

A Study on the Factors Affecting the Acceptance of Mental Health Applications

Jie Hou^{1, a}, Anmin Wang²

¹School of Economics and Management, Xidian Univ., Xi'an, China

²School of Economics and Management, Xidian Univ., Xi'an, China

^ajhou@stu.xidian.edu.cn

Abstract

This paper analyzes the influence factors of users' acceptance of mental health applications from the perspective of consumers, and discusses the moderating effect of individual health literacy. The results show that improving the user's perceived usefulness and perceived ease of use is helpful to improve the user's acceptance attitude, then improve behavioral intention, but individual health literacy does not make moderating effect in the influencing process to acceptance attitude.

Keywords

Mental health application; Individual health literacy; Empirical study.

1. INTRODUCTION

The world health organization puts forward that health is not only the absence of physical diseases, but also mental health, good social adaptation and morality. In recent years, the suicides of celebrities with depression have aroused wide attention of the society to mental health problems. It has been found that people who look sunny and cheerful at ordinary times may suffer a lot when they are alone. Therefore, the society widely appeals to people to care more about depression patient. Psychological problems are widespread in society. Under the increasing pressure of work in modern society, more and more people are suffering from mental illness, which may be mild or severe. Therefore, the attention of the society to mental health is of great urgency. In China, the lack of treatment for mental illness is a common phenomenon. There are now more than 3,000 apps on sale around the world, including recording mood, monitoring treatment, psychological consultation and mental health testing. Such apps can let people know their psychological status in a more timely manner, and can help patients alleviate and improve their symptoms by tracking and monitoring, which is very helpful to their daily life. However, due to the particularity and privacy of psychological problems, mental health apps are far less popular than other health apps, such as fitness apps and medical consultation apps. Therefore, by studying the factors influencing the adoption of mental health apps from the perspective of consumers, we can better help different kinds of mental health apps to promote their products and make patients with mental illness get more help. The government can cooperate with developers to popularize the importance of mental health and make it more concerned by the society.

Currently, the research on the influencing factors of users' acceptance and adoption of mobile medical services is based on the application of general disease inquiry, and no scholars have started to study the application of mental health. Existing research is divided into two categories: (1) exploring the factors affecting user adoption. Through literature reading and observation of life phenomena, scholars put forward the factors influencing users' use of mobile

medical services, defined and measured them, and verified the degree and direction of their influence. their influence.(2) verifying the suitability of the theory. The models and theories which are applicable to other mobile services are used to verify their explanatory power and predictability to the usage intention of mobile medical service users. Therefore, this paper will focus on the adoption of mental health applications to make up for the shortcomings of existing studies.

An Internet medical entrepreneurship service platform summarized and sorted out the mental health apps in the apple APP store, and divided their functions into guided treatment, psychological assessment, tracking assessment, skill training, auxiliary adjustment and social mutual assistance. After referring to the classification of the platform, the main contents of domestic mental health software were analyzed and the research significance of various kinds of apps was considered. In this paper, the app with psychological inquiry function was selected for research. The main functions of psychological consultation apps are online psychological consultation, online community communication, public courses and psychological tests. Popular apps include "Jiandan Psychology", "Yi Psychology" and "Nuan Psychology", etc. The purpose of this paper is to verify the acceptability of the Technology Acceptance Model applied to the research on users' acceptance of mental health apps, and to verify the moderating effect of moderator variable "individual health literacy" in the process of "perceived usefulness" and "perceived ease of use" affecting "attitude".

2. LITERATURE REVIEW

2.1. Individual health literacy

The national health and family planning commission of the People's Republic of China [1] defines health literacy as the ability of an individual to obtain and understand basic health information and services, and to use these information and services to make correct decisions to maintain and promote their own health. Therefore, health literacy mainly includes two aspects, health knowledge and relevant skills [2]. Health knowledge includes scientific medical concepts, common sense of health and methods to maintain physical and mental comfort, etc. Relevant skills refer to an individual's ability to consult a doctor, communicate with a doctor, understand medical advice and practice health-promoting behaviors.

With the development of technology and economy, mobile medical care comes into our life and provides medical services and information through mobile communication technology which requires consumers to be able to fully access, understand and process health information and interact online with doctors or medical institutions. Chen[3] verified that e-health literacy has a positive and direct impact on health information behavior. Wu[4] studied the application of e-health literacy in mobile medicine, designed a scale for e-health literacy, and obtained the indirect influence of e-health literacy on usage intention through perceived ease of use, social impact, perceived usefulness and perceived risk.

2.2. Adoption of mental health APP

Both domestic and foreign researches focus on the influencing factors of users' acceptance and adoption of mobile healthcare, and no scholars have started to study mental health applications specifically. The current research on mobile medical service is mainly divided into exploring the influencing factors of user adoption and verifying the applicability of the theory.

Nwabueze [5] verified that cultural factors only affect users who intend to use telemedicine services in the future, but have no impact on actual users. Dunnebeil [6] found that perceived usefulness, perceived ease of use and subjective norms have a positive impact on the adoption intention of e-medical users. Boontarig [7] found that performance expectation, favorable conditions and perceived value have a significant impact on users' acceptance of e-health

services, while social influence and effort expectation have not. Des Spence [8] mentioned in the interview that many health apps, smart bracelets and other devices are untested and unscientific, and the uncertainty of diagnosis will increase people's anxiety. Gagnon [9] found that TAM was highly predictive of the adoption intention of medical professionals, and favorable environment was the most influential factor. Lee and Rho [10] used UTAUT to detect the factors affecting users' acceptance of mobile health monitoring devices.

There is also some research on mobile medicine in China. Yao Ling [11] analyzed the main reasons for college students' refusal to use mobile medical APP, including uncertainty about the quality of mobile medical service, fear of personal information disclosure, and complex operation. Zhao Dongjie [12] mentioned that in the current market, most of the developers of health apps do not have medical and health knowledge background, and the health content they spread is not scientific and accurate. Moreover, most of the health apps, whether free or paid, do not have relevant regulations on users' privacy, and their users' health data are easily accessed by a third party. Yin Meng [13] studied the variables of social influence, performance expectation, perceived trust, effort expectation, personal habit and convenience condition in the study on the use of healthy APP users. Yu Wenhan [14] analyzed that mobile health services are characterized by privacy and sensitivity, and security and privacy are the keys for users to consider whether to accept the services. Yuan Jinqiao [15] proposed a theoretical framework to explore users' willingness to use mobile medical services based on the privacy computing theory. Liu Qingshun and Liang Zhidong [16] verified the explanatory power of TAM, and found that the basic factors affecting user behavior are still perceived ease of use and perceived usefulness. Moreover, the professionalism, convenience, community entertainment and fashion taste of medical APP have significant influence on the acceptance behavior of mobile medical APP users.

Although the above literatures explored the influencing factors of users' adoption of health apps and verified the models or theories, there is a lack of research specifically targeted at mental health apps.

3. ASSUMPTIONS

3.1. Mental health APP adoption model

Based on the Technology Acceptance Model (TAM), this paper proposed the Mental Health APP Adoption Model including individual health literacy variables, as shown in figure 1. As an outcome variable, "intention to use" refers to the measurable degree of an individual's willingness to complete a specific behavior. This model believes that individual users' use of the target system is mainly determined by their willingness to use behavior. Factors taken from TAM included "perceived usefulness", "perceived ease of use" and "acceptance attitude". Among them, "perceived usefulness" refers to the technology adopter's subjective understanding of the possibility of increasing work efficiency when adopting a new technology, that is, how much the technology can improve his productivity. "Perceived ease of use" reflects a person's perceived ease of using a specific system. "Acceptance attitude" refers to the subjective positive or negative feelings of individual users when using the system. "Intention to use" is the measurable degree of an individual's willingness to perform a particular act. Using the existing model, this paper proposes the following assumptions:

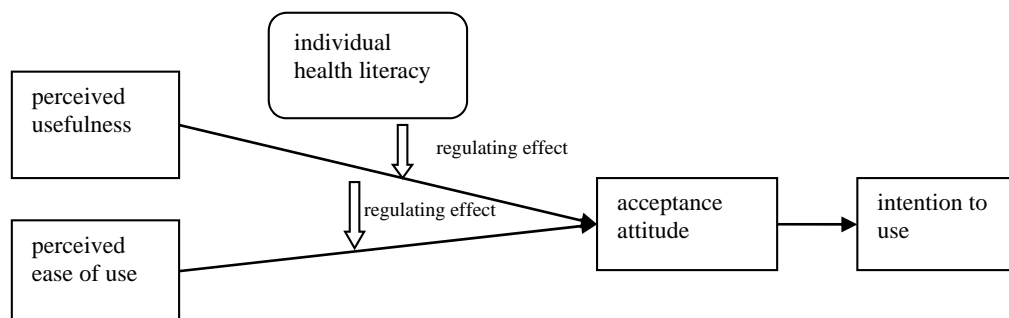


Figure 1. Mental Health APP Adoption Model

Hypothesis 1 perceived usefulness has a positive effect on acceptance attitude

Hypothesis 2 perceived ease of use has a positive influence on acceptance attitude

Hypothesis 3 acceptance attitude has a positive influence on intention to use

3.2. Regulating effect of individual health literacy

Individual health literacy refers to the ability of consumers to fully obtain, understand and process health information and interact with doctors or medical institutions online. Based on mental health problems, people with health literacy have the ability to solve their own mental problems through scientific thinking, have the sense of responsibility and can make decisions beneficial to themselves and others, can master certain psychological knowledge, and can use concise language to communicate with psychologists. People with health literacy should have the following skills: understand the methods to promote mental health and maintain a good mental state, selectively accept mental health information and health-related products and services, analyze the influence of culture, media, technology and other relevant factors on mental health, use interpersonal communication skills to improve mental health, and use goal-setting and decision-making skills to improve mental health, etc. [17].

Based on the particularity of psychological problems, the target users of mental health APP are different from the users of ordinary health APP in terms of psychological adoption. The acceptance and adoption of ordinary health APP users is aimed at a rational consumer, while the rationality level of the target users of mental health APP may be low. Whether individuals want to accept psychological counseling becomes very important. Therefore, this paper assumes that whether an individual pays attention to his mental health status, whether he has the ability to obtain health information and services from the Internet, and whether he can solve his mental health problems through the Internet will affect his decision to accept and adopt the mental health APP. Therefore, this paper proposes the following hypotheses:

Hypothesis 4: individual health literacy plays a moderating role in the influence of perceived usefulness on acceptance attitude

Hypothesis 5: individual health literacy plays a moderating role in the influence of perceived ease of use on acceptance attitude

4. RESEARCH METHODS

4.1. Sample collection

The research object of this paper is consumers of mental health APP, so the selected objects are divided into two categories: users who use mental health APP and potential consumers who have no use of mental health APP but have demand and are skilled in using smart phones. Considering that the majority of consumers using the APP are young and middle-aged people, and the age range of the subjects for convenient data collection is between 20 and 30 years old,

this paper selects college students and on-the-job personnel as the research objects and conducts a random questionnaire survey. In this paper, the questionnaire was designed based on the previous studies at home and abroad. After the preliminary design of the questionnaire, a preliminary survey was conducted through the Internet. The pre-survey period was from May 13th, 2017 to May 24th, 2017. A total of 69 questionnaires were issued and 56 were valid. The recovery rate of the valid questionnaires was 81.2%. According to the reliability and validity analysis results of the pre-test questionnaire, the questions of each variable in the questionnaire were modified, the questions with low consistency were deleted, inappropriate language expressions were modified, the background description of the questionnaire was improved, and a formal questionnaire was formed.

The official questionnaire survey was conducted from May 22th, 2017 to May 28th, 2017. A total of 204 copies were issued and 161 copies were valid. The recovery rate of the valid questionnaires was 78.9%. The questionnaire is distributed on the Internet and published in WeChat friend circle, QQ space and "Yi Psychology" post bar. The subjects of this survey are undergraduates and postgraduates, psychological APP users, psychology enthusiasts, ordinary employees and executives of enterprises across the country. Compared with the pre-survey, the sample scope is expanded, which increases the sample of psychological application users and psychology enthusiasts, and makes the result more credible.

4.2. Variable measurement

Variables in this study include exogenous variables, endogenous variables, outcome variables and moderator variables. Variables were measured using Likert5 scale. Referring to existing studies, all variables were measured with relatively mature and effective scales. The specific measurement indexes of each variable are as follows.

4.2.1 Measurement of exogenous variables

Bauer[18] measured the variable of perceived usefulness in the study through the utility of products and the degree to which users benefited from the product. The measurement items in this paper are from this literature, and the measurement questions include: (1) I think this APP is worth downloading. (2) I think using this APP is helpful for my emotional catharsis. (3) I think using this APP is good for my mental health. (4) I think this kind of APP is designed for my needs.

Davis[19] used the ease of system interaction and degree of autonomous control to measure the perceived ease of use in the study. The measurement items in this study are from this literature, and the measurement questions include: (1) I feel the APP is convenient to use. (2) I feel the APP is not difficult to operate. (3) I think the operation of the APP is able to quickly start. (4) I can use this APP easily, and it hardly requires any extra time or effort.

4.2.2 Measurement of endogenous variables

Bauer[18] measured acceptance attitude in the study by the degree of users' positive use of the product and their appreciation of the product. The measurement items in this study are from this literature, and the measurement questions include: (1) I use the APP actively or frequently. (2) I'm glad the APP exists. (3) In general, the APP is good. (4) For me, the APP is not required.

4.2.3 Measurement of outcome variables

Deng Chaohua[20] used the degree of preference to measure intention to use in his study. The measurement items in this study are from this literature, and the measurement questions include: (1) I will continue to use the APP to adjust emotional or psychological conditions. (2) Compared with other similar apps, I prefer to use this APP. (3) I will recommend this APP to relevant people. (4) I will accept the follow-up update of the APP.

4.2.4 Measurement of moderator variable

Wu Yingmin [4] used three sub-dimensions to measure individual health literacy in the study, self-perception, information acquisition, interactive evaluation. In this paper, individual health literacy is a variable set according to the characteristics of mental health APP. After referring to literatures, this variable was measured by the degree of concern about one's own health, the degree of the initiative to seek treatment, and the degree of proficiency in querying information. The measurement questions include: (1) I'm concerned about my mental health. (2) I would like to seek help from a psychologist when I feel depressed. (3) I know how to use the Internet to answer my health questions.

5. DATA ANALYSIS RESULTS

After the questionnaire was collected, SPSS23.0 was used for descriptive statistical analysis of each variable, reliability and validity analysis of the questionnaire, and regression analysis to verify the hypothesis. The mean value, standard deviation and correlation coefficient of each variable are shown in table 1.

Table 1. Descriptive Statistical Analysis of Each Variable

	Mean value	Standard deviation	IHL	PU	PEOU	ATS
individual health literacy (IHL)	3.86	0.748				
perceived usefulness (PU)	3.79	0.712	0.593			
perceived ease of use (PEOU)	3.96	0.716	0.610	0.693		
acceptance attitude (ATS)	3.61	0.605	0.466	0.598	0.573	
intention to use (INS)	3.64	0.679	0.509	0.635	0.546	0.679

5.1. Reliability and validity

Reliability refers to the consistency of the results of repeated measurements of the same object using the same method. The index of reliability analysis is Cronbach's alpha. The reliability coefficient of the subscale is best above 0.7. As can be seen from table 2, the Cronbach's alpha of all variables is greater than 0.7, which indicates that the reliability of this questionnaire is high and further data analysis can be conducted.

Validity refers to the degree to which a measuring tool or instrument can accurately measure something to be measured. In other words, validity refers to the degree to which the measurement results reflect the test object. The more consistent the measurement result is with the content investigated, the higher the validity will be. Validity is usually measured by load values. In general, a load value greater than 0.4 is considered to be effective. As can be seen from table 2, the load value of all measured variables is greater than 0.4, so each indicator can measure the corresponding variable well.

Table 2. Reliability and Validity Test of Measurement

Indicators	load values	Cronbach 's alpha
individual health literacy		
I'm concerned about my mental health.	0.744	
I would like to seek help from a psychologist when I feel depressed.	0.723	0.779
I know how to use the Internet to answer my health questions.	0.742	
perceived usefulness		
I think using this APP is helpful for my emotional catharsis.	0.621	
I think using this APP is good for my mental health.	0.798	0.829
I think this kind of APP is designed for my needs.	0.639	
perceived ease of use		
I feel the APP is convenient to use.	0.638	0.893
I feel the APP is not difficult to operate.	0.809	
I think the operation of the APP is able to quickly start.	0.830	
acceptance attitude		
I use the APP actively or frequently.	0.453	0.771
I'm glad the APP exists.	0.718	
In general, the APP is good.	0.606	
For me, the APP is not required.	0.751	
intention to use		
I will continue to use the APP to adjust emotional or psychological conditions.	0.766	0.869
Compared with other similar apps, I prefer to use this APP.	0.789	
I will recommend this APP to relevant people.	0.667	
I will accept the follow-up update of the APP.	0.743	

5.2. Results

The hypothesis test in this paper uses hierarchical regression and adjustment regression methods. Firstly, the main effects are analyzed: the effect of perceived usefulness on acceptance attitude, the effect of perceived ease of use on acceptance attitude and the effect of acceptance attitude on intention to use. Then the moderating effect of individual health literacy is analyzed. The results are shown in table 3.

Table 3. Regression Analysis

Influence path	Model1	Model 2	Model 3
main effect			
ATS→INS	0.679***	0.679***	0.679***
PU→ATS	0.598***	0.481***	
PEOU→ATS	0.573***		0.461***
moderating effect			
IHL		0.155*	
PU×IHL		-0.076	
IHL			0.187**
PEOU×IHL			0.006

Note: ①*** means $P < 0.001$, ** means $P < 0.05$, * means $P < 0.1$; ②The coefficient in the table is the standard regression coefficient.

Hypothesis 1 holds that perceived usefulness has a positive influence on acceptance attitude. The regression results of model 1 in table 3 strongly support this hypothesis (0.598, $P < 0.001$). Perceived usefulness has a significant effect on acceptance attitude.

Hypothesis 2 holds that perceived ease of use has a positive impact on acceptance attitude. The regression results of model 1 in table 3 strongly support this hypothesis (0.573, $P < 0.001$). Perceived ease of use has a significant influence on the acceptance attitude.

Hypothesis 3 holds that acceptance attitude has a positive impact on intention to use. The regression results of model 1 in table 3 strongly support this hypothesis (0.679, $P < 0.001$). Acceptance attitude has significant influence on intention to use.

Hypothesis 4 holds that individual health literacy plays a moderating role in the influence of perceived usefulness on acceptance attitude. The results of model 2 in table 3 show that the result of regression analysis of the cross term of perceived usefulness and individual health literacy and acceptance attitude is not significant ($P > 0.05$), which does not support hypothesis 4.

Hypothesis 5 holds that individual health literacy plays a moderating role in the influence of perceived ease of use on acceptance attitude. The results of model 3 in table 3 show that the regression results of the cross term of perceived ease of use and individual health literacy and acceptance attitude are not significant ($P > 0.05$), which does not support hypothesis 5.

6. DISCUSSION

Based on the Technology Acceptance Model, this study analyzed the influence of individual health literacy, perceived usefulness and perceived ease of use on users' acceptance attitude and intention to use through empirical research, so as to obtain the influencing factors on users' acceptance and adoption of mental health APP. The contributions of this paper are mainly in the following aspects: (1) From the perspective of consumers, the results can help mental health APP developers to promote their products more effectively, and patients with mental illness can get more help. (2) When the former scholars mainly take mobile medical care as the research object, this paper studies the user's use decision from the perspective of mental health products. (3) In this paper, the Technology Acceptance Model is used for the first time to study the acceptance and adoption of mental health applications, and the applicability of the Technology Acceptance Model is verified. (4) This paper verifies whether the user's individual health literacy plays a moderating role in the influence of perceived usefulness and perceived ease of use on acceptance attitude.

The important conclusions of this paper include: (1) Perceived usefulness has a positive effect on acceptance attitude. Perceived ease of use has a positive influence on acceptance attitude. Acceptance attitude has a positive influence on intention to use. These conclusions are consistent with the original hypotheses of the Technology Acceptance Model, indicating that the Technology Acceptance Model has a good receptivity when applied to mental health APP.(2) Individual health literacy doesn't play a moderating role in the influence of perceived usefulness and perceived ease of use on acceptance attitude. It indicates that users of mental health apps will not affect their use decisions due to the symptoms of psychological problems. The research conclusion indicates that developers of mental health apps can improve relevant performance, enhance users' perceived usefulness and perceived ease of use, promote their own apps, attract new users and retain old users. The government should also pay more attention to mental health and support products and activities conducive to the development of public mental health.

This paper still has some deficiencies to be improved. Considering the ease of data collection, most of the data are from college students, and only a small part of the data are from psychological BBS users. Therefore, the individuals who provide data are not users who have such demand completely, and the research conclusions need to be verified in a large sample study. This paper negates the moderating effect of individual health literacy in the model. There may be other moderating variables between perceived usefulness, perceived ease of use and attitude, so it is necessary to further look for other regulated variables and deepen the understanding and application research of Technology Acceptance Model.

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