledge on medication, daily care, diet, and exercise with people with similar health conditions on WeChat health applet and health care apps	3.82	1.05	0.73
Mean	3.70			
SD	0.90			
Eigenvalue	2.69			
Cronbach's alpha	0.87			

The fifth factor, labelled as "self-presentation," accounted for 10.06 % of the variance, with three items (e.g., mobile health services allow me to monitor and filter health-related rumours and fake news). Self-expression refers to how older people present themselves in order to control or shape how others (referred to as the audience) perceive them. It entails expressing oneself and acting in a way that creates the desired impression. The average score for the three items was 3.64. Item mean scores ranged from 3.08 to 3.71. Cronbach's alpha of 0.85 indicated high reliability. Table 10 summarizes the item statistics.

Table 10

Item Statistics of Self-Presentation

	Items	*Mean*	*SD*	Factor loading
SP3	1. I feel empowered to share health information and to give health-related advice to WeChat friends and groups	3.61	1.14	0.89
SP4	2. To express personal stance on health issues through mobile health platforms make me feel satisfied	3.50	0.77	0.88
SP5	3. Through health education, I think I can better understand diseases and take care of myself.	3.43	1.05	0.87
Mean	3.64			
SD	0.95			
Eigenvalue	2.69			
Cronbach's alpha	0.85			

The sixth factor labelled "surveillance needs," accounted for 9.07 % of the variance, with three items (e.g., To filter health-related misinformation and offer high-quality information for WeChat friends and groups). Surveillance was defined as the monitoring of behaviour, many activities, or information for the purpose of gathering information, influencing, managing, or directing. The average score for the three items was 3.70. Item mean scores ranged from 3.08 to 3.71. Cronbach's alpha of 0.87 indicated high reliability. Table 11 summarizes the item statistics.

Table 11

Item Statistics of Surveillance Needs

	Items	*Mean*	*SD*	Factor loading
SN3	I feel empowered to share health information and to give health-related advice to WeChat friends and groups	3.61	1.14	0.74
SN4	To express personal stance on health issues through mobile health platforms make me feel satisfied	3.50	1.05	0.81
SN5	Through health education, I think I can better understand diseases and take care of myself.	3.43	1.05	0.81
Mean	3.79			
SD	0.86			
Eigenvalue	2.69			
Cronbach's alpha	0.87			

4.4 Discussion of Study 1

Study 1 designed a scale to measure older adults' health-related motivations to use mobile health technology. Six types of motivations, namely, information needs, social support, surveillance, social interaction, self-presentation, and technological convenience, were identified by rigorous statistical analyses across large group samples. Not surprisingly, the strongest motivation for using mobile health technology was the need for health information. Socialising need was also identified as a significant factor motivating older Chinese individuals to utilize mobile health technology. The current study's findings suggest that older adults use mobile health not only for personal health, but also for social purposes enabled by unique features of mobile health platforms, such as interactivity features of forwarding useful health tips to families and friends, obtaining emotional and informational support from others on mobile health platform,

and sharing medication experiences and knowledge with people with similar health conditions.

Notably, this study reveals that the motivation for surveillance is another indispensable component among the elderly. Such a motivation is distinctively found in the current study, given that it has been little studied in previous research in the health communication and technology adoption field. The researcher argues that older adults seek surveillance needs through mobile health platforms like WeChat and health care apps, mainly because of the unique information environment of mobile health platforms as a place for providing timely and comprehensive news regarding accidents, diseases, and disasters. Mobile health platforms provide up-to-date news about public health events, which satisfies the older people's survival instinct to detect surrounding threats and allow a quick reaction to deal with a potential or actual threat (Ng & Zhao,2020). Moreover, the researcher also found that the motivation of self-presentation is a unique and fundamental motive among older adults. More senior people pay attention to health-related knowledge and are considered to have more say in this field. Thus, the more older adults want to build their self-agency in the health field, the more likely they engage in mobile health technology. This discovery shows that older mobile health users have the health-related motives to become gatekeepers of health information in their community. They want to express their experience and views about specific health issues to establish their values or contribute to their community, reinforcing that older mobile health users are more likely to be credible sources of particular health issues.

4.5 Results of Study 2

4.5.1 Results of Pilot Study

A pilot study was conducted because this research was: first, re-using the TAM instrument in a different population and technology; Second, testing the reliability and validity of new-developed instrument of health-related motivations; thirdly, the survey instrument was slightly modified to suit the nature of this study by adding questionnaires about age-specific factors. Therefore, conducting a pilot study helped evaluate the validity and reliability of the survey instrument (Creswell, 2002). According to Moore et al. (2011), a sample size of 12 should be the minimum in a pilot study because it ensures a researcher has the information needed in the planning and performance of the full study. Hence, a sample of 55 participants was selected for the pilot study.

Table 12

Demographic Information of Participants (Pilot Study)

Measure	Range	*N (SD)*	Percentage (%)
Gender	Male	33	60%
	Female	22	40%
AGE	M=59.90	SD=6.78	
Education	Not educated/Primary School	10	18.18%
	Junior high School	15	27.27%
	High School	18	32.72%
	Bachelor's degree	10	18.18%
	Master's degree/above	2	3.61%
Health condition	Very bad	1	1.81%
	Bad	2	3.63%
	Moderate	23	41.81%
	Good	17	30.90%
	Very good	12	21.81%
Monthly income	1000RMB or below	2	3.6%
	1000-3000RMB	18	32.72%
	3001-5000RMB	23	41.81%
	5001-7000RMB	10	18.18%
	7001/Above RMB	2	3.6%

Note. n = 55

The purpose of study 2 was to investigate the behavioural intention to adopt mobile health technology using a quantitative correlational design. Creswell and Guetterman (2019) described the concept of correlational design as the degree of relationships between two or more variables. A multivariate statistical correlation analysis tool was used since this is a correlational study involving multiple variables (Ong & Puteh, 2017). Past studies in technology adoption using the TAM framework have utilized the variance-based Partial Least Square (PLS) method for statistical analysis because the PLS is more concerned with investigating correlation, not causation (Venkatesh et al., 2012; Efuetlateh, 2020; Scott, 2020). The primary objective of PLS in statistical analysis is to predict the dependent variable(s) (Hair et al., 2014).

In study 2, PLS was used to predict the behavioural intention to adopt mobile health technology. PLS was used to test the measurements of latent variables, relationships between latent variables, and test the hypotheses (Ringle et al., 2015). Since PLS is a non-parametric statistical tool, it made no assumptions about the distribution of the data used in this study (Vinzi et al., 2010). It was also helpful in overcoming the challenge of using a small sample size to explain a complex model. The proposed research model includes the outer model (measurement model) and the inner model (structural model). "The measurement model indicates the link between construct that is being evaluated, while the structural model captures the relationship between the constructs and indicator variables" (Okrah, 2021, p.74). Therefore, the researcher adopted the well-accepted two-step approach to test the proposed research model and hypotheses (Anderson, 1988). This means that the outer model is tested first before the inner model.

Measurement Model Evaluation. Hair et al. (2014) advised that evaluating the measurement model after specifying the research model enhances trust in the constructs that make up the inner model relationships, which also demonstrates the accurate measurement and representation of the research model. The purpose of the pilot studies is to evaluate whether the manifest variables can measure the latent variable under investigation. Therefore, the measurement model was used in assessing the convergent validity, discriminant validity, and construct reliability of the measurement scale in the pilot study (Wong, 2019).

The researcher initially performed a CFA to verify the reliability and validity of the measurement model. Reliability, which refers to the ability to produce the

consistency of each construct, was usually evaluated by composite reliability and Cronbach alpha (Salkind, 2019; Hair et al., 2014). According to the previous research (Bagozzi & Yi, 1988; Hulland, 1999), the composite reliability and Cronbach alpha coefficients over 0.7 indicated the constructs are reliable. The questionnaires (SI1 and SI2) for Social Involvement were lower than 0.5, indicating that they are not reliable for their respective constructs. All other items of the current study were higher than 0.80, indicating that they are reliable for their respective constructs. Validity is about the accuracy of a measurement, which was evaluated by convergent validity and discriminant validity. Convergent validity was assessed by the standard loading of each item and the average variance extracted (AVE) of each latent variable. According to Hair et al. (2014), when the loading factor of each item is higher than 0.70 and the AVE of each construct is above 0.50, the Convergent validity achieves acceptable results. Table 13 below shows the outer loading values of each indicator variables (items) from pilot study.

Table 13

Outer Loadings of Each Indicator Variable for Pilot Research Model

	PU	PEOU	SS	HIN	TC	SI	SN	SP	RTC	TT	SE	PR	BI
PU1	0.86												
PU2	0.82												
PU3	0.70												
PU4	0.41												
PU5	0.77												
PU6	0.16												
PEOU1		0.82											
PEOU2		0.78											
PEOU3		0.13											
PEOU4		0.80											
PEOU5		0.76											
SS1			0.91										
SS2			0.74										
SS3			0.91										
HIN1				0.94									
HIN2				0.96									
HIN3				0.79									
HIN4				0.84									
TC1					0.66								
TC2					0.87								
TC3					0.92								
SI1						0.43							
SI2						0.38							
SI3						0.91							
SI4						0.80							
SI5						0.70							
SI6						0.89							
SN1							0.89						
SN2							0.86						
SN3							0.82						
SP1								0.90					
SP2								0.97					
SP3								0.85					
RTC1									0.80				
RTC2									0.73				
RTC3									0.82				
TT1										0.82			
TT2										0.79			
TT3										0.77			
SE1											0.81		
SE2											0.84		
SE3											0.75		
PR1												0.86	
PR2												0.87	
PR3												0.81	
BI1													0.73
BI2													0.76
BI3													0.77

Note. Convergent validity was not met for indicator variable values in bold during the pilot study. The questionnaires item SI1, SI2, PU4, PU6, PEOU3 were highlighted because these items had low outer loading values.

After conducting a convergent validity analysis, the researcher test discriminant validity. Discriminant validity refers to the degree to which a construct is different from other constructs in a research model (Hair et al., 2014). Fornell and Larcker (1981) identified the discriminant validity of a research model is supported when the square root of the AVE of each latent variable is greater than the correlation with any other latent variable. Table 14 shows the results of testing the discriminant validity in the pilot study. The diagonal values in table 14 show the square root of AVE, while the other values are the correlations between the respective latent variables. The results from the pilot study show all the latent variables have their square root of AVE's greater than their respective correlation values in each column and row. Therefore, discriminant validity of every indicator variable was met in the pilot study. Although Cronbach's alpha has been traditionally used in evaluating internal consistency. Hair et al. (2014) suggested using composite reliability to measure a construct's internal consistency reliability. The authors recommended composite reliability over Cronbach's alpha because composite reliability does not assume all indicator loadings are equal in the population. Also, Cronbach's alpha usually underestimates internal consistency because it is vulnerable to the number of items in the scale. Composite reliability values over 0.7 show constructs are reliable (Bagozzi & Yi, 1988; Hulland, 1999). The pilot study results below show all constructs had good reliability.

Table 14

Discriminant Validity for the Pilot Group

Dis	PU	PEU	TA	RTC	TT	SE	PR	SS	HIN	TC	SI	SN	SP	BI
PU	**0.78**													
PEU	0.50	**0.78**												
TA	0.39	0.39	**0.82**											
RTC	0.16	0.13	0.14	**0.80**										
TT	0.39	0.37	0.43	0.18	**0.79**									
SE	0.32	0.32	0.29	0.08	0.44	**0.81**								
PR	0.49	-0.41	-0.44	-0.22	-0.58	-.43	**-0.83**							
SS	0.58	0.35	0.55	0.40	0.43	0.42	0.71	**0.61**						
HIN	0.44	0.61	0.63	0.42	0.53	0.55	0.42	0.53	**0.74**					
TC	0.33	0.46	0.32	0.44	0.69	0.55	0.58	0.34	0.65	**0.82**				
SI	0.58	0.31	0.47	0.42	0.73	0.49	0.55	0.46	0.76	0.71	**0.89**			
SN	0.65	0.76	0.23	0.44	0.26	0.56	0.76	0.56	0.45	0.67	0.57	**0.66**		
SP	0.37	0.47	0.63	0.69	0.55	0.63	0.42	0.13	0.85	0.45	0.68	0.37	**0.77**	
BI	0.58	0.47	0.55	0.42	0.53	0.55	0.40	0.33	0.24	0.33	0.26	-0.35	-0.46	**0.76**

Note. Discriminant validity for the pilot group was met for all indicator variables.

Table 15

Construct Reliability for the Pilot Group

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
PU	0.82	0.85	0.89	0.74
PEU	0.90	0.95	0.93	0.78
TA	0.81	0.92	0.85	0.52
RTC	0.78	0.86	0.89	0.69
TT	0.82	0.83	0.86	0.74
SE	0.91	0.88	0.85	0.84
PR	0.62	0.79	0.75	0.63
SS	0.93	0.72	0.88	0.82
HIN	0.57	0.64	0.75	0.68
TC	0.86	0.79	0.83	0.79
SI	0.67	0.69	0.75	0.68
SN	0.78	0.86	0.69	0.81
SP	0.69	0.86	0.87	0.78
BI	0.87	0.79	0.98	0.87

Note. Composite reliability of all indicator variable was met in the pilot study

4.5.2 Results of The Main Study

Demographic detail. There were 586 returned responses, for an overall response rate of 89.85% from the total number of participants; there were 43 invalid returned responses, which were eliminated before final data analysis. The reason for non-participation was mainly due to lack of time to complete the survey. Overall, 57.5% (N = 328) were female; the average age was 57.32 (ranging from 55 to 72 years old); 69.12 % received a middle school or higher degree; 52.21% had a monthly personal income between CNY 3000-5000 and above. 74.56 % reported they are in moderate health status or above. Table 16 provided the detailed demographic information of the participants. An independent t-test indicated that there were no significant gender differences on age, monthly income, health status. A chi-square test of independence revealed that the male participants had higher education levels, as 64.9% of male participants attained the high school or above education level, compared to 55.4% of female participants $\chi 2$ (3, N=585) = 16.01, $p < 0.01$.

Table 16

Demographic Information of the Participants (Study 2)

Measure	Range	N (SD)	Percentage (%)
Gender	Male	328	52.5
	Female	258	47.5
A	M=57.32	SD=5.71	
Education	Not educated/Primary School	16	2.73
	Junior high School	88	15.01
	High School	242	41.29
	Bachelor's degree	214	36.51
	Master's degree/above	26	4.43
Health condition	Very bad	60	10.23
	Bad	89	15.18
	Moderate	232	39.59
	Good	147	25.08
	Very good	58	9.89
Monthly income	1000RMB or below	101	17.23
	1000-3000RMB	179	30.54
	3001-5000RMB	139	23.72
	5001-7000RMB	132	22.52
	7001/Above RMB	35	5.97

Note. n =586

Measurement Model Evaluation for Main Study

Evaluating the convergent validity for the pilot study showed some of the outer loading values were less than 0.50. The questionnaires item SI1, SI2, PU4, PU6, PEOU3 were removed from the survey because these items had low outer loading values. After removing these items, the research model was re-evaluated, and it produced outer loading indicators that satisfied the convergent validity. The PLS (variance-based SEM) is recommended over the full-information approach when the accuracy of all parts of the model cannot be guaranteed (Henseler et al., 2014). The limited-information approach was used in this study because it is more robust to incorrectly specified models (Gerbing et al., 1994). Therefore, removing loading indicators that were less than 0.50

did not affect the analysis of the overall model. The discriminant validity and construct reliability values also improved after excluding the indicator variables loadings that were less than 0.50. Table 17 below shows the convergent validity, discriminant validity, and construct reliability of the research model were good.

Table 17

Outer Loading of Each Indicator Variable for Full Sample

Factors	Items	Standard Loadings	Cronbach's alpha	Composite Reliability	AVE
PU	PU1	0.865	0.789	0.901	0.783
	PU2	0.824			
	PU3	0.703			
	PU4	0.774			
PEOU	PEU1	0.882			
	PEU2	0.786	0.812	0.887	0.780
	PEU3	0.801			
	PEU4	0.756			
SS	SS1	0.916			
	SS2	0.749	0.876	0.831	0.611
	SS3	0.915			
	IN1	0.946			
HIN	IN2	0.962	0.749	0.699	0.743
	IN3	0.791			
	IN4	0.843			
	TC1	0.669			
TC	TC2	0.879	0.856	0.701	0.824
	TC3	0.926			
	SI1	0.700			
SI	SI2	0.893	0.755	0.686	0.893
	SI3	0.918			
	SI4	0.806			
	SN1	0.891			
SN	SN2	0.860	0.766	0.809	0.661
	SN3	0.828			
	SP1	0.900			
SP	SP2	0.975	0.877	0.788	0.773
	SP3	0.855			
	RTC1	0.801			
RTC	RTC2	0.763	0.796	0.839	0.635
	RTC3	0.826			
	TT1	0.824			
TT	TT2	0.796	0.897	0.895	0.629
	TT3	0.774			

Table 17 (continued)

Outer Loading of Each Indicator Variable for Full Sample

Factors	Items	Standard Loadings	Cronbach's alpha	Composite Reliability	AVE
SE	SE1	0.815	0.852	0.847	0.648
	SE2	0.840			
	SE3	0.758			
PR	PR1	0.86	0.799	0.901	0.694
	PR2	0.876			
	PR3	0.81			
BI	BI1	0.734	0.79	0.801	0.773
	BI2	0.762			
	BI3	0.774			

Structure Model Evaluation for Main Study

According to the two-approach method (Hair et al., 2014), after achieving an acceptable measurement model, the structural model needs to be evaluated (Hair et al., 2019). The researcher adopted Partial Least Square (PLS) method (Garthwaite, 1994) to examine the quality of the structural model and the hypothesized relationship between independent variables and dependent variables (H1-H3). PLS recommended using the estimates of the path coefficients and R^2 values (coefficient of determination) to evaluate the structural model's quality. Specifically, R^2 values refers to a measure of the predictive accuracy of a research model, which evaluates "the overall effects or the variance in an endogenous variable for the structural model" (Sarstedt, Ringle & Hair, 2017). According to Hair et al (2019), an R^2 values of 0.19 is considered weak, 0.33 is moderate, and 0.67 is accurate. The current study showed that eleven independent variables explain 72.68 % of the variance in the behavioural intention to adopt mobile health services among older users.

Path coefficient showed the association between independent variables and dependent variables. Path coefficient values should between -1 and +1. Figure 6

presents the relationship between independent and dependent variables. Specifically, the value close to +1 means a stronger positive relationship, while the value close to -1 indicates a stronger negative relationship. Accordingly, the results of hypotheses testing are presented in Table 18. All independent variables, Perceived usefulness (β=0.56, p<0.001)，Perceived ease of use (β=0.45, p<0.01) have positive affect the Behavioural intention. H1a andH1b are supported. Besides, Perceived ease of use (β=0.62, p<0.001) was positively associated with Perceived usefulness. H1c is supported. Health information need (HIN) (β=0.46, p<0.01), Social support (SS) (β=0.67, p<0.01), Social involvement (SI) (β=0.47, p<0.01), Technological Convenience (TC) (β=0.41, p<0.01), Self-presentation (SP) (β=0.06, p<0.01), Surveillance need (SN) (β=0.09, p>0.05) were positively associated with Behavioural intention (BI). Therefore, H2a, H2b, H2c, H2d, H2e, H2f were supported. Ageing characteristic factors such as technology trust (TT) and self-efficacy (SE) positively impacted Behavioural intention (β=0.63, p<0.001; β=0.39, p<0.01). Perceived risk and technology anxiety have a significant negative impact on behavioural intention (β=-0.11, p<0.01; β=0.37, p<0.01).Resistance to change has no obvious influence on behavioural intention (β=0.04, p>0.05). Therefore, H2a, H2b, H2c, and H2e are supported, and H2e was rejected.

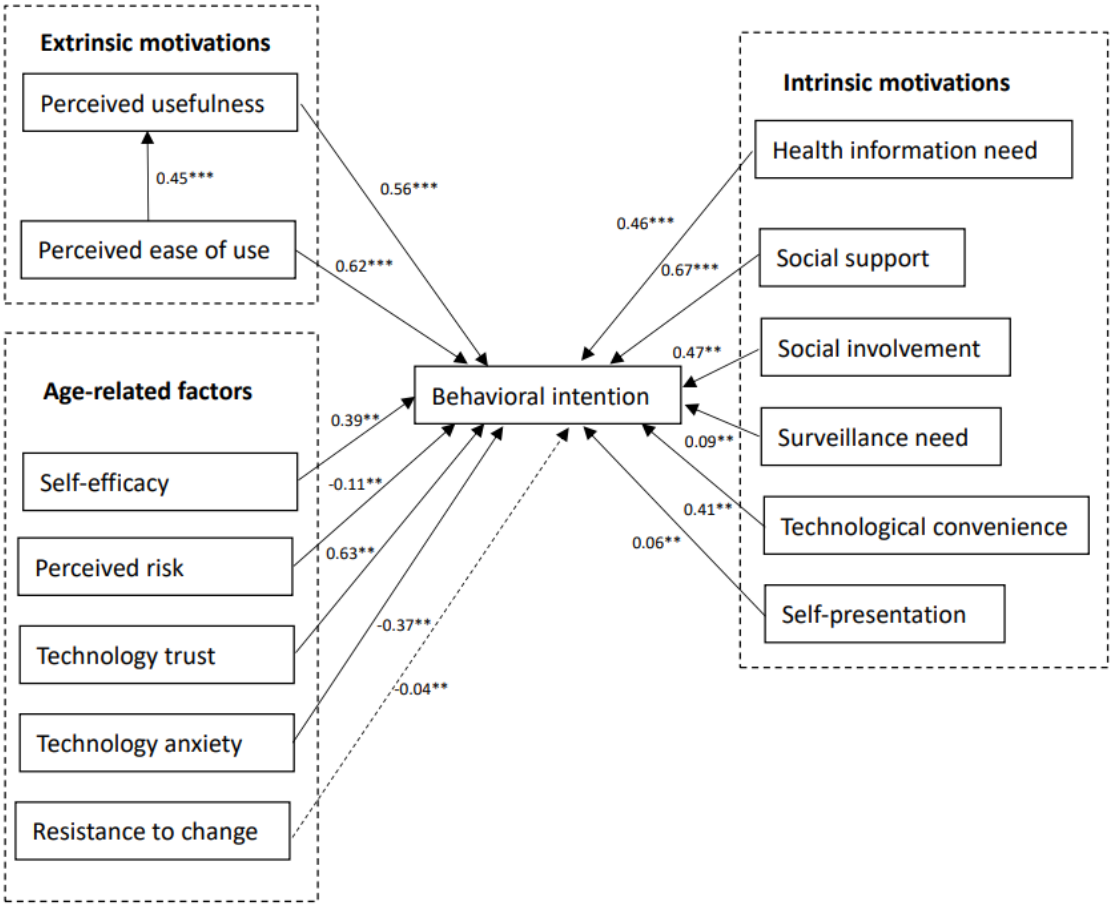

Figure 5. Path Coefficient of the Research Model Testing

Table 18

The Result of Hypotheses (n=586)

Hypothesis	Path	Coefficients	T value	Results
H1a	PU-BI	0.56	5.67***	Supported
H1b	PEOU-BI	0.45	7.71***	Supported
H1c	PEOU-PU	0.62	4.00***	Supported
H2a	HIN-BI	0.46	8.03***	Supported
H2b	SS-BI	0.67	6.03***	Supported
H2c	SI-BI	0.47	1.78**	Supported
H2d	TC-BI	0.41	3.44**	Supported
H2e	SN-BI	0.09	6.08**	Supported
H2f	SP-BI	0.06	2.43**	Supported
H3a	SE-BI	0.39	1.80**	Supported
H2b	TA-BI	-0.37	-2.48**	Supported
H2c	TT-BI	0.63	7.08***	Supported
H2d	RTC-BI	-0.04	-0.65	Not Supported
H2e	PR-BI	-0.11	-4.43**	Supported

Note. *$p < .05$; **$p < .01$; ***$p < .001$.

4.6 Discussion of Study 2

Apart from exploring older people's health-related motivations for using mobile health services in study 1, study 2 further examined how older users' motivations are associated with their behavioural intention to use this innovative technology. The results confirmed that extrinsic motivations such as perceived usefulness and ease of use significantly affect older users' behavioural intention. Specifically, perceived usefulness was the most dominant attribute of older users' behavioural intention, followed by perceived ease of use, suggesting a predominantly utilitarian motivation to decision-making regarding mobile health technology use among the Chinese elderly. Also, the result confirmed that the perceived ease of use could be an antecedent of perceived usefulness. For older adults, user-friendly technology enables them to accomplish their

daily health management easily, which will also increase their perception of the technology's usefulness and influence their intention to adopt it.

Besides, the results confirmed that most health-related motivations (e.g., Health information need, social support, technology convenience, social involvement and self-presentation; surveillance needs significantly predicted older adults' behavioural intention. Of these motives, health information need, social support and technological convenience are the critical influencing factors, suggesting that the Chinese elder's active participation in mobile health services is driven by personal instrumental gratification (Hiniker, 2016). Specifically, the motivation for seeking health information was positively associated with older users' behavioural intention, suggesting that the more older adults seek healthcare information, the more likely they will participate in mobile health-related services. Besides, older people use mobile health technology not only to obtain health information but also for purposes of socialising, such as receiving healthcare suggestions from someone with similar health conditions and sharing helpful health tips with families and friends on WeChat or health care apps. Furthermore, the result also shows that self-presentation has a robust relationship with older people's behavioural intentions. More senior people pay attention to healthcare information and are considered to have more say in this field. Thus, the more older adults want to present their own experiences and knowledge on healthcare and medication, the more likely they engage in mobile health. This discovery shows that older mobile health users have the health-related motives to become gatekeepers of health information in their community. From the in-depth interview, the elderly reported feeling empowered to

share health information and give health-related advice to others through mobile health platforms such as WeChat applets.

Furthermore, as age is often considered in the healthcare context, the researcher introduced aging-specific factors into the research model. The result shows that technology anxiety negatively correlated with behavioural intention. Most elderly are unfamiliar with digital technology, and "their declining physical and cognitive capabilities possibly cause them to suffer a higher level of anxiety" (Deng et al., 2015, p. 214), reducing their intention to use innovative technology. Perceived risk, as seen in this study, negatively correlated with older adults' behavioural intention. When older adults perceive a potential danger associated with using mobile health technology, such as personal medical record leakage and receiving incorrect health recommendations, they are more likely to avoid using this innovative treatment and might choose traditional medical treatment. The result also reveals that technology trust exerts a significant positive effect on older' behavioural intention. Older people are more willing to adopt mobile health technology if they believe this new technology is trustworthy. None of the hypotheses associated with the construct of resistance to change were supported. The elderly usually keep the same habits and behaviours they previously had (Oreg, 2003). Previous studies have confirmed that the elderly have a high tendency to resist changing their medical habits. Despite the emergence of mobile health technology, most elderly choose to continue the traditional face-to-face medical treatment (Oreg, 2006; Phang et al., 2006). However, the existing conclusions do not support the above arguments. The possible interpretation is that the elderly in the current study are people

who have used or are using mobile health services. They probably did not have much resistance to new technologies. Unlike their peers, who are more likely to receive traditional medical treatment, they embrace this innovative healthcare technology.

4.7 Summary

The goal of study 1 was to identify older adults' health-related motivations to use mobile health technology. This research goal was achieved by adopting a sequential exploratory mixed-method study, combining qualitative (study 1a) and quantitative research (study 1b) to develop a reliable, empirically derived instrument to measure older adults' health-related motivations. The researcher labeled six types of health-related motivations: health information need, social support, technological convenience, social involvement, surveillance need, and self-presentation.

Study 2 conducted a quantitative study to investigate how health-related and extrinsic motivations and age-specific factors affect older mobile users' behavioural intentions. The results of data analysis support most hypotheses. Extrinsic motivations, such as perceived usefulness and perceived ease of use, were confirmed to be an important determinant of older users' behavioural intention. The results also confirmed that the perceived ease of use could be an antecedent of perceived usefulness. Besides, five health-related motivations (e.g., Health information need, social support, technology convenience, social involvement and self-presentation) were confirmed to affect older adults' behavioural intention positively. Furthermore, age-related factors such as technology anxiety and perceived risk were negatively correlated with behavioural intention. Technology trust and self-efficacy significantly positively affect

older' behavioural intention. Resistance to change was not supported. In the next chapter, the researcher will provide a detailed interpretation of the results and findings. The theoretical and practical contributions will be mentioned. Limitations and future research directions will also be discussed in the end.

Chapter 5 Conclusions

5.1 Overview

Mobile health technology offers a challenge and an opportunity in providing support and in enhancing the daily lives of older people. The proposed research model is a useful theoretical model to explain and predict technology usage intention of older users. Based on the TAM and U&G, an extended technology acceptance model was developed that integrates age-related construct (i.e., perceived risk, resistance to change, self-efficacy, technology trust and technology anxiety) to analysing adoption behaviour of mobile health technology among older adults in China. The proposed model was empirically tested using data collected from series of online surveys of mobile health users aged 55-75 years old. The PLS technique was used to examine the quality of the structural model and the hypothesized relationship between independent variables and dependent variables. The findings indicated that all variables except resistance to change significantly affected older users' behavioural intention. The variance in behavioral intention explained (R^2) in the current study was 72.76%, far exceeding previous studies (e.g., Deng, Mo and Liu, 2013; Camilleri and Falzon, 2020). This chapter integrates the findings from the two studies and then discusses the contributions of this research to the academic field and industries. After that, limitations and future research directions were discussed.

5.2 Findings and Interpretations

This study generated a model to predict the behavioural intention of older people to use mobile health technology. After removing unsupported hypothesis, the results

showed that eleven independent variables explain 72.68 % of the variance in the behavioural intention, which demonstrates that the proposed research model is a model with good explanatory power. Of all the independent variables, perceived usefulness, perceived ease of use, health information need, and social support were the most important motivations in mobile health use. New-generated variables such as surveillance needs and self-presentation were also found to be influential to some extent. Notably, this study innovatively introduces age-characteristic constructs and confirms that some of these variables (e.g., perceived risk, technology anxiety and technology trust) affect older users' behavioural intention. In particular, older people's trust in technology significantly influences their usage decision, even as much as perceived usefulness and social support. The amended research model is present below (see Figure 7). In the following sections, the researcher will elaborate more on the findings of the current study.

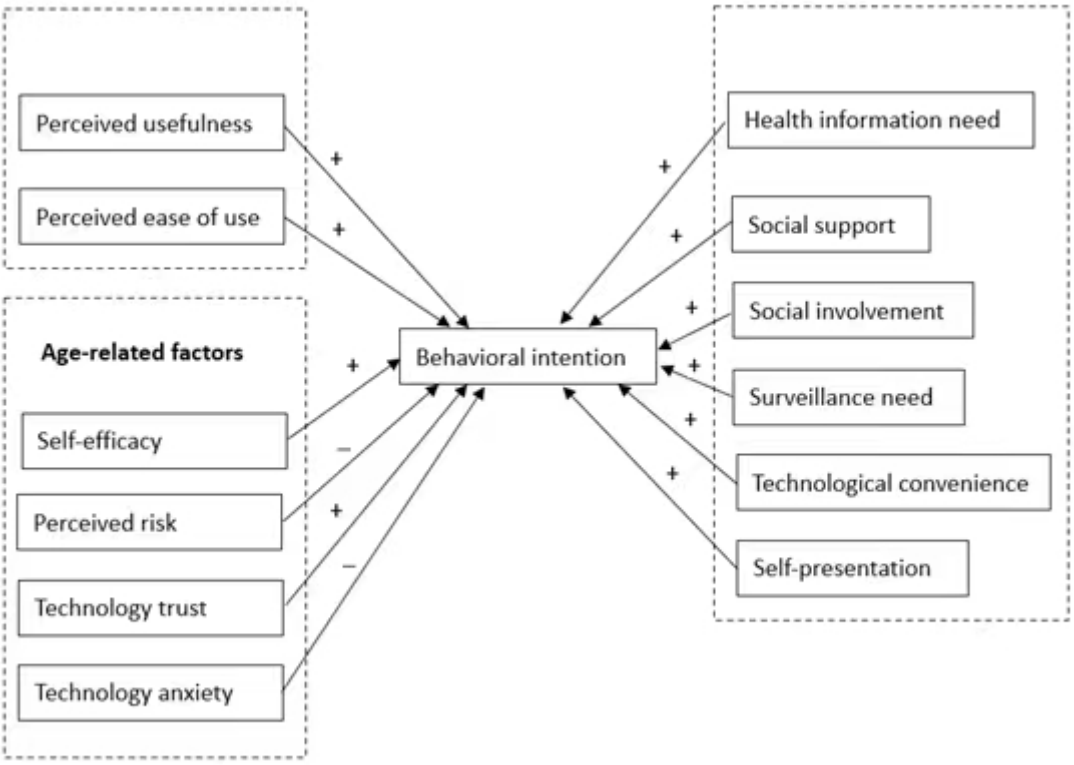

Figure 6. Technology Adoption Model for Older Adults

The study 1 sought to create a valid, reliable, and empirically derived instrument to assess the health-related motivations of older adults. Overall, study 1 accomplished this goal by determining the dimensionality of the instrument through exploratory factor analysis. Psychological statistical analyses of large group samples revealed a distinct pattern of health-related motivations for health-related purposes among older mobile health users: health information needs, social support, surveillance, social involvement, self-presentation, and technological convenience. Health information need was the most important influencing factor among these motives, implying that the Chinese elder's active participation in mobile health is motivated by personal instrumental gratification (Hiniker, 2016). This finding is consistent with previous research (e.g., Zhang, He, & Sang, 2013; Hussain & Shabir,2020; Eginli & Tas; 2018; Chen and Wells, 1999). Online

health information benefits older adults' well-being and health management because mobile health platforms provide a valuable opportunity to exchange health experiences and obtain health education such as information on the prevention, diagnosis, and treatment of specific conditions and disorders. Approximately 74 percent of older adults own a mobile device, and an increasing number of older people are becoming interested in advanced digital devices with mobile Internet access and previous studies found that one of the most common reasons for older adults to use innovative technology is to "obtain relevant health information" (Gerike, 1990, p. 37). Studies discovered that the Internet was a trusted source of health information among older adults in a recent study by Medlock et al. (2020), particularly for learning more about the prognosis, symptoms, and treatment options for personal health issues.

Besides, older people use mobile health technology not only to obtain health information but also for socialising purposes, such as getting social support and involving in social activities. This finding also is in line with the findings in the existing literature, highlighting the role of digital technologies in facilitating social connectedness. This was most clearly seen in those studies specifically looking into social support. (e.g., Eginli & Tas; 2018; Chen & Wells, 1999; Shah et al. 2001). Previous findings revealed that mobile technology and computer-based interventions can provide social support for older people. Mobile health platforms can function as forums where older people can gather and engage socially to overcome isolation, get up-to-date information about family members and acquaintances, and build or consolidate their social relationships. In the Chinese context, the dramatic population

ageing together with social and economic change increases the likelihood that older individuals will feel lonely. Loneliness is a serious problem for older Chinese people, which can be alleviated by social support. For older Chinese, the one-child policy and the new urban migration policy led them to live far away from their children and relatives, causing a more stratified social structure. Chinese elderly received relatively little support from neighbours, government or other social organisations. After retirement, they face anxiety and loneliness because of a lack of social and family. As a result, despite mobile health is a fairly new technology for the elderly in China, it has been adopted to "build new patterns of social bonding" by many Chinese elderly people (Ke, 2015, p.10). It offers older people the possibility to engage in meaningful social contact and provides more opportunities to give and receive emotional and informational support through their friend networks.

The present study identifies surveillance need as another key component of motivation among the older mobile health users. This motivation is unique to the present study, as it has not been thoroughly explored in the existing health communication and technology adoption literature. McQuail, Blumler, and Brown (1972, p.136) defined surveillance as "the need to learn about current events, seek guidance on decisions, understand things, and gain a sense of security through knowledge". According to (Gummerus et al., 2012), when it comes to surveillance, the goal is to stay on top of current events and gain a better understanding on problems. Users who obtained high-quality information felt that their interactions were worthwhile since surveillance pertains to having access to current affairs and attaining a comprehensive understanding

of such issues. In previous studies, surveillance has indicated that mass media such as newspaper/magazines, books and television were used by people to learn about others and the world around them. This is perhaps most understandable, as these features of the mass media are, for the most part, designed specifically for the purposes of communicating current news and information (Fuchs, 2011; Albrechtslund, 2013; Kazemi et al., 2017). The digital technology-based services such as mobile health have mass media features. Older adults seek surveillance needs through mobile health platforms like the WeChat and health care apps, mainly because of the unique information environment of mobile health platforms as a place for providing timely and comprehensive news regarding accidents, diseases, and disasters. From the in-depth interview, older participants reported that they are especially concerned about significant public events that are unusual and lethal, such as the COVID-19 pandemic, given that these threats significantly affect their quality of life and personal well-being. Mobile health platforms provide up-to-date news about public health events, which satisfies the older people's survival instinct to detect surrounding threats and allow a quick reaction to deal with a potential or actual threat.

Moreover, the researcher also found that self-presentation is a unique and fundamental motive of older mobile health users. This motive has a robust relationship with older people's intention to adopt mobile health technology. More senior people pay more attention to healthcare information, and they are considered to have more say in this field. Thus, the more older adults want to present their own experiences and knowledge on healthcare and medication, the more likely they engage in mobile health

activities. This discovery shows that older mobile health users have the health-related motives to become gatekeepers of health information in their community. They want to express their experience and views about specific health issues to establish their values or contribute to their community, reinforcing that older mobile health users are more likely to be credible sources of health issues (Sundar & Limperos, 2013). Much like any other group, older individuals are acutely aware of how they are perceived by others; on this basis, they will be motivated to act in a given way to convey the desired image of themselves. How we are perceived by those around us is equally as relevant to the health and wellbeing of old people. older individuals may have an especially pressing concern with how they are viewed as they age. Indeed, in societies where 'old age' is associated with 'incompetence, misery, lethargy, unattractiveness, asexuality and bad health conditions (Gerike, 1990), older individuals may be particularly concerned with others' impressions of the mastery age. It is clear from the in-depth interviews that older participants reported they often feel socially restricted in pursuing their interests, personal needs and the loss of their sexual identity and social status after retirement.

Apart from the findings about health-related motivations, the findings about extrinsic motivations are also very meaningful. The results confirmed the validity of the original TAM in predicting older users' technology adoption behaviour in the context of China. First, the key TAM constructs (e.g., perceived usefulness and perceived ease of use) were confirmed as significant extrinsic motivations that affect older user's intention to use mobile health technology. Specifically, perceived usefulness was the most dominant attribute on older users' behavioural intention, followed by perceived ease of

use, suggesting a predominantly utilitarian motivation to decision making regarding mobile health technology use among Chinese elderly. These findings are in line with those published in the existing literature on technology adoption. (e.g., Cho, Lee, & Quinlan, 2015; Monney et al., 2015; Van der Heijden, 2004; Ernst, Pfeiffer & Rothlauf, 2013). Regarding perceived usefulness, the academic consensus is that older people will more readily accept and utilize new technologies if they if they believed and realized that these technologies might be used to improve their lives and satisfy their needs. In in-depth interviews, older participants reported that they highly valued the impact of independence and the use of mobile health technology on their quality of life. They also stated that they would not be interested in high-tech products, but rather in technology that would make their daily lives easier and provide added safety and security. Positive attitudes among older adults were most frequently associated with how technology supported activities, improved convenience, and contained useful features. Perceived ease of use is another importance for older people, which is in line with the findings in previous studies (Ziefle & Rocker,2010). Previous research suggests that perceived ease of use has a strong influence on individual technology acceptance and adoption. Older people are more likely to accept technology that is simple to use and understand. Aside from the direct impact, it is also a significant indicator of Perceived usefulness for older users in this current study, which is consistent with previous research (e.g., Pan & Jordan-Marsh, 2010). Previous studies have discovered that most older people do not fully accept modern technology and have ambivalent feelings of acceptance and detachment from it. (e.g., Chen & Chan, 2011; Mitzner et al., 2010; Karahasanovi et al.,

2010). Although elderly individuals are aware of the potential benefits to be derived from modern technology, they are unsure whether they will be able to access such benefits as they do not view themselves as possessing the necessary skills to navigate high-tech applications (Mallenius, Rossi & Tuunainen, 2010; Mitzner et al., 2010). Previous research has found that most older people have low self-efficacy and high technology anxiety. Even though older adults are increasingly using technology, they have a more difficult time learning to use and operate widely used digital technologies than younger people (Chung et al., 2010). Moreover, the result confirmed that the perceived ease of use could be an antecedent of perceived usefulness. This finding echoes the significant body of technology acceptance research, suggesting that these two key constructs of TAM theory are related (Davis et al.,1992; Tsai & Wilson, 2020). For older adults, the ease-of-use function enables them to accomplish their daily health management easily, which will also increase their perception of the usefulness of this latest technology and influences their intention to adopt it.

The findings from study 2 show that the addition of aging-characteristic variables into the final model can increase TAM's explanatory power. To be specific, technology anxiety was negatively correlated with behavioural intention. Also, it moderated the links between perceived usefulness and behavioural intention. For older adults with higher technology anxiety, the level of behavioural intention of mobile health technology was relatively low regardless of their perceived usefulness levels. Similar to previous research (e.g., Deng, Mo & Shan, 2013; Guo et al., 2017), most elderly are not familiar with digital technology, and "their declining physical and

cognitive capabilities possibly cause them to suffer a higher level of anxiety" (Deng, 2013, p. 214), reducing their intention to use innovative technology. In in-depth interview, participants who are 65 years older and above reported more anxiety than those who are under 65 years old. This supports Eisma et al.'s (2003) research, suggesting that older adults may experience more anxiety when they interact with new technologies. Perceived risk, as seen in this study, was negatively correlated with older adults' behavioural intention. When older adults perceived a potential danger associated with using mobile health technology, such as personal medical record leakage and receiving incorrect health recommendations, they were more likely to avoid using this innovative treatment and might choose traditional medical treatment. This finding is similar to that of other studies. For instance, Zhang, Zheng and Deng (2018) found that privacy concern can affect the Chinese elderly's trust and intention to use mobile health apps. Zhang, Zheng and Deng (2018) concluded that privacy and security perceived by users significantly affects their behavior to adopt mobile health technology. The results from Klaver et al., (2021) recent work confirmed that factors related to the perceived risk of mobile health apps use diminish mobile health adoption by senior citizens in the Netherlands. The result of the current study also confirmed that technology trust positively moderates the relationship between perceived ease of use and behavioural intention. Technology trust is important for fostering successful relationships, reducing uncertainty and risk, and increasing willingness to use innovative technology (Ejdys, 2018). Elderly with high technology trust is more likely to use mobile health technology even when their level of perceived ease of use is not high. This finding is consistent

with previous research that the level of trust individuals place in technology directly influences their decision to use or discard it (e.g., Hancock et al., 2011; Parasuraman & Riley, 1997). For example, Nicolaou and McKnight (2006) discovered that trust had a negative impact on perceived risk, which in turn had a positive impact on people's intention to use a data exchange in a business-to-business environment. Lin and Wang (2006) discovered that trust has a significant impact on mobile user satisfaction and behavioral intention. Additionally, technology trust and perceived usefulness were found to be moderately correlated. Previous studies confirmed that technology trust positively affected perceived usefulness (Pavlou, 2003; Thiesse, 2007) and perceived ease of use (Pavlou, 2003; Chiu & Wang, 2008; Cody-Allen & Kishore, 2006; Venkatesh et al., 2003). In terms of technology anxiety, the result showed that it affects older people's confidence in their decisions to use mobile health technology. Similarly, the previous research demonstrated that technology anxiety could hamper individual's intention to use computer (Horgan & Simeon, 1988; Nykodym et al., 1989). Technology anxiety differs from a negative attitude toward computers (Heinssen, Glass, & Knight, 1987). It is defined as an affective response, such as emotional fear of the potential negative consequences of using technology (Chua et al., 1999). Such negative feelings about computers will hinder performance and have a significant impact on job satisfaction. Igbaria and Parasuraman (1989) discovered that computer attitudes are negatively related to computer anxiety. As for self-efficacy, a significant interaction was observed between this variables and perceived ease of use, which is in accordance with that of several studies on other mobile services and mobile technology (e.g., Clarke et

al., 2014; Morgan-Thomas et al.,2013; Hossain et al., 2011). In the case of older adults with a lower level of self-efficacy, the relationship between perceived ease of use and behavioural intention is stronger than those with a higher level of self-efficacy. However, this relationship tends to decrease with older adults with a higher level of self-efficacy. In other words, for those who think they have the necessary skills, abilities and knowledge to use the functions of mobile health technology, the effect of perceived ease of use on behavioural intention will tend to be insignificant. Perceived ease of use of mobile health technology will not be a powerful driving force to change the behavioural intention of the elderly with high self-efficacy (Iconaru, 2013). Regarding the hypotheses associated with the construct of resistance to change, none were supported. The researcher did not find a negative relationship between resistance to change and older users' behavioural intention, which is inconsistent with previous findings (e.g., Oreg,2003; Phang et al., 2006). Despite the emergence of mobile health technology, most of elderly choose to continue the traditional face-to-face medical treatment (Oreg, 2003; Phang et al., 2006). However, the existing conclusions do not support the above arguments. The possible interpretation is that the elderly in the current study are people who have used or are using mobile health technology, they probably did not have much resistance to new technologies. Unlike their peers who are more likely to receive traditional medical treatment, they are embracing this innovative healthcare technology.

5.3 Contributions and Implications

The current study contributes significantly to people's understanding of the psychological mechanism underlying the older adults' adoption of new technologies in

the context of China. A technology adoption model for older adults was tested and amended to describe, explain and predict their perception toward using mobile health technology to manage their health. As predicted, the proposed research model was effective at explaining older adults' behavioural intention. After excluding the unsupported hypothesis, the variance of the research model to explain behavioural intention was 72.76 percent, exceeding previous studies by a significant margin (e.g., Deng, Mo and Liu, 2014; Camilleri and Falzon,2020). The technology adoption model for older adults innovatively presents three different types of factors that affect their decision-making, namely extrinsic motivations, health-related motivations, and age-related factors, which the major contributions of this study. In the next section, the researcher will elaborate on the theoretical and practical contribution in more detailed way.

This study confirms the validity of the TAM and U&G in explaining the acceptance of new technology and contributes to the validation of technology-related models in Asian cultures, particularly in the context of mobile health. Specifically, the traditional technology adoption constructs (i.e., perceived usefulness and perceived ease of use) from the TAM are incorporated into the proposed research model, confirming the predictive and explanatory power of the TAM in the health domain and for technology use in older people. Notably, U&G theory is rarely utilized in research on mobile health technology adoption. Most of the prior research has concentrated on user motivations and general media use and selection. The findings indicated that U&G can be effectively applied to mobile health contexts, thereby expanding the corpus of U&G

studies. In sum, the results demonstrate that TAM and U&G are applicable to the adoption behavior of mobile health technology by Chinese older users, thereby contributing to the literature on TAM and U&G research.

Incorporating health-related motivations into the proposed research model is another contribution to the research on technology adoption. Although some academics believe that both extrinsic and health-related motivators play a significant role in determining the adoption of new technology, this view is not universally accepted. Few studies have thoroughly investigated the health-related motivation of users. For older users, digital technology-based services such as mobile health have mass media features, so older adults' decision-making may be influenced by a variety of health-related motivations. Using a sequential exploratory mixed-methods study to develop an empirically derived instrument, the current study identifies a group of health-related motivations that influence older users' usage behaviour and confirms that these motivations will positively influence older people's intention to use mobile health technology. In the meantime, a scale to measure health-related motivation has been developed, which has the potential to contribute to a better understanding of the diverse health-related motivations of older mobile health users. The reliability and validity of this scale have been demonstrated to be high, making it useful for future research on the health-related motivation of users. This study extends the technology adoption model for older adults by providing important implications regarding how health-related motivations predict their engagement with mobile health technology in self-care management.

This study also contributed to a better understanding of the role of age-related factors in technology adoption decisions, which has previously been overlooked in the literature. In most studies, the factor of 'age' was measured by 'chronological age,' which is the number of years or months since the person's birth. Ageing, on the other hand, occurs on multiple levels and can be classified into several dimensions such as chronological, biological, functional, psychological, and social (Erber, 2010; Quadagno, 2008). No study has considered the age-specific characteristics of older adults when investigating their use and adoption of mobile health technology. This study introduced age-specific constructs such as resistance to change, technology anxiety, perceived risk, self-efficacy, and technology trust, and the results show that age-related variables have a decisive influence on the use of mobile health technology by the elderly, and more importantly, the moderating effect of age-related variables has been confirmed. This will aid future researchers in understanding the distinct older user groups. Understanding the impact of age-related factors is critical for better predicting older adults' mobile health technology usage behavior.

More specific practical implications can be drawn from the current study's detailed findings. First, this study looked at the relationship between older people's motivations and behavioral intentions, which has practical implications for using mobile technology to improve older adults' self-care management. For example, older adults' decisions to use mobile health features are heavily influenced by perceived usefulness, and their usability expectations are extremely high. Increasing the usability of mobile health services can be accomplished by removing barriers that older adults face during

the adoption process. All these findings suggest that mobile medical providers should incorporate more elderly-friendly strategies into their product development, such as simplifying the usage process and providing elderly-specific instruction and training.

This study supports claims that older adults are not a monolithic group. Some of them are technologically savvy and lead interesting lives. They are not passive consumers of new technologies; rather, they actively engage with new technology. The current study's findings confirmed that older adults generate a variety of motivations that deserve the attention of mobile health service providers. For example, as self-presentation was discovered to be a strong motivator for older users, mobile health platforms like WeChat official account can rely more on these older opinion leaders to facilitate the dissemination of health information. When sharing healthcare information, the WeChat official account can selectively share it with some older users with more influential power, and then ask them to distribute it to their friends and groups. This could be one of the most effective ways to get health information to more targeted older users.

Furthermore, this study discovered that various age-related factors influenced older adults' mobile health usage, and that these factors should be considered when designing mobile health platforms. The study found that age-related perceptual and cognitive changes affect older adults' ability to use technology, as well as their preferences and priorities for user interface design. The following interface design recommendations were developed based on the study's findings. Screen size, screen resolution, font size on screen, screen contrast, screen brightness, and screen backlight

duration, for example, to maximize easy reading health information on display. Also, design considerations such as minimizing demand on working memory by minimizing key presses, avoiding technical jargon, and minimizing irrelevance are included to accommodate the cognitive aging process of older adults.

5.4 Limitations and Future Research Directions

This research has some limitations. First, the sample used in this study might not accurately represent the elderly Chinese population. For instance, the sample's average education level is higher than that of China's elderly population, and most of the subjects are healthy retirees with prosperous social and economic standing. The results may not apply to other older populations because the elderly sample in this study may use mobile health technology more frequently or have more experience than other older Chinese people. Future research should consider studies with a stratified sampling method. Sampling criteria should include education background, monthly income, geographic locations, and frequency and duration of mobile health services use.

Additionally, this study collected data in a cross-sectional manner without much consideration for longitudinal approaches. Cross-sectional studies have the drawback of not offering a strong basis for establishing causality. No causal connections are revealed by this research methodology. The objective of this approach is to offer correlated data that can be used to make judgments about a particular demographic. It cannot provide an explanation for why a causal relationship exists. Two different variables are measured simultaneously. Cross-sectional studies can demonstrate a connection between the two factors, but they cannot demonstrate causation. Cross-sectional studies

are unsuccessful due to confounding factors as well. Although they won't change the variables themselves, additional variables may change how the important ones relate to one another. More accurate results can be obtained from longer-term studies.

Additionally, further studies are needed to examine complex mobile health scenarios. For instance, a portion of the older adult population with higher information literacy will become more adept at searching for a wide range of health information using various smart devices and immersive technologies, such as interacting with information through voice recognition and gesture control, as wearable devices become more popular and various health-related vertical search platforms emerge. Thus, it is necessary to investigate into the cross-platform and cross-device seeking behaviours of older adults. It is also necessary to examine other seeking behaviours, such as passive exposure, information encountering, and surrogate health information seeking, deserve consideration and further research in the interim, in addition to active engagement with mobile health technology. Furthermore, it would be worthwhile to investigate the effects and benefits of older adults using search as a learning tool.

This study This study generated an instrument to measure older users' health-related motives through study 1a and study 1b. The researcher has taken several steps to ensure the reliability and validity of the newly-developed instrument. Firstly, two independent coders with advanced degrees in Information systems and media and communication studies sorted, coded, and categorised all self-reported responses into categories. The outcomes from the first and second coders were then compared. The agreement level for the subjects in this study was 89 % when using Cohen's kappa,

which indicates that transcripts have good inter-coder reliability. Secondly, a subject matter expert review was conducted to assess the content validity of the initial questionnaire items. Expert reviewers from various backgrounds were carefully selected to provide technical knowledge (industry-oriented experts), process-oriented knowledge (professors), and explanatory knowledge (participants) of mobile health adoption. Instruments were finalised after the expert reviews. Thirdly, the researcher tested the reliability of the initial questionnaire items by using EFA. In study 2, the reliability and validity of the measurement model were measured by the PLS method, and the results showed that the reliability and validity of the questionnaire are acceptable. It can be seen that the instruments used in this study has good reliability and validity and can be applied to other studies. Notably, although the researcher is trying to ensure the reliability and validity of the newly-developed instrument, the initial questionnaire items were identified through interviews and many motivations may be subjective. The newly-developed scale has never been used in any other research, so more empirical research is needed to provide solid evidence for the application of the newly-developed instrument.

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APPENDIX A

Interview guide

Dear participants:

First of all, please allow me to briefly introduce my research. I mainly study the use of mobile medical services by the elderly (aged 50-70) in China for health-related

activities. So I want to know what are the reasons why you often use mobile health applications? Because this is a semi-structured interview, although I have an interview outline, we just chat more and have no fixed questions. I need you to sign the informed consent form before the interview, which I have already sent to you. At the same time, I will record during the interview. Do you agree? During the interview, if you have any questions that you don't want to answer and want to stop the interview, please feel free to tell me.

(1) Your age, occupation, whether you are retired or not, and how often you use your smartphone and WeChat.

(2) How concerned are you about your health? Can you briefly talk about your experience in using mobile medical services?

(3) What activities related to health care or health care have you participated in on WeChat applet or medical app? If you can't recall it for the time being, let me give you an example: pay attention to WeChat official account in health, make a doctor's appointment through WeChat applet or participate in WeChat step-keeping?

(4) Who will be sent some health-related content? Colleague? Friends? Family? In what form?

(5) Have you ever wondered why you want to send it to them? I mean, is there any difference between the reason or starting point of sending it to colleagues and family members?

(6) Do you have a health discussion group on your WeChat? Is it the group owner? What is the main job? Is it an opinion leader?

APPENDIX B

Participant ID: 202010221-P1

Age: 65

Education: High School

Monthly income: 3001-5000

Health status: Good

Marital status: Married

Participant ID: 202010221-P2

Age: 60

Gender: Male

Education: Bechelor

Monthly income: 1001-3000

Health status: Good

Marital status: Married

Participant ID: 202010221-P3

Age: 55

Gender: Male

Education: Master

Monthly income: 5001-7000

Health status: Good

Marital status: Married

Participant ID: 202010221-P4

Age: 57

Gender: Male

Education: Bachelor

Monthly income: 1001-3000

Health status: Good

Participant ID: 202010221-P5

Age: 69

Gender: Female

Education: Bachelor

Monthly income: 1001-3000

Health status: Good

Participant ID: 202010221-P6

Age: 66

Gender: Female

Education: Bachelor

Monthly income: 1001-3000

Health status: Good

Participant ID: 202010221-P7

Age: 70

Gender: Male

Education: Bachelor

Monthly income: 1001-3000

Health status: Good

Participant ID: 202010221-P8

Age: 52

Gender: Female

Education: Middle school

Monthly income: 1001-3000

Health status: Good

Participant ID: 202010221-P8

Age: 52

Gender: Female

Education: Middle school

Monthly income: 1001-3000

Health status: Good

Participant ID: 202010221-P9

Age: 64

Gender: Male

Education: High School

Monthly income: 1001-3000

Health status: Good

Participant ID: 202010221-P10

Age: 65

Gender: Female

Education: High School

Monthly income: 1001-3000

Health status: Good

Participant ID: 202010221-P11

Age: 72

Gender: Female

Education: Middle School

Monthly income: 1001-3000

Health status: Good

Participant ID: 202010221-P12

Age: 68

Gender: Male

Education: Middle School

Monthly income: 1001-3000

Health status: Good

Participant ID: 202010221-P13

Age: 63

Gender: Male

Education: Bachelor

Monthly income: 1001-3000

Health status: Good

Participant ID: 202010221-P14

Age: 62

Gender: Female

Education: Bachelor

Monthly income: 1001-3000

Health status: Good

Participant ID: 202010221-P15

Age: 57

Gender: Male

Education: Bachelor

Monthly income: 1001-3000

Health status: Good

Participant ID: 202010221-P16

Age: 58

Gender: Female

Education: Bachelor

Monthly income: 1001-3000

Health status: Good

Participant ID: 202010221-P17

Age: 58

Gender: Female

Education: Bachelor

Monthly income: 1001-3000

Health status: Good

Participant ID: 202010221-P18

Age: 69

Gender: Female

Education: Bachelor

Monthly income: 1001-3000

Health status: Good

Participant ID: 202010221-P18

Age: 69

Gender: Male

Education: Bachelor

Monthly income: 1001-3000

Health status: Good

Participant ID: 202010221-P18

Age: 69

Gender: Male

Education: Bachelor

Monthly income: 1001-3000

Health status: Good

Participant ID: 202010221-P19

Age: 68

Gender: Male

Education: Bachelor

Monthly income: 1001-3000

Health status: Good

Participant ID: 202010221-P20

Age: 61

Gender: Male

Education: Bachelor

Monthly income: 1001-3000

Health status: Good

APPENDIX C

Dear expert,

Please rate the items in the following dimensions (Clarity and Difficulty) on a 1-to-5 scale and show your opinion whether this item is retain, modify and discards.

Items	Clarity	Difficulty	Retain	Modify	Discard
40. I have acquired all kinds of medical knowledge and healthcare information through mobile health services (i.e., WeChat health applet and health care apps), which is difficult for me to obtain from other channels	5	4	y		
	5	4	y		
	5	4	y		
	4	5	y		
	5	5	y		
	5	5	y		
41. convenience	3	2			Y
	3	2			y
	2	2			y
	3	3		y	
	3	4			y
	4	2			y
42. mobile health services help me to access tailored and customized healthcare advice from online disease diagnosis	4	4	Y		
	5	4	y		
	5	4	y		
	5	4		y	
	4	5	y		
	5	5	y		
43. It is convenient and time-saving to use WeChat health applet and health care apps to book online	4	5	Y		
	4	5		y	
	4	4		y	
	5	4	y		
	5	4	y		

medical registration and treatment	5	4	y		
44. WeChat offers online medical diagnosis and telehealth, which helps me quickly find famous doctors I would normally struggle to get an appointment with	5	4	Y		
	4	5	y		
	4	5	y		
	4	4	y		
	5	4	y		
	5	4	y		
45. I can get more health education on WeChat health applet and health care apps	5	4	Y		
	4	5	y		
	4	4	y		
	5	4	y		
	5	4		y	
	5	4	y		
46. To get professional drug information	4	5	Y		
	4	5			y
	4	4			y
	5	4			y
	5	4		y	
	5	4	y		
47. WeChat health applet and health care apps provides timely and authoritative coverage of public health issues and health policy	5	4	Y		
	4	4	y		
	5	4	y		
	5	4	y		
	5	4		y	
	4	5	y		
48. I can search for any health information I need from mobile health platform	4	5	Y		
	5	4	y		
	5	4	y		
	5	4		y	
	4	4	y		
	5	4	y		
49. See others ‘interested health information	5	4	Y		
	5	4	y		
	5	4	y		
	5	4	y		
	5	4	y		

	4	4		y	
50. mobile health services help me manage my health	5	4	y		
	5	4	y		
	5	4	y		
	4	4	y		
	4	5	y		
	4	4	y		
51. To filter health-related misinformation and offer high quality information	4	5	y		
	5	4	y		
	5	4	y		
	5	4	y		
	4	4	y		
	5	4	y		
52. Express care to others through WeChat and healthcare apps	4	4	y		
	4	4	y		
	5	4	y		
	5	4	y		
	5	4	y		
	4	4	y		
53. To obtain up to date health information	4	5	y		
	5	4	y		
	5	4	y		
	5	4	y		
	4	4	y		
	5	4	y		
54. Follow health-related official account on WeChat	5	4	y		
	5	4	y		
	4	4	y		
	4	4	y		
	5	4	y		
	5	4	y		
55. mobile health platforms allow me to monitor and filter health-related rumors and fake news	5	4	y		
	4	4	y		
	4	4		y	
	5	4	y		
	5	4	y		
	5	4	y		
	4	4	y		

56. My community uses WeChat health applet and health care apps to issue health notifications such as vaccinations and free clinic information	4	4	y		
	5	4	y		
	5	4		y	
	5	4	y		
	4	4		y	
57. Get others' opinions about purchasing health products	3	3			y
	4	4	y		
	5	4			y
	5	4	y		
	5	4	y	y	
	4	4	y		
58. It is very efficient and convenient for the community to deliver health notifications through WeChat health applet and health care apps	5	4	y		
	4	4		y	
	5	4	y		
	5	4	y		
	5	4	y		
	4	4		y	
59. Through the WeChat health applet and health care apps, I can keep abreast of the latest developments in public health events	5	4	y		
	4	4		y	
	5	4		y	
	5	4	y		
	5	4	y		
	4	4	y		
60. To express personal stance on health issues makes me feel satisfied	5	4	y		
	5	4	y		
	4	4		y	
	5	4	y		
	4	4		y	
	5	4	y		
61. I feel empowered to sharing health information and to give health-related advice to friends on WeChat groups and health care apps	3	5	y		
	3	4		y	
	5	4		y	
	5	4	y		
	4	4	y		
	5	4	y		

62. I can obtain emotional and informational support from others on mobile health platform when discussing some health issues and personal health conditions	4	4	y		
	5	4	y		
	5	3	y		
	4	3		y	
	5	4	y		
	5	4	y		
63. I often share my experiences and knowledge on medication, daily care, diet and exercise with people with similar health conditions on WeChat health applet and health care apps	4	4	y		
	5	4	y		
	4	4		y	
	5	4		y	
	5	4	y		
	5	4	y		
64. I often ask my friends to exercise together through WeChat, which improved my enthusiasm	4	4	y		
	5	4	y		
	4	4	y		
	5	4	y		
	3	4	y		
	4	5	y		
65. Store the needed information	4	3		y	
	3	3		y	
	3	2		y	
	4	3			y
	3	3			y
	4	3			y
	2	2			y

66. Keep up with cutting-edge technology	2	1			y
	3	1			y
	2	2		y	
	2	1			y
	2	1			y
67. Habitual use	2	3			y
	2	2			y
	2	3		y	
	2	2			y
	3	3			y
	2	3		y	
68. Seek professional tips for general health management	5	4	y		
	3	4	y		
	4	3	y	y	
	5	3	y		
	3	3		y	
	3	4			y
69. WeChat sports and health code help me manage my health	5	4	y		
	5	4	y		
	4	4		y	

	5	4	y		
	4	4		y	
	5	4	y		
70. Get closer with family and friends	3	4			y
	3	4			y
	4	3			y
	3	4			y
	4	3			y
	3	4		y	

APPENDIX D

PARTICIPANT CONSENT FORM

Project title: Older Adults and Use of Mobile Health Technology:

The Role of Extrinsic and Health-related Motivations

Researcher's name Xu Xiaoge

Supervisor's name Zhang Xiaoxiao

- I have read the Participant Information Sheet and the nature and purpose of the research project has been explained to me. I understand and agree to take part.

- I understand the purpose of the research project and my involvement in it.

- I understand that I may withdraw from the research project at any stage and that this will not affect my status now or in the future.

- I understand that while information gained during the study may be published, I will not be identified and my personal results will remain confidential.

- I understand that the interview/data collection [*omit as appropriate*].

  will be recorded/filmed [*omit as appropriate*].

- I understand that data will be stored in accordance with data protection laws.

- I understand that I may contact the researcher or supervisor if I require more information about the research, and that I may contact the Research Ethics Sub-Committee of the University of Nottingham, Ningbo if I wish to make a complaint related to my involvement in the research.

Signed …… (participant)

Print name ……

Date …20201223……

Contact details

Researcher: Zhang Xiaoxiao hnxxz6@nottingham.edu.cn

Supervisor: Prof. Xu xiaoge Xiaoge.Xu@nottingham.edu.cn

UNNC Research Ethics Sub-Committee Coordinator:

Joanna.Huang@nottingham.edu.cn

参与者同意书

项目标题 .....中国老年人使用微信进行健康管理.....

研究者姓名 ……张潇潇……

导师姓名 .....徐小鸽.....

- 本人已阅读声明，项目组织者已经我解释了研究项目的性质和宗旨。本人理解并同意参与。
- 本人理解项目的目的和在项目中的参与作用。
- 本人明白可以在研究项目的任何阶段退出，不会因此影响现在以及将来的状况
- 本人明白研究过程中信息可能会被公开，但本人身份不会被确认，个人的调查结果始终是被保密。
- 本人知道面谈/数据采集（酌情省略）将会被录音/拍摄（酌情省略）
- 本人了解数据会根据数据保护相关法律进行存储
- 本人知道，如果需要进一步有关研究的信息可以联系研究者或者导师，如果需要对参与研究提出投诉则可以联系宁波诺丁汉大学科研伦理小组委员会。

参与者签名.....

日期……20201223……

联系方式

研究者：张潇潇 and hnxxz6@nottingham.edu.cn

导师：徐小鸽 and Xiaoge.Xu@nottingham.edu.cn

诺丁汉大学研究道德委员会秘书：Ms Joanna Huang (Joanna.Huang@nottingham.edu.cn)

APPENDIX E

Survey on Chinese Older Adults' Use of Mobile health technology (Test version)

Hello! Thank you for taking part in this survey during your busy schedule! This is an academic survey approved by the Academic Board of the University of Nottingham Ningbo. The purpose of this survey is to understand the awareness and willingness to use mHealth services among the middle-aged and elderly population (55-75 years old) in China.

With the booming development of Internet healthcare, mobile healthcare services are gradually entering people's daily lives. You can get an electronic prescription after a consultation on the Internet and have your medicines delivered directly to your home; you can open your mobile phone software for a follow-up consultation on the Internet and communicate with your doctor about your condition in real time; you can get treatment from a specialist anytime and anywhere through online consultation; your electronic social security card is bound to a mobile payment platform, so you can scan the code to settle your bill quickly and conveniently ..... Nowadays, more and more people are enjoying the convenient services brought by Internet healthcare The Internet has brought more and more people to enjoy the convenient services. According to data recently released by Ai Media Consulting, the size of China's mobile medical users will reach 661 million in 2020, of which 18.9% are middle-aged and elderly users, and this number is continuing to climb. It is vital to understand this group's willingness to use mHealth technology.

This survey is anonymous and the information you provide is for research purposes only and will not be published in any form. There are no right or wrong answers to any of the questions, so please just fill them in as you see fit. Your cooperation is greatly appreciated.

1. What is your age? [Fill in the blanks]

2. Your gender: [multiple choice questions]

Male

Female

3. What is your highest educational level (including the one you are currently studying)? [Multiple choice questions]

- Primary school and below
- Junior high school
- High school/technical secondary school/technical school
- College University degree
- Master degree or above

4. Have you ever used or are using health services on WeChat: [Multiple choice questions]

- Yes.
- No.

Next, we will ask you about the daily use of WeChat. This part of the topic will take you 2 minutes. Thank you for your cooperation!

5. WeChat is a part of my daily life. (please fill in 1-5 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

6. I always open WeChat to check WeChat official account push, friends circle update and friends news. (please fill in 1-5 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

7. When I didn't log in to WeChat for a while, I felt as if I had lost contact with the outside world. (please fill in 1-5 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

8. I think I am a member of WeChat group, and I feel a sense of belonging in WeChat group. (please fill in 1-5 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

9. If WeChat is shut down for a long time for some objective reasons, I will feel uncomfortable. (please fill in 1-5 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

Next, we will ask you questions about using WeChat for health-related activities. This part of the questions will take you 2 minutes. Thank you for your cooperation!

10. Do you often share health-related news and information in your circle of friends? [Scoring question] (please fill in 1-4 numbers to score)

1 is infrequent, 4 is very frequent, and your score is _ __ _ _

11. Do you often share health-related news and information in your circle of friends? (please fill in 1-4 numbers to score)

1 is infrequent, 4 is very frequent, and your score is _ __ _ _

12. Do you often share health-related news and information with your WeChat friends and WeChat group? (please fill in 1-4 numbers to score)

1 is infrequent, 4 is very frequent, and your score is _ __ _ _

13. When you read a good health news and health popular science article, will you click "Watching" at the end? (please fill in 1-4 numbers to score)

1 is infrequent, 4 is very frequent, and your score is _ __ _ _

14. When you read a good health news and health popular science article, will you click "like" at the end? (please fill in 1-4 numbers to score)

1 is infrequent, 4 is very frequent, and your score is _ __ _ _

15. When you read a good health news and news, will you search for it? (please fill in 1-4 numbers to score)

1 is infrequent, 4 is very frequent, and your score is _ __ _ _

16. When you read a good health news and news, will you comment on it? (please fill in 1-4 numbers to score)

1 is infrequent, 4 is very frequent, and your score is _ __ _ _

Next, we will ask you what health-related activities you have carried out on WeChat and the psychological reasons for these activities. This part of the questions will take you 5-10 minutes, and you will get a red envelope reward after the last two questions are answered. Thank you for your patient cooperation!

17. Share the latest progress of public health events with friends through WeChat subscription number message. (please fill in 1-5 numbers to score) 1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

18. I can monitor and filter health-related rumors and fake news through WeChat. For example, I know that some folk epidemic prevention methods are unscientific through the WeChat applet Tencent Real Artifact; For example, the official subscription number will refute some false information in the epidemic; For example, sharing in the circle of friends will correct rumors. (please fill in 1-5 numbers to score) 1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

19. I can get authoritative health information in time through the subscription number message in WeChat, the message in the health applet and sharing with friend's moments. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

20. My community quickly and efficiently transmits public health notices and news through WeChat. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

21. It is convenient and time-saving to use WeChat to make online appointment and registration. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

22. Small medical care programs on WeChat, such as Good Doctor and Clove Doctor, can easily make an appointment with an expert doctor, which saves me a lot of time and energy. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

23. Small programs on WeChat, such as WeChat campaign and health code, help me manage health more efficiently. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

24. I can get more health education on WeChat. Such as popularization of health care knowledge, prevention of chronic diseases and promotion of healthy lifestyle. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

25. I can get advice from professional doctors through WeChat subscription number and applet. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

26. Through WeChat, a social media platform, I have gained all kinds of health knowledge, which is hard for me to get from other channels. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

27. I got customized health knowledge through WeChat, such as searching for information related to my personal health through WeChat applet such as Clove Doctor Tencent Medical Code. (please fill in 1-7 numbers to score)1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

28. Through WeChat, I can search for drug information and usage methods. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

29. Through WeChat, I chat with my family, friends and colleagues about health issues, and I can get peer support. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

30. My community issues health notices such as vaccination and free clinic information through WeChat. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

31. I have joined some WeChat groups once or now. When we talk about some health-related topics, I feel emotional support and comfort from others. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

32. I will meet my family and friends on WeChat for daily exercise, which will improve my sports enthusiasm. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

33. I will share health information with my family and friends through WeChat to express my daily concern for them. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

34. I used to or am now exchanging experiences on medication, nursing, maintenance and exercise with people with similar health status on WeChat. (please fill in 1-5 numbers to score) 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

35. I will help my family, friends and colleagues filter out the wrong health information and share it with them on WeChat. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

36. I establish and maintain relationships with other WeChat friends by sharing important health information. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

37. I feel psychologically satisfied by spreading trustworthy health information to my friends on WeChat. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

APPENDIX F

Survey on Chinese Older Adults' Use of Mobile health technology (Study2)

Hello! Thank you for taking part in this survey during your busy schedule! This is an academic survey approved by the Academic Board of the University of Nottingham Ningbo. The purpose of this survey is to understand the awareness and willingness to use mHealth services among the middle-aged and elderly population (55-75 years old) in China.

With the booming development of Internet healthcare, mobile healthcare services are gradually entering people's daily lives. You can get an electronic prescription after a consultation on the Internet and have your medicines delivered directly to your home; you can open your mobile phone software for a follow-up consultation on the Internet and communicate with your doctor about your condition in real time; you can get treatment from a specialist anytime and anywhere through online consultation; your electronic social security card is bound to a mobile payment platform, so you can scan the code to settle your bill quickly and conveniently ..... Nowadays, more and more people are enjoying the convenient services brought by Internet healthcare The Internet has brought more and more people to enjoy the convenient services. According to data recently released by Ai Media Consulting, the size of China's mobile medical users will reach 661 million in 2020, of which 18.9% are middle-aged and elderly users, and this number is continuing to climb. It is vital to understand this group's willingness to use mHealth technology.

This survey is anonymous and the information you provide is for research purposes only and will not be published in any form. There are no right or wrong answers to any of the questions, so please just fill them in as you see fit. Your cooperation is greatly appreciated.

Screening Questions:

1. Have you ever used or are you using mobile health technology?

   Yes No

2. Are you older than 55 and younger than 75?

   Yes No

1. What is your age? [Fill in the blanks]

2. Your gender: [multiple choice questions]

   Male

   Female

3. What is your highest educational level (including the one you are currently studying)? [Multiple choice questions]

- Primary school and below
- Junior high school
- High school/technical secondary school/technical school
- College University degree

- Master degree or above

4. Have you ever used or are using health services on WeChat: [Multiple choice questions]

- Yes.
- No.

Next, we will ask you about the daily use of WeChat. This part of the topic will take you 2 minutes. Thank you for your cooperation!

5. WeChat is a part of my daily life. (please fill in 1-5 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

6. I always open WeChat to check WeChat official account push, friends circle update and friends' news. (please fill in 1-5 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

7. When I didn't log in to WeChat for a while, I felt as if I had lost contact with the outside world. (please fill in 1-5 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

8. I think I am a member of WeChat group, and I feel a sense of belonging in WeChat group. (please fill in 1-5 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

9. If WeChat is shut down for a long time for some objective reasons, I will feel uncomfortable. (please fill in 1-5 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

Next, we will ask you questions about using WeChat for health-related activities. This part of the questions will take you 2 minutes. Thank you for your cooperation!

10. Do you often share health-related news and information in your circle of friends? [Scoring question] (please fill in 1-4 numbers to score)

1 is infrequent, 4 is very frequent, and your score is _ __ _ _

11. Do you often share health-related news and information in your circle of friends? (please fill in 1-4 numbers to score)

1 is infrequent, 4 is very frequent, and your score is _ __ _ _

12. Do you often share health-related news and information with your WeChat friends and WeChat group? (please fill in 1-4 numbers to score)

1 is infrequent, 4 is very frequent, and your score is _ __ _ _

13. When you read a good health news and health popular science article, will you click "Watching" at the end? (please fill in 1-4 numbers to score)

1 is infrequent, 4 is very frequent, and your score is _ __ _ _

14. When you read a good health news and health popular science article, will you click "like" at the end? (please fill in 1-4 numbers to score)

1 is infrequent, 4 is very frequent, and your score is _ __ _ _

15. When you read a good health news and news, will you search for it? (please fill in 1-4 numbers to score)

1 is infrequent, 4 is very frequent, and your score is _ __ _ _

16. When you read a good health news and news, will you comment on it? (please fill in 1-4 numbers to score)

1 is infrequent, 4 is very frequent, and your score is _ __ _ _

Health-related Motivations

Next, we will ask you what health-related activities you have carried out on WeChat and the psychological reasons for these activities. This part of the questions will take you 3-5 minutes, and you will get a red envelope reward after the last two questions are answered. Thank you for your patient cooperation!

17. Share the latest progress of public health events with friends through WeChat subscription number message. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

18. I can monitor and filter health-related rumors and fake news through WeChat. For example, I know that some folk epidemic prevention methods are unscientific through the WeChat applet Tencent Real Artifact; For example,

the official subscription number will refute some false information in the epidemic; For example, sharing in the circle of friends will correct rumors. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

19. I can get authoritative health information in time through the subscription number message in WeChat, the message in the health applet and sharing with friends circle. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

20. My community quickly and efficiently transmits public health notices and news through WeChat. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

21. It is convenient and time-saving to use WeChat to make online appointment and registration. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

22. Small medical care programs on WeChat, such as Good Doctor and Clove Doctor, can easily make an appointment with an expert doctor, which saves me a lot of time and energy. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

23. Small programs on WeChat, such as WeChat campaign and health code, help me manage health more efficiently. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

24. I can get more health education on WeChat. Such as popularization of health care knowledge, prevention of chronic diseases and promotion of healthy lifestyle. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

25. I can get advice from professional doctors through WeChat subscription number and applet. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

26. Through WeChat, a social media platform, I have gained all kinds of health knowledge, which is hard for me to get from other channels. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

27. I got customized health knowledge through WeChat, such as searching for information related to my personal health through WeChat applet such as Clove Doctor Tencent Medical Code. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

28. Through WeChat, I can search for drug information and usage methods. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

29. Through WeChat, I chat with my family, friends and colleagues about health issues, and I can get peer support. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

30. My community issues health notices such as vaccination and free clinic information through WeChat. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 5 is strongly disapproved, and your score is _ _ _ _

31. I have joined some WeChat groups once or now. When we talk about some health-related topics, I feel emotional support and comfort from others. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

32. I will meet my family and friends on WeChat for daily exercise, which will improve my sports enthusiasm. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

33. I will share health information with my family and friends through WeChat to express my daily concern for them. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

34. I used to or am now exchanging experiences on medication, nursing, maintenance and exercise with people with similar health status on WeChat. (please fill in 1-5 numbers to score)

1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

35. I will help my family, friends and colleagues filter out the wrong health information and share it with them on WeChat. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

36. I establish and maintain relationships with other WeChat friends by sharing important health information. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

37. I feel psychologically satisfied by spreading trustworthy health information to my friends on WeChat. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

- **Extrinsic motivations**

  - **Perceived usefulness**

37. Using mobile medical service will help me quickly check what medicine I should take. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 7 is strongly agreed, and your score is _ _ _ _

38. Using mobile health services will help me better manage and track my health. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

39. Using mobile medical service will help me not to miss taking medicine. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

40. Using mobile health service will help me remember to manage my daily health. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 7 is strongly agreed, and your score is _ _ _ _

41. Using mobile medical services will make daily health management easier. (please fill in 1-7 numbers to score)

1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

  - **Perceptual ease of use**

42. It is easy for me to learn to use mobile medical services. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 7 is strongly agreed, and your score is _ _ _ _

43. I find it easy to let the mobile health service do what I want it to do to manage my daily health. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 7 is strongly agreed, and your score is _ _ _ _

44. It is clear and easy to understand how to use the mobile medical service (please fill in 1-7 numbers to score). One score is strongly disapproved, seven scores are strongly agreed, and your score is _ _ _ _

45. I find that mobile medical service is very flexible to use. (please fill in 1-7 numbers to score) 1 is strongly disapproved, 7 is strongly agreed, and your score is _ _ _ _

46. I can easily use mobile medical services skillfully. I found that the mobile medical service is easy to use (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

- **Technical self-efficacy**

47. I believe I can use most functions of mobile health services if there was no one around to tell me. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

48. I believe I can use most functions even if I have never used a similar technology before. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

49. I am confident that I can effectively use mhealth services for daily health management. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

- **Technology Trust**

50. Due to the mHealth services our lives is easier and more comfortable. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

51. Due to the mHealth services our lives is safer. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

52. mHealth services are making our lives better. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

53. mHealth services are making our lives easier. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

54. I believe that mHealth services are created for the good of human being. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

55. Do you think the information provided by mobile medical service is true and effective? (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

56. Do you think you can rely on mobile medical services for daily health management? (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

57. Do you think you can rely on mobile medical services to obtain reliable medical information? (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

58. Do you think you can rely on mobile medical services to treat diseases? (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

- **Related IT experience**

59. To what extent do you use applications related to health/medical on a mobile device? (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

60. To what extent do you use monitoring options on a mhealth apps? (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

- **Technology anxiety**

61. Use mhealth services apps alone without the guidance of others. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

62. Learning to operate mHealth services apps. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

63. Learning how mHealth services apps computer works. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

64. Learning to use Make an appointment and consult a doctor functions on a mobile computer. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

65. Being unable to keep up with the advance of mhealth services. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

66. Reading mhealth services manual. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

67. Getting software and data from remote sites using a mobile computer. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

68. Searching particular medical /health wellness information from mhealth services Posting. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

- **Satisfaction**

69. I intend to use a mobile device app in order to maintain my health. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

70. I believe I will continue using clinical mobile apps in order to maintain my health. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

71. If any health care provider will ask me to report personal health data using a mobile device app, I will do so. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

- **Behavioral Intention**

72. I intend to use a mhealth services in order to maintain my health. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

73. I believe I will continue using mobile health services in order to maintain my health. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

74. I will recommend the mhealth services to others. (please fill in 1-7 numbers to score). 1 is strongly disapproved, 7 is strongly disapproved, and your score is _ _ _ _

- **Health literacy**

Next, we will ask you questions about health knowledge, which will take you 2 minutes. Thank you for your cooperation.

38. Health food is not medicine, nor can it replace medicine treatment. [Multiple choice questions]

Right.

Error.

39. The best way to prevent influenza is to take antibiotics (anti-inflammatory drugs). [Multiple choice questions]

Right.

Error.

40. Fruits and vegetables have similar nutritional components, so you can eat fruits instead of vegetables. [Multiple choice questions]

Right.

Error.

41. Residents can get health knowledge free of charge at community health service centers (stations) and township hospitals (village clinics). [Multiple choice questions]

Right.

Error.

42. About the concept of health, the description is complete: [Multiple choice questions]

○ Health means being physically strong and free from diseases.

○ Health means good psychological quality and strong physique.

○ Health is not only the absence of diseases, but the intact state of physical, psychological and social adaptation.

○ No idea.

43, under normal circumstances, blood donors to () for free blood donation. [Multiple choice questions]

A hospital

○ Blood center (blood station) or its blood donation vehicle

○ Centers for Disease Control and Prevention

○ No idea.

44. In what ways can hepatitis B be transmitted to others? [Multiple choice questions]

○ Work, eat and swim with patients or infected people.

○ It can be transmitted from mother to child through sex, blood transfusion.

○ Talk, shake hands and hug with patients or infected people.

○ No idea.

45. For the treatment of tuberculosis patients, the following statement is correct: [multiple choice questions]

○ No preferential policies

○ The state provides anti-tuberculosis drugs free of charge.

○ Hospitalization is free

○ No idea.

46. What measures should be taken for patients with respiratory or cardiac arrest? [Multiple choice questions]

A. Artificial respiration

○ Giving drugs for hypertension treatment

○ Don’t touch the sick and wounded and wait for the medical staff in place.

○ No idea.

The following question is a situational question. Please read the material first and then answer the related questions.

BMI refers to the body mass index, which is a standard commonly used in the world to measure the degree of obesity and health of the human body. The specific calculation method is to divide the weight (KG, kg) by the square of height (m, m), that is, BMI= weight/height 2(KG/M2). For Chinese adults, BMI less than 18.5 is underweight, BMI equal to about 24 is normal weight, BMI greater than 24 less than 28 is overweight, and BMI greater than 28 is obesity.

47. Mr. Li, 45 years old, is 170 cm tall and weighs 160 kg. How to calculate his BMI? [Multiple choice questions]

○ (80)2/170=37.6

○ 80/(1.7)2=27.7

○ 160/(1.7)2=55.4

○ No idea.

APPENDIX G

Variables						
Name	**Concept**	**Indicators**		**St.d.**	**Cronbach's alpha**	**ce**
Independent variables						
Social Support	Social Support (SS) is the support that older individuals get through social contact with other individuals, groups and larger communities through the Internet or other mobile terminals.	1. I can obtain emotional and informational support from others on WeChat health applet and health care apps when discussing health issues and personal health conditions 2.I am a member of some online health and wellness groups. When we talked about health-related topics, I felt emotional support and	Interval	A 5-point Likert scale	Cronbach's alpha = .91 (Preliminary test)	re ge m ty st

		comfort from other group members 3. My community uses WeChat and health care apps to issue health notifications such as vaccinations and free clinic information.				
Health Information Need	*Health Information Need* (HIN) was defined as an older individual's desire to locate and obtain health-related information to satisfy conscious or unconscious health-related gratifications.	1. I can get more health education through mobile health services platform 2. mobile health services help me to access tailored and customized healthcare advice from online diseases diagnosis and treatment 3. I have acquired all kinds of medical knowledge and healthcare information through mobile health services, which is difficult for me to obtain from other channels 4. I can search for any health information I need from mobile health services	Interval	A 5-point Likert scale	Cronbach's alpha = .82 (Preliminary test)	re ge m ty st
Technological Convenience	Technological Convenience (TC) was defined as older individuals can more easily access convenience in Health through the use of the Internet and mobile technology.	1.mobile health services offers online medical diagnosis and telehealth, which helps me quickly find famous doctors I would normally struggle to get an appointment with 2.mobile health services help me to access tailored and customized healthcare advice from online diseases diagnosis and treatment 3. I have acquired all kinds of medical knowledge and healthcare information through mobile health services, which is difficult for me to obtain from other channels	Interval	A 5-point Likert scale	Cronbach's alpha = .85 (Preliminary test)	re ge m ty st
Social Involvement	Social Involvement (SI) was defined as older individuals that build and	1.Through mobile health services, I can keep abreast of the latest developments in	Interval	A 5-point Likert scale	Cronbach's alpha = .82	re ge

	strengthens social capital and norms through Internet and/or mobile terminals.	public health events 2. To build and consolidate relationships by sharing important health information with my friends through mobile health platforms 3. I often ask my friends to exercise together through WeChat health applet and health care apps, which improved my enthusiasm 4.To show my care to my family and friends by sharing meaningful health information on mobile health services 5.I often share my experiences and knowledge on medication, daily care, diet, and exercise with people with similar health conditions on WeChat health applet and health care apps			(Preliminary test)	m ty st
Surveillance need	Surveillance is the monitoring of behavior, many activities, or information for the purpose of information gathering, influencing, managing or directing.	1. To filter health-related misinformation and offer high quality information for WeChat friends and groups 2. mobile health services allow me to monitor and filter health-related rumors and fake news 3.mobile health services provide timely and authoritative coverage of public health issues and health policy	Interval	A5-point Likert scale	Cronbach's alpha = .79 (Preliminary test)	re ge m ty st

Self-expression	*Self-expression* (SE) is how older people try to present themselves to control or shape how others (called the audience) perceive them. It involves expressing oneself in a way and behaving in a way that creates the desired impression.	1.I feel empowered to share health information and to give health-related advice to WeChat friends and groups 2. To express personal stance on health issues through mobile health platforms make me feel satisfied 3.Through health education, I think I can better understand diseases and take care of myself.	Interval	A5-point Likert scale		
Dependent variables/ Mediator						
Perceived usefulness	Perceived Usefulness (PU) is the subjective perception of users where they believe that using certain technologies can improve their work performance (Davis, 1986, p.320).	PU1.mobile health technology (e.g., WeChat health applet and health care apps) can help me manage my daily health more efficiently; PU2. mobile health technology make daily health management easier; 3. WeChat health applet and health care Apps (e.g., We Doctor, JDH, Chunyu Doctor, etc.) can help me record health monitoring data more accurately; PU4.mobile health technology make online medical registration more convenient and faster; PU5.mobile health technology help me get authoritative health information; PU6. Generally speaking, using mobile health technology are good for my health.	Interval	A 5-point Likert scale	Cronbach's alpha = .79 (Preliminary test)	et ac D
Perceived Ease of Use	Perceived Ease of Use (PEOU) understand as "the degree to which an individual believes that using a particular information technology	PEU1. I can easily learn to use most functions of mobile health services (i.e., WeChat health applet and health care Apps); PEU2. For me, the	Interval	A 5-point Likert scale	Cronbach's alpha = .83 (Preliminary test)	et ac D

	system would be free of effort" (Davis, 1989, p.320).	instruction and guidelines of mobile health devices (i.e., smartphones and wearable activity trackers) are easy to understand; PEU3.I found it easy to use mobile health devices to do what I want; PEU4. I can easily use most functions of the WeChat health applet and health care Apps; PEU5.Generally speaking, mobile health technology are easy to use.				
Moderators						
Age			continuous			
Gender		0=male (reference) 1=female	Categorical Treat gender as dummy variable			
Previous experience		0= have experience (reference) 1=no experience	Categorical Treat gender as dummy variable			
Self-efficacy	Self-Efficacy is a person's particular set of beliefs that determine how well one can execute a plan of action in prospective situations (Bandura, 1977).	SE1. Even if no one teaches me, I can learn to use most functions of mobile health platforms. SE2. I believe I can use most functions of mobile health technology, even though I have never used similar technology before. SE3. I am confident that I can effectively use mobile health technology for daily health management.	Interval	A 5-point Likert scale	Cronbach's alpha = .81 (Preliminary test)	u, H
Perceived risk		PR1. I am worried that using mobile health services will disclose personal data.PR2. I am		A 5-point Likert scale	Cronbach's alpha = .89	

		worried that the owner of mobile health services will sell my personal data to others. PR3. Compared with face-to-face consultation, I am worried about the efficiency and accuracy of online medical consultation services. PR4.I am worried that my credit card/debit card information may be stolen when I pay on the WeChat health applet and/or health care apps.			(Preliminary test)	
Technology anxiety	Technology anxiety (TA) is a negative emotional response such as fear or discomfort, which people experience when they think about using or actually using technology (Hasan & Ahmed, 2010).	TA1. I feel anxious and apprehensive about using mobile health services (technology). TA2. I have avoided mobile health services because it is unfamiliar to me. TA3. I hesitate to use mobile health services for fear of making mistakes I cannot correct. TA4. mobile health services make me feel confused.	Interval	A 5-point Likert scale	Cronbach's alpha = .86 (Preliminary test)	&
Technology trust	Technology Trust (TT) refers to people's judgment or expectation that a given technology's helpfulness, reliability, and functionality will support them in their work and daily life (Mcknight et al., 2011).	TT1. Due to the mohealth technology, our lives are easier and more comfortable; TT2. Due to the mobile health technology, our lives are safer; TT3. I believe that mobile health technology are created for the good of human beings; TT4. Generally speaking, I think mobile health technology are trustworthy.	Interval	A 5-point Likert scale	Cronbach's alpha = .79 (Preliminary test)	ht Ej
Resistance to change	Resistance to change (RTC) is an unwillingness to adapt to new circumstances or ways of doing things. It can happen with individuals, relationships, or within organizations. There are many reasons for	RTC1. I will not let mobile health technology change how I used to deal with health-related problems.	Interval	A 5-point Likert scale	Cronbach's alpha = .93 (Preliminary test)	&

	resistance, but at its heart, resistance is rooted in fear of the unknown (Aglin, 2003).	RTC2. I will not let mobile health technology to change my daily health management. RTC3. I will not let mobile health to change how I interact with other people on health-related issues. RTC4. Overall, I will not let mobile health services to change the way I currently live.				
Behavioral Intention	Behavioral intention was defined as the degree to which a person recognizes users' enthusiasm to adopt mHealth services (Yu, 2012)	BI1. I intend to use a mobile health service in order to maintain my health. BI2. I believe I will continue using mobile health services in order to maintain my health; BI 3. I will recommend the mobile health services to others.	Interval	A 5-point Likert scale	Cronbach's alpha = .93 (Preliminary test)	et