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Understanding psychological determinants to promote the adoption of general practitioner by Chinese elderly

Min Zhou[a,b], Shujuan Qu[c,*], Lindu Zhao[b], Kathryn S. Campy[d], Song Wang[a], Wei Huang[e]

[a] College of Business Administration, Hunan University of Commerce, NO. 569 Yuelu Avenue, Changsha 410205, China
[b] School of Economics and Management, Southeast University, No. 2 Sipailou Road, Nanjing 210096, China
[c] The Third Xiangya Hospital of Central South University, 138 Tongzipo Road, Changsha 410013, China
[d] Center for Public Health Initiatives, University of Pennsylvania, 3451 Walnut Street, Philadelphia, PA19104, USA
[e] School of Architecture and Art, Central South University, No. 598 Xiaoxiang Middle Road, Changsha 410083, China

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ABSTRACT

Objective: The aim of this study is to investigate the psychological determinants on elderly' acceptance of general practitioners.
Methods: This study extends the Unified Theory of Acceptance and Use of Technology (UTAUT) model by considering the aspect of trust, perceived utility, and satisfaction, and compares it with other psychological determinants. A questionnaire survey was conducted in seven cities in central China from November 2017 to March 2018, Changsha, Nanjing, Wuhan, Nanchang, Guangzhou, Zhengzhou and Hefei, and 646 valid samples (> = 60 years old) were collected.
Results: All the structures met the requirements and the discriminant validity of the data was acceptable. Eleven hypotheses were supported at the significance level of 0.05. Performance expectancy, effort expectancy, social influence, and facilitating conditions were considered positive determinants of behavioral intention; trust was considered as a positive determinant of behavioral intention and adoption behavior; behavioral intention was considered as positive determinant of adoption behavior; adoption behavior was considered positive determinants of both satisfaction and perceived utility; perceived utility was positive determinant of satisfaction, and satisfaction positive influence behavioral intention.
Conclusions: It is necessary to integrate trust, satisfaction, and perceived utility into the extended UTAUT model, which would have good explanatory power on elderly's behavioral intention for adopting general practitioners. These understandings can prompt policymakers to better understand the psychological perception and behavioral intention of elderly.

Introduction

The world's population is rapidly aging. According to the "2017 Global Risk Report" released by the World Economic Forum, elderly population of aged over 65 will exceed 1.6 billion people in 2050 and accounting for 15.6% of the global population [1]. Especially in China, this proportion will exceed 30% [2]. The aging population brings huge medical demands among the elderly. General practitioners are the basic construction of the hierarchical medical system and can significantly increase the efficiency of medical resource utilization [3]. General practitioners can deal with diseases and precise treatments at the first time, so residents can greatly reduce invalid medical treatment [4,5]. General practitioners in developed countries played an important role as health gatekeepers and served more than 90% of outpatient demands [6]. The National Health Commission of China has implemented a series of proactive laws to promote the adoption of general practitioners among Chinese residents, including general practitioner training, general post allowance for general practitioners, service standards, affordable medical expenses, medical insurance and referral regulations. However, the proportion of Chinese elderly using general practitioners remained low, less than 40% by 2017 [2]. It is of great need to investigate the psychological determinants on elderly' acceptance of general practitioners.

The previous literature on patient's perspective to general practitioners are mainly focused on the satisfaction, service demand characteristics, medical expenditure and medical insurance coverage. Survey data from 1390 patients in the North of England, the Midlands, and Scotland showed that Patient Satisfaction Questionnaire (PSQ) is an effective and internally reliable tool to assess patient satisfaction with general practitioner services [7]. Services demand of general practitioners may vary depending on the demo-

* Corresponding author at: The Third Xiangya Hospital, Central South University, 138 Tongzipo Road, Changsha 410013, China.
E-mail address: qushujuan25@gmail.com (S. Qu).

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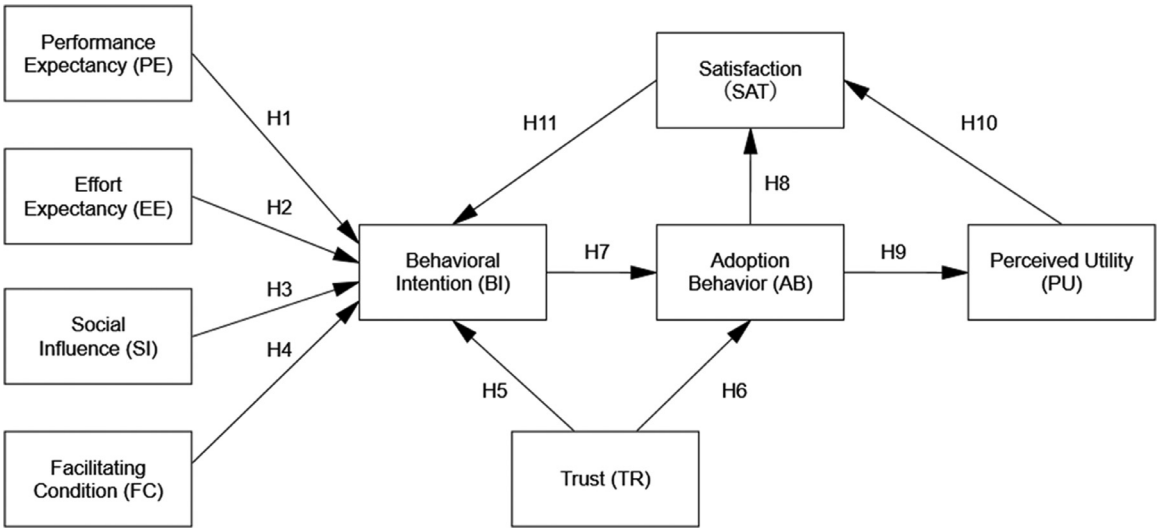

Fig. 1. Conceptual model.

graphic characteristics, such as elderly people with a history of diabetes or cardiovascular diseases have a stronger demand for general practitioner's service [8]. General practitioners conduct initial examinations of patients and save on healthcare expenditures, such as finding signs of dementia in elderly people and decrease unwanted referral for patients suffering from infertility [9]. The models used to investigate residents' choice behaviors for general practitioners didn't include the important psychological variables that may affect the decision-making process. Furthermore, few theoretical frameworks of behavior were adopted in order to explain the relationship between these variables and their impact on elderly's adoption behavior to general practitioners. This study extends the Unified Theory of Acceptance and Use of Technology (UTAUT) as structural equation modeling framework by considering the aspect of trust, perceived utility, and satisfaction, then compares it with other psychological determinants. To validate the theoretical hypothesis, a survey was conducted in seven cities in central China, and 646 valid samples were collected among elderly (over 60 years old). Our results verify that it is necessary to incorporate trust, perceived utility, and satisfaction into the modeling framework and the extended model has good explanatory power regarding elderly's intention to adopt general practitioners.

Theoretical framework and hypotheses

Following the findings of psychology, the UTAUT was used to understand people's acceptance of new technologies and service systems [10,11]. In the context of healthcare, UTAUT models were developed to explain psychological factors that influence the adoption of new systems by patients, which include self-efficacy and cost-effectiveness in the context of HIS adoption [12], medical service satisfaction, ease of use, and information quality among elderly people using telehealth systems [13,14], as well as sociality, sociotechnical commensurability, and habitual momentum [15,16]. Most studies show that performance expectancy, effort expectancy, social influence, and facilitating conditions are positively influencing behavioral intention, and behavioral intention is the positive determining factor influence adoption behavior [17]. While these UTAUT models provided important references to our study, specific characterization of elderly's acceptance to general practitioners remains insufficient. The application of new services often leads to anxiety, then trust is an important psychological factor that motivates us in this study. We added the constructs of *trust, perceived utility, and satisfaction* to the extended UTAUT model to enhance the explanatory power of our theoretical framework. An extended UTAUT model (Fig. 1) was developed to examine the effect of psychological factors on the acceptance of using general practitioners by elderly. The nine constructs included are *Performance Expectancy* (PE), *Effort Expectancy* (EE), *Social Influence* (SI), *Facilitating Conditions* (FC), *Trust* (TR), *Behavioral Intention* (BI), *Adoption Behavior* (AB), *Satisfaction* (SAT) and *Perceived Utility* (PU), and four moderator variables are as follows: gender, age, education and income. The following sections display the hypotheses developed in this study.

Performance Expectancy (PE) is considered as an important construct in behavioral research, and it refers to the expected improvement of performance after adopting new system [10]. In this study, PE is defined as achievable improvements of health management after elderly using general practitioner. Specifically, it includes waiting time, cost-saving, convenience, and health status. Previous research has shown that PE is one of the strongest determinants on BI [18].

Hypothesis 1. PE has a positive effect on elderly's BI of adopting general practitioners.

Effort Expectancy (EE) mainly refers to the ease of using a new system and it is associated with the user's interest in understanding it [18]. EE is a necessary variable in determining user behavior in many areas, such as online learning systems, electric vehicles and telemedicine [17,19,20]. In the context of the elderly's adoption behavior to general practitioners, EE includes easy matter, affordable charge, the convenience of communicating with GPs on health issues, and easy access to health services.

Hypothesis 2. EE has a positive effect on elderly's BI of adopting general practitioners.

Social Influence (SI) was defined as the degree of others believe the user should adopt the new system or technology in previous literature [21,22]. For example, the acceptable price of a general practitioner was influenced by opinions of friends. Many developed countries have established general practitioner services systems, and that help to increase the impact of SI. Three measurements on SI used in this study include (1) views from important people, (2) attitude from the living environment, and (3) community recognition of general practitioners.

Hypothesis 3. SI has a positive effect on elderly's BI of adopting general practitioners.

Facilitating Conditions (FC) is measured by how people believe that technical support infrastructure exists to help them use the technology whenever necessary [10]. FC is an important determining factor of elderly people using telemedicine systems [20]. In the context of general practitioners, facilitating conditions include necessary resources and knowledge for the elderly, ancillary equipment matching with other medical systems.

Hypothesis 4. FC has a positive effect on elderly's BI of adopting general practitioners.

Trust (TR) in organization is defined as the confident, positive expectations of employees about the intention and behavior of multiple constituencies of an organization regarding the organization's conduct, motives and intentions in an organizational setting [23]. In the field of health care, it is assumed or shown to affect many important behaviors and attitudes, including the patient's willingness to seek treatment, reveal the personal sensitive information, compliance with treatment, and believe general practitioner.

Hypothesis 5. TR has a positive effect on elderly's BI of adopting general practitioners.

Hypothesis 6. TR has a positive effect on elderly's AB of adopting general practitioners.

Behavioral Intention (BI) is conceptualized as the extent to which the customer tends to use the new system. The significant relationship between behavioral intention and adoption behavior is well documented in many researches. That is, subjective normative perception and behavioral control are significantly positively correlated, which in turn positively influences adoption behavior. For example, the behavioral intention of the elderly to use mobile medical care is the determinant of adoption behavior, and the intention of the doctor to use the medical information system determines the use behavior [20]. In the context of elderly's adoption behavior for general practitioners, BI includes four items as follows: intention to accept, to order, to receive health services and try to use health service from GPs.

Hypothesis 7. BI has a positive effect on elderly's AB of adopting general practitioners.

Adoption Behavior (AB) is the consumer's decision to adopt a new system or service. AB mainly includes three aspects: consult a general practitioner about health knowledge, follow the doctor's advice, and take the general practitioners as the first choice whenever need medical care.

Hypothesis 8. AB has a positive effect on elderly's SAT of adopting general practitioners.

Hypothesis 9. AB has a positive effect on elderly's PU of adopting general practitioners.

Perceived Utility (PU) is defined as the degree to which individuals feel their own needs and desires are achieved. This structure plays a crucial role in the decision-making process because it determines the individual's psychological perception of the behavioral outcome. Psychological counseling will have a positive effect on hospitalized patients and will be highly satisfied during a six-month visit [24]. Three items are included in the PU construct, medical expenditure saving, waiting time saving, and convenience of medical referral service.

Hypothesis 10. PU has a positive effect on elderly's SAT of adopting general practitioners.

Satisfaction (SAT) refers to people's expectations of health care services due to health, illness, and quality of life requirements, and then a reflection of the emotional state that results from the comparison of the experienced healthcare services [25]. Communication between doctors and patients is a typical continuing medical education program designed to develop the communication skills of clinicians, but it is not effective in improving the general satisfaction of patients. To increase patient satisfaction with GP visits, communication skills training programs may need to be intensive and provide continuous performance feedback [26]. As a closed-loop feedback, patient satisfaction will affect their medical behavioral intentions.

Hypothesis 11. SAT has a positive effect on elderly's BI of adopting general practitioners.

Materials and methods

Questionnaire design

The questionnaire has two parts. The first part was used to collect respondents' demographic information and the second part was used to survey respondents' behavioral intention on the use of general practitioner. The first part included four questions on gender, age, education, and annual household income before tax. In the second part, measures were modified based on existing scales about the use of general practitioner in previous literature, and items for seven psychological constructs were developed. Variables pertaining to the seven constructs were scored on a 7-point Likert scale.

The questionnaire was first written in Chinese and then translated into English by a native English editor. The measures were reviewed by five experts: two professors and three senior doctors in behavioral economics research. Following their suggestions, we deleted 2 items of PE because they were likely to be misunderstood. In addition, esoteric technical terms were replaced by colloquial words which are easy to understand. Before we conducted a large-scale investigation, a pilot survey was tested among elderly. Feedback of the pilot survey helped us make further minor revisions about the literal statement. Confirmatory factor analysis (CFA) was conducted on the valid sample data. Two items for PE and one for FC were deleted due to their standardized factor loading <0.50. The final version of the items used to measure the constructs is provided in Table 1.

Data collection and analysis

The survey was conducted in seven cities in central China from November 2017 to March 2018, Changsha, Nanjing, Wuhan, Nanchang, Guangzhou, Zhengzhou and Hefei. The population of these seven cities at the end of 2018 were as follows: 7.92 million, 8.44 million, 11.08 million, 5.55 million, 14.48 million, 10.12 million, 8.09 million. The age structure of the population in these cities is in line with the average ageing of China, and there are large numbers of elderly people in these cities suffer from various chronic diseases which will need general practitioners. With help of Health Commission, study participants were selected randomly based on their IDs. Eligible respondents included all members of elderly (over 60 years old) in 12 hospitals that were randomly selected from designated cities. Respondents were asked to complete the questionnaire and submit it to the investigation team. To promote the enrollment, the investigators offered a discount coupon for retail stores as an incentive. Total 750 people were invited to complete the questionnaire, and 646 provided valid responses for the analysis (valid rate = 86.1%). All participants signed a written informed consent form prior to entering the study.

Table 1
Summary of construct with measurement items.

Constructs	Items	
Performance Expectancy (PE)	PE1	I think GPs will shorten the waiting time of treatment.
	PE2	I think GPs will reduce the costs of treatment.
	PE3	I think GPs will make it more convenient of treatment.
	PE4	I will become healthier if I have a GP.
Effort Expectancy (EE)	EE1	It is an easy matter to choose a GP.
	EE2	The charge of GPs is affordable.
	EE3	It is convenient to communicate health issues with GPs.
	EE4	Getting health services from GPs is easy.
Social Influence (SI)	SI1	People who are very important to me think I should have a GP.
	SI2	The people who affect my behavior think I should have a GP.
	SI3	Having a GP will be considered a healthy lifestyle.
(FC)	FC1	I have all resources to get health services from GPs.
	FC2	I have the necessary knowledge to cooperate with GPs.
	FC3	GPs are compatible with existing medical systems.
Trust(TR)	TR1	I trust the treatment plan developed by GPs.
	TR2	I am willing to reveal the personal sensitive information to GP.
	TR3	I believe medical services of GPs are trustworthy.
	TR4	I believe GPs will do everything to secure health for users.
Behavioral Intention (BI)	BI1	I intend to accept medical services from GPs.
	BI2	I intend to order a GPs medical service in the future.
	BI3	I plan to receive health services from GPs frequently
	BI4	I will always try to use health service from GPs.
Adoption Behavior	AB1	I will consult GPs for health knowledge.
(AB)	AB2	I will take the medicine according to medical orders from GPs.
	AB3	When I needed medical services, the GP was my first choice.
Perceptual Utility	PU1	The medical expenditure will decrease by the GPs.
(PU)	PU2	The waiting time for medical treatment will shorten by GPs.
	PU3	The medical referral service with the help of GP is convenient.
Satisfaction	SAT1	I am satisfied with the GPs diagnosis and treatment techniques.
(SAT)	SAT2	I am satisfied with the GPs prescription for medicines.
	SAT3	I am satisfied with the GPs health consultation service.

GP: general practitioner.

The sample sizes of the study are accordant with the statistical requirements. Regarding the statistical analysis of structural equation modeling (SEM), the optimal samples size is generally not less than 200, and the sample size should be 10-15 times of the number of variables in multi-factor analysis [27–29]. In the present study, the proposed structural equation model consists of 31 items, and 646 qualified samples were collected for data analysis. Trained investigators conducted questionnaire surveys at 12 hospitals in the above seven cities and collected questionnaires on the spot. Considering the above references and the number of variables currently studied, the sample size is sufficiently representative.

Statistical comparisons were made with respect to the socioeconomic group of each participant. Indicators such as quantity accumulation, ratio, and average score were considered. SPSS 22.0 for Windows and AMOS 24.0.0 were used as the analysis software. One-way ANOVA was used to verify the significance among different groups to each construct. To test the reliability and validity of the measurement model, confirmatory factor analysis (CFA), Cronbach's alpha and the average variance extracted (AVE) were adopted in present study. The threshold values of the indicators are as follows: each standardized factor loading must be greater than 0.5, CR must be greater than 0.7, the Cronbach's alpha must be greater than 0.7, and AVE must be greater than 0.5 [29,30]. The discriminant of model validity is obtained by comparing the square root of the AVE and the cross-loading matrix. The square root of the AVE of each construct should be greater than the cross loading associated with it [31]. The following indicators were adopted to test the overall fitness of the measurement model: CHI/DF, NFI, IFI, RFI, P, TLI, CFI, GFI, AGFI, RMSEA, and the maximum likelihood method was used to calculate the parameters. The recommended values for these indicators are as follows: CHI/DF < 3; NFI > 0.9; IFI > 0.9; RFI > 0.9; TLI > 0.9; CFI > 0.9; GFI > 0.9; AGFI > 0.9; P-value < 0.05; RMSEA$<$0.08 [28,30].

Results

Demographic characteristics

The demographic characteristics of respondents (Table 2) show that more than half of the 646 participants were male elderlies (52.5%), and half of the respondents (50.6%) were aged between 60 and 65. As to the education of elderly, most respondents (92%) did not obtain bachelor's degree. In terms of the total annual household income before tax, 43.2% of respondents are below $10,000, and only 13.6% are over $30,000.

Reliability and validity of the measurement model

The results of reliability and validity of the measurement model are listed in Table 3. All factor loadings are greater than 0.65 and CRs are greater than 0.7, indicating that each structure has good convergence validity; the Cronbach's alpha for all structures is greater than 0.8, indicating that the scale reliability at the excellent level; the AVEs are better than the recommended level 0.5, indicating that the structure's horizontal convergence validity is acceptable. As shown in Table 4, the diagonal elements are the square root of the AVE of the corresponding construct, and the entries in the corresponding columns and rows list the cross-loadings of the associated construct. The results show that all the structures meet the requirements and demonstrate that the discriminant validity of the data is acceptable.

The test results for the overall fit between the theoretical model and sample data are as follows: CHI/DF $= 2.076$, lower than the recommended value (i.e., 3); NFI $= 0.931$, IFI $= 0.963$, RFI $= 0.922$, TLI $= 0.958$, CFI $= 0.963$, GFI $= 0.924$, AGFI $= 0.909$, meeting of the requirements (i.e., 0.9); P-value $= 0.000$, RMSEA $= 0.041$ is less than 0.08, indicating the overall model fitting is acceptable.

Table 2
Sample demographics characteristics ($N = 646$).

Variable	Options	Frequency	Percent	Cumulative percent	Mean	SD
Gender	Male (1)	307	47.5	47.5	1.52	0.5
	Female (2)	339	52.5	100		
Age	60–65 Years old (1)	327	50.6	50.6	1.65	0.737
	65–70 Years old (2)	217	33.6	84.2		
	70+Years old (3)	102	15.8	100		
Education	High school education or below (1)	342	52.9	52.9	1.55	0.637
	Vocational college degree (2)	253	39.2	92.1		
	Bachelor degree and above (3)	51	7.9	100		
Total annual household income before tax	Below $ 10,000 (1)	279	43.2	43.2	1.99	1.061
	$ 10,000–$ 20,000 (2)	184	28.5	71.7		
	$ 20,000–$ 30,000 (3)	95	14.7	86.4		
	Over $ 30,000 (4)	88	13.6	100		

Table 3
Internal reliability and convergent validity of the measures.

Constructs	Variables	Loadings	C.R	AVE	Cronbach's alpha
Performance expectancy (PE)	PE1	0.790	0.860	0.606	0.857
	PE2	0.765			
	PE3	0.826			
	PE4	0.730			
Effort expectancy (EE)	EE1	0.802	0.855	0.596	0.854
	EE2	0.750			
	EE3	0.788			
	EE4	0.745			
Social influence (SI)	SI1	0.811	0.887	0.723	0.885
	SI2	0.917			
	SI3	0.819			
Facilitating condition (FC)	FC1	0.797	0.861	0.674	0.860
	FC2	0.841			
	FC3	0.825			
Trust(TR)	TR1	0.817	0.854	0.595	0.849
	TR2	0.692			
	TR3	0.729			
	TR4	0.839			
Behavioral intention (BI)	BI1	0.764	0.904	0.703	0.902
	BI2	0.846			
	BI3	0.833			
	BI4	0.904			
Adoption behavior (AB)	AB1	0.837	0.895	0.739	0.895
	AB2	0.884			
	AB3	0.858			
Perceptual utility(PU)	PU1	0.761	0.836	0.630	0.832
	PU2	0.881			
	PU3	0.732			
Satisfaction (SAT)	SAT1	0.810	0.865	0.682	0.864
	SAT2	0.887			
	SAT3	0.776			

Loading: Standardized factor loading; AVE: Average Variance Extracted; CR = Composite Reliability.

Table 4
Constructs' correlations and square roots of AVE.

	PE	EE	SI	FC	TR	BI	AB	PU	SAT
PE	**0.778**								
EE	0.356	**0.772**							
SI	0.328	0.281	**0.850**						
FC	0.339	0.321	0.263	**0.821**					
TR	0.373	0.322	0.341	0.273	**0.771**				
BI	0.696	0.556	0.555	0.541	0.518	**0.838**			
AB	0.413	0.373	0.293	0.289	0.643	0.528	**0.860**		
PU	0.236	0.24	0.189	0.156	0.305	0.386	0.514	**0.794**	
SAT	0.460	0.317	0.383	0.311	0.346	0.667	0.507	0.431	**0.826**

Hypothesis testing

The structural model was developed to determine the relationship between constructs in the study model and eleven hypotheses were supported at the significance level of 0.05 (Table 5, Fig. 2). PE, EE, SI, and FC were considered positive determinants of BI; TR was considered as a positive determinant of BI and AB; BI was considered as positive determinant of AB; AB was considered positive determinants of both SAT and PU; PU was positive determinant of SAT, and SAT positive influence BI.

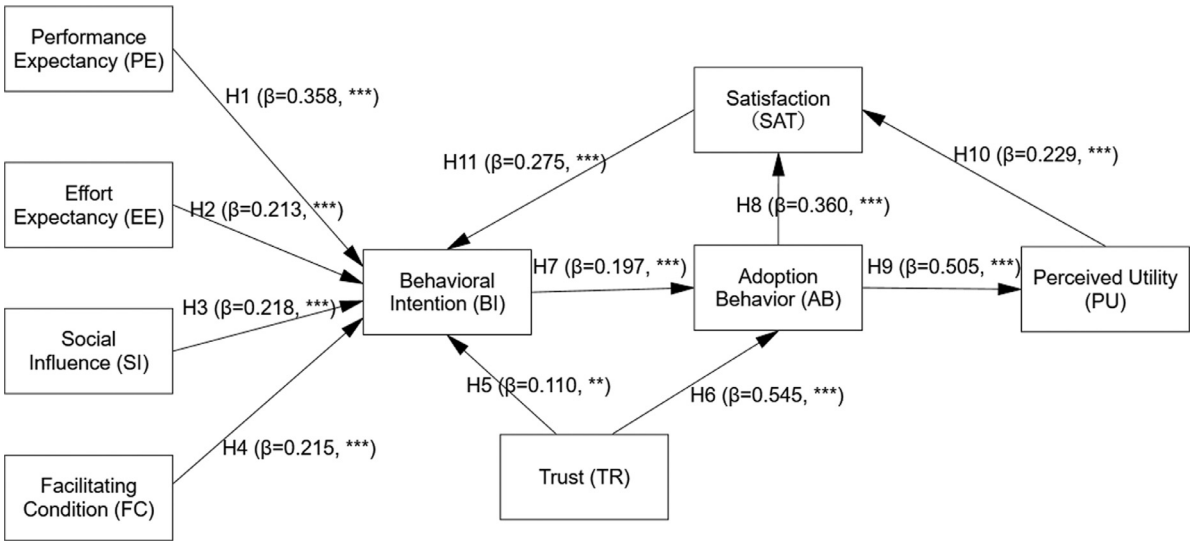

Fig. 2. Measurement and structural model ($n = 646$).
β: loading factors. ***: All factor loadings were significant at $p < 0.001$ level.

Table 5
Hypothesis testing.

Hypotheses	Paths			t	β	p	Comments
H1	BI	<—	PE	10.546	0.358	<0.001	Supported
H2	BI	<—	EE	6.763	0.213	<0.001	Supported
H3	BI	<—	SI	7.280	0.218	<0.001	Supported
H4	BI	<—	FC	7.021	0.215	<0.001	Supported
H5	BI	<—	TR	3.397	0.110	<0.001	Supported
H6	AB	<—	TR	11.328	0.545	<0.001	Supported
H7	AB	<—	BI	4.354	0.197	<0.001	Supported
H8	SAT	<—	AB	7.193	0.360	<0.001	Supported
H9	PU	<—	AB	11.102	0.505	<0.001	Supported
H10	SAT	<—	PU	4.620	0.229	<0.001	Supported
H11	BI	<—	SAT	9.055	0.275	<0.001	Supported

Mediation and moderation effects

The mediator variable, also known as intermediate variable or intervention variable, can change the relationship between the independent variables and the dependent variables [29]. PU as a mediator affects the strength of the relationship between SAT and AB, and BI exerts significant direct effect ($z = 7.633$) and indirect effect ($z = 4.700$), which indicates that BI partially mediator.

Previous studies found control variables have significant moderating effects in various UTAUT models [32]. In the current study, some control variables have the significant moderation effects: Gender is significant control variable between BI and PE ($Z = -3.246$), BI and TR ($Z = -2.204$), SAT and PU ($Z = -2.056$); Age is significant control variable between BI and PE ($Z = -2.009$), BI and TR ($Z = -2.732$), AB and TR ($Z = 2.426$); Income is significant control variable between BI and SAT ($Z = 2.374$). The control effects of Education on all paths are not significant.

Discussion and implications

Discussion

The purpose of our study is to empirically investigate the relationship between elderly's psychological perceptions and their behavioral intentions to adopt general practitioners. Sample data of 646 elderly were collected. Many intrinsic psychological perception factors were incorporated into the extended UTAUT model and the empirical study supports several theoretical hypotheses. Trust is considered as a significant determinant of elderly's behavioral intention to adopt general practitioners, and it is effective and necessary to integrate it into the extended UTAUT model. The extended UTAUT model is an applicable theoretical framework to examine behavioral intention. Performance expectancy, effort expectancy, social influence and facilitating conditions are considered as positive determinants of behavioral intention; adoption behavior and perceived utility are considered as positive determinants of satisfaction. Perceived utility is a partial mediator between adoption behavior and satisfaction. The moderating effects among control variables are significant, such as gender, age, and household income. Our empirical research provides important insights into promoting the adoption of general practitioners among Chinese elderly.

The empirical study supports that "trust" is a significant determinant of behavioral intention and adoption behavior for general practitioners among elderlies. Compared with many developed countries, China's per capita medical resources are insufficient. It leads to misunderstanding between doctors and patients, and mutual trust is fragile [33]. When older people's trust in general practitioners increases, they will be more likely to translate into behavioral intention and actual behavior. The impact loading between trust and adoption behavior is stronger than that of trust and behavioral intentions. This is because behavioral intention is a psychological variable, which is dynamics and uncertainty. This will cause the participants' responses become diversified and the correlation coefficients become weak. Adoption behavior is a definite result and participants can give a clear and stable option. Our research contributes to the improvement of the theoretical framework by integrating trust into the UTAUT model.

The extended UTAUT model has acceptable explanatory power for analyzing behavioral intentions among elderly. As confirmed by previous studies, the UTAUT offers an effective theoretical framework and it has an explanatory power of more than 70% for new technology acceptance behavior [34]. There are four constructs that affect behavioral intention and adoption behavior: performance expectancy, effort expectancy, social influence and facilitating con-

ditions. As an innovative and efficient healthcare system, general practitioners attracted widespread attention from patients, hospitals and government. There are many valuable insights into the factors affecting the acceptance of general practitioners. Expected savings in medical expenses, which is the direct cause of the adoption of general practitioners in Alzheimer's patients [35]. General practitioners can significantly improve the patient's ease of seeking medical care, which is an important reason for influencing behavioral intentions [7]. When individuals have insufficient knowledge of health care, the views of others become more prominent [8]. The facilities condition of the general practitioner is an important factor in determining the behavioral intention, such as referral and Medicare reimbursement [35]. There are some new findings in the context of general practitioners: trust is a significant factor affecting behavioral intentions and adoption behavior (discuss in the previous paragraph); performance expectancy is the most important factor affecting behavioral intention and its loading ratio is nearly 40%. In the context of telehealth service, elderly's adoption behavior is affected by social influences, performance expectancy, and effort expectancy [20,36]. Reasons for seemingly contradicting research findings may include: General practitioners are used as a replacement for the existing medical service system whereas telehealth systems are for supplementary purpose; elderly are primarily concerned with user experience and the convenience of receiving medical services from general practitioners in daily life whereas telehealth systems were only used occasionally.

Empirical studies provide new insights into the perceived utility and satisfaction: adoption behavior and perceived utility are considered as positive determinants of satisfaction, and perceived utility is a partial mediator between adoption behavior and satisfaction. Improving the perceived utility is the final goal of Chinese health system reforms and the application of general practitioners. Perceived utility can significantly improve elderly people's satisfaction with medical services. Satisfaction is an important variable that determines the performance of medical services, and it is positively influenced by the adoption behavior and the perceived utility [37]. This extended theoretical path brings a new perspective to ease the low satisfaction of global medical services. Perceived utility acts as a partial mediator that helps the adoption behavior to impact on satisfaction positively. The theoretical explanation of medical service satisfaction in present study adds new knowledge to the literature.

Consistent with previous studies on elderly's behavioral intention for healthcare systems, demographic variables have significant mediating effects in theoretical models. Gender significantly influences the paths from performance expectancy and trust to behavioral intention, and women have stronger behavioral intention. The loading of females is significantly higher in these two paths than males, that is, women's behavioral intention is more susceptible to be influenced by the psychological perception of performance expectancy and trust. Gender significantly influences the path between satisfaction and perceived utility. Age acts as significant moderator impacts on the three paths: from both performance expectancy and trust to behavioral intention, and between adoption behavior and trust. In addition, younger participants are more likely to translate trust into the adoption behavior to general practitioners. For low-income participants, behavioral intent shows a high correlation with satisfaction. It is somewhat surprising that the variable of education does not have any significant moderating effect in the model, even though it is suggested to be an important moderator influencing elderly's decision behavior to adopt telehealth systems [20,36]. This may be because the elderly has plenty of cognitive experience and they rely mainly on experience rather than the knowledge obtained from education to make decisions [20].

Implications

Under serious pressures of aging population and insufficient medical resources, it is an efficient medical reform strategy for the Chinese government to implement the general practitioners service system. China Health Commission has set a grand goal, namely by 2020, every Chinese have his own general practitioner. A series of unprecedented incentive strategies were proposed by governments in recent years, central government has invested heavily to establish the hierarchical diagnosis and treatment system and launched a large-scale general practitioner training program. Although the conditions of facilities have been greatly improved and led to benefits, the adoption rate of general practitioners was only 40% in 2017. The Chinese government has hope to promote the adoption rate of general practitioners among elderly. However, there is still lack of research to understand the psychological perceptions of elderly's adoption behavior, especially trust, satisfaction, and perceived utility.

Our study is focused on the psychological perspective of elderly for adopting general practitioners. In China, most promotion strategies and policies of medical reform are government-led subsidization. The understanding is that when the hospitalization costs of general practitioners is lower than existing mode, patients will be willing to adopt general practitioners. However, promotions based on this belief has not paid off as elderlies seemingly do not pay much attention to these promotion strategies and policies. In other words, government need to develop comprehensive understanding on elderly's real intention and their psychological acceptance is undoubtedly an indispensable determinant. Therefore, policymakers should use necessary research to identify influential factors of the psychological perspective and thus develop target promotion policies.

First, trust should be considered as important factor impacting elderly's behavioral intention. Policies should focus on two aspects: comprehensive skills training for general practitioners and neutral propaganda. The comprehensive skills training for general practitioners should include two aspects: medical technology expertise and communication skills. General practitioners with comprehensive medical services ability are more likely to obtain the trust from elderly, and doctors' communication skills are a key factor in determining patient satisfaction [38]. Neutral reports can enhance the correct understanding of general practitioners among elderly. It is necessary to clarify the positioning of general practitioners: to be familiar with the health of patients, provide early health interventions and to protect their lives. Second, elderly's performance expectations for general practitioners should be improved, emphasis of theoretical models should be placed between perceived usefulness and behavioral intention. Policymakers should strive for the convenience and economy of adopting general practitioners, such as higher Medicare reimbursement rates, more priority referrals, and shorter waiting time. Third, effort expectancy, social influence, and facilitating conditions are also important factors that influence behavioral intention. Policy makers need to design service systems of general practitioners that are easy to adopt, and reduce the converting difficulties (from the existing treatment process to general practitioners) faced by elderly both emotionally and economically. Governments and general practitioners need to work together to construct infrastructure for elderly such as community hospitals and telemedicine systems.

Last but not the least, the empirical findings also indicate that satisfaction is a construct with multi-dimensional roles. It is not only an expected result of the promotion program for the general practitioner, but also an important independent variable that affects the behavioral intentions of the elderly. From this perspective, policy makers should focus on improving the elderly's satisfaction of general practitioner services. Specific measures include:

providing more sufficient general practitioner's healthcare services by cultivating more general practitioners; improving general practitioners' service quality (such as shortened the waiting time) by increasing their salary; supporting affordable medical expenditures by government financial funds; implementing convenient referral system from general practitioner to large special hospitals. These measures will improve patient satisfaction and promote the application of general practitioners.

Limitations

Finally, some limitations and future research directions should be considered. First, the use of limited age-specific samples and object categories (general practitioners) limits the generalizability of these findings to the industry-wide (healthcare field) [18,39]. We conducted our study with 646 elderly participants in China that only 31% of them received the services of a general practitioner; in addition, surveys were conducted at 12 hospitals, then the participants probably don't represent a random sample of elderly people in the 7 cities. Therefore, it is recommended that further studies should extend the current study to include more population and geographical scope to reveal the broader generalized view of the proposed model in the context of developing countries. In addition, user experience was found to be important determinants of behavior intentions in previous literature such as telehealth system [36], near field communication [40], Electric Vehicle [41], and human computer interaction [42]. As Chinese general practitioners were unable to provide comprehensive and personalized health care services, they cannot change patient's healthcare behavior substantially. The variable of user experience cannot be used as determinant in this study due to data unavailability.

Conclusions

Based on the theoretical framework of an extended UTAUT model, our study aims to find the factors that affect elderly's behavior of adopting general practitioners. The study was focused on seven psychological factors, namely performance expectancy, effort expectancy, social influence, facilitating conditions, trust, satisfaction, and perceived utility, and on the analysis of mediating effects and moderating effects. We conducted an empirical study with 646 sample data in seven cities in central China as valid study participants. Findings form our empirical research confirmed that it is necessary to integrate trust, satisfaction, and perceived utility into the extended UTAUT model, which would have good explanatory power on elderly's behavioral intention for adopting general practitioners. These understandings can prompt policymakers to better understand the psychological perception and behavioral intention of elderly. This study expanded the literature on UTAUT in the context of general practitioners and improved the explanatory power of the theoretical model.

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Author statements

Competing interests

None declared.

Ethical approval

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