Factors Influencing Proxy Internet Health Information Seeking Among the Elderly in Rural China: A Grounded Theory Study

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Abstract. Online health information seeking is becoming increasingly important for self-health management. As a special group, the elderly are at a disadvantage in online health information search. Recent studies have found a large number of proxy searchers who help old people search for health information online. The purpose of this paper is to explore the factors that influence the old people to adopt proxy internet health information seeking (PIHIS). We chose 20 old people in rural China as the research object, and used grounded theory to analyze the interview data, so as to understand old people's attitudes and concerns towards PIHIS. The results of this study provide both theoretical contributions and practical implications on how the Internet benefits the old people.

Keywords: Proxy Internet use · Health information seeking · The elderly · Grounded theory

1 Introduction

The elderly group is growing both in proportion and in size of the total population in China from the year 2000. Especially, the speed of the ageing population has exceeded the world average level [1]. By the end of 2017, the number of people aged over 65 years in China had reached more than 158 million, which accounts for 11.4% of the total population [2]. The accelerated growth of the elderly population leads to the increasing demand for health care and community services, which has become a major challenge for China. At the same time, the aging of the population contributes to the emergence of the "silver-hair market" and provides a huge potential market for the development of gerontechnology [3].

In addition, there is another growing tendency towards widespread dissemination of health information on the Internet from the year 2000 [4]. The Internet plays an increasingly important role as the source of health information for people, including the elderly group. Compared with off-line community hospitals, it is more convenient for

the elderly to obtain health information on the Internet. Health information is particularly useful to help the elderly maintain physical and psychological health, and strengthen self-education on personal care and disease prevention [5, 6]. Prior studies show that seeking health information is one of the main reasons that older people use the Internet in America [7, 8].

Despite rapid development of Internet technology, digital inequalities always exist, especially for the elderly in rural areas. According to the report (2018) issued by China Internet Network Information Center (CNNIC) [9], the Internet penetration rate in rural areas of China is only 36.5%, and rural population is the main component of non-netizens. Although the benefits of using the Internet to obtain health information are obvious, there are some obstacles for the older people, such as lack of access to the Internet, lack of knowledge and skills, and concerns with the security and privacy [10].

Proxy Internet use is considered as one of the effective ways to bridge digital inequalities [11]. Proxy Internet use refers to the indirect access to Internet resources and services through others [12]. Selwyn *et al.* [13] pointed out that the most frequent proxy Internet use focused on seeking online health-related information while family members, especially children or grand-children, and friends acted as the proxies in most cases. Recent studies have found that 61% of online health information searchers seek for health information on behalf of others [14]. However, little research refers to the factors that affect proxy Internet use. This paper aims at filling this research gap by carrying out an in-depth interview with 20 older people in rural China. The results provide a basis for the research on intervention of proxy health information seeking, and further contribute to the reduction of health information acquisition inequalities among the elderly in rural areas.

2   Related Work

2.1   Old People's Internet Use for Health Information

Internet has become a new source of health information for the elderly. Older people are more likely to suffer from chronic diseases than the younger generation, which leads to a great level of health information need [15]. Previous studies have found that Internet users with chronic diseases are more likely to get health information online and share it with others regardless of age and education [16]. Health information helps older people reduce health risks, enrich health literacy and establish a more positive relationship with doctors. Seeking and utilizing health information will be beneficial to their physical and mental health [17]. Since there are a limited number of doctors in China and the inquiry time is short, the Internet is very important for patients to obtain health information, especially for the elderly [18].

Although Internet use may bring great benefits to the elderly, there are still many problems for them to use the Internet. For examples, their lack of experience in Internet use has a negative impact on online health information seeking, which is associated with greater anxiety and lower confidence [19]. Wong *et al.* [17] found that perceived ease of use and attitudes had significant predictive effects on online health information seeking behavior of the elderly. There are also some physical and psychological factors that affect the Internet use of the elderly, such as lack of access to the Internet, lack of use skills, memory and information processing capabilities, and concerns about the security and privacy [10]. It is necessary to help the elderly improve the Internet use and identify reliable online health information source, so as to improve their ability and satisfaction in searching and using online health information.

2.2   Proxy Internet Use

Proxy Internet use could bring the benefits of the Internet to more people. Recent studies on the digital divide have questioned the dichotomy between Internet users and non-users. Some studies have found that the forms of indirect Internet use are less explored in the traditional Internet use research [20, 21]. In particular, among the elderly population, a considerable number of proxy Internet users have been identified. They do not surf the web themselves, but do things online by others. They mainly rely on their children and/or grandchildren, who act as enthusiastic experts [22]. This form of proxy Internet use provides cognitive, mental and socio-material support for the elderly who do not use the Internet by themselves, and helps them with the practice of accessing online information resources [13].

The conceptual model of proxy health information seeking includes three main components: health information demander, proxy searcher and online health information resources (shown in Fig. 1). Dolničar *et al.* [11] studied the proxy Internet use from the perspective of social support network. Some studies focused on the proxy searchers. Proxy searchers, also called "surrogate seekers" [21] or "lay information mediary searchers" [23], are considered as non-medical professionals who search health information for others [14]. Surrogate seekers are more likely to be married middle-aged people with good physical condition [24]. Moreover, they are more likely to live with others, visiting social networking sites to read and share information on medical topics frequently, and participate in online health group activities [21].

In summary, the review suggests that, although there are many studies on online health search and proxy Internet use for the elderly, little is known about the influencing factors of using proxy health information seeking among the elderly. This study intends to fill this research gap.
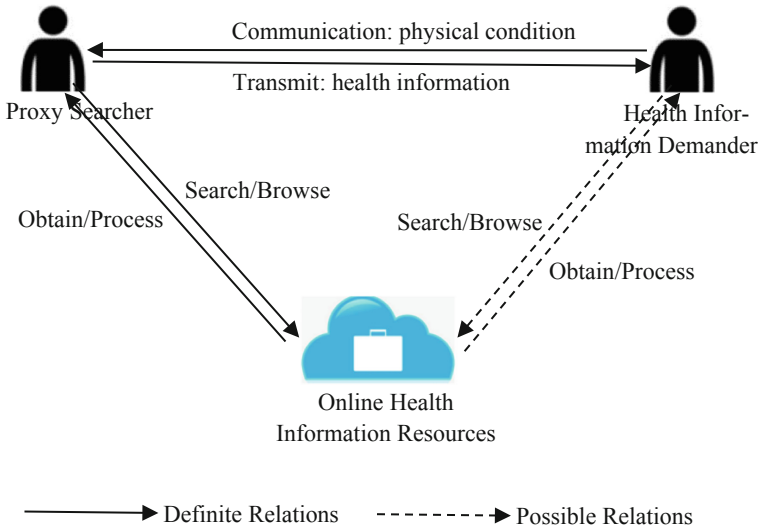
Fig. 1. The conceptual model of proxy health information seeking.

3 Research Design

3.1 Methods

This paper explores and analyses the factors that affect the old people's proxy health information seeking behavior. Since this problem is unfolded in the absence of a solid theoretical basis, this paper adopts grounded theory as the research method. Grounded theory rises original data to systematic theory through systematic analysis [25]. Specifically, there are two reasons for choosing this method. (a) Firstly, the research on the proxy Internet use is still in the preliminary exploratory stage. There are many problems that need further analysis. It is suitable to use qualitative research methods for exploratory research; (b) Secondly, this study aims to analyze the elderly's proxy health information seeking. However, there are few relevant references. This paper uses three stages of data analysis in grounded theory to analyze data, including open coding, axial coding and selective coding [26].

3.2 Participants

This study chooses 20 old people in rural areas of Xuzhou City, Jiangsu Province as the research objects, as shown in Table 1. They are 60–79 years old and have experience in proxy health information seeking. Under the guidance of the interview outline, we interviewed each of the participants for 30–50 min. The interview outline focuses on the following issues: (a) In what circumstances have you experienced proxy health information seeking, and what are your attitudes and views towards this model? (b) Do you think this model is suitable for the old people in rural areas? And why? (c) Could you briefly describe your feelings about the proxy health information seeking and the main problems encountered in the process? (d) Under what circumstances would you voluntarily ask someone to search for health information on the Internet on behalf of you? And why?

Table 1. Characteristics of the participants.

Variables	Number	Proportion
Gender		
Female	9	45%
Male	11	55%
Children		
1–2	4	20%
3–4	11	55%
5–6	5	25%
Live with children		
Yes	7	35%
No	13	65%
Education		
Unlettered	6	30%
Primary school	9	45%
Junior middle school	3	15%
High school and above	2	10%
Chronic		
Yes	14	70%
No	6	30%
Smartphone		
Yes	5	25%
No	15	75%
Computer experience		
No	16	80%
Less than 1 year	3	15%
1-2 years	1	5%
Note: n = 20		

4   Data Analysis

4.1   Open Coding

Open coding is used to decompose and refine data on the basis of collation and induction [27]. In open coding process, the concepts that describe various phenomena are abstracted from the initial data and then these concepts are further generalized to various categories. In this study, a total of 32583 words (including punctuation) were recorded in 20 interviews. Since there are three researcher conducting open coding processes, the number of initial concepts generated is large and some of the concepts are repetitive. Therefore, in the process of categorization, we review the initial concepts again and combines the repetitive concepts. Finally, 18 initial concepts are identified, as shown in Table 2.

Table 2. The results of open coding.

Concepts	Connotation	Original data
Health status	Physical condition of the elderly	"When I'm not feeling well for a long time and I don't know what's going on, I'll talk to my family and ask them to help me see what's going on"
Need care	Old people need care and help from their families	"My daughter often searches some information on the Internet and tells me how to pay attention to my body and what food I can't eat. I'm glad to see that my children care so much about me"
Own experience	Ways for the old people to keep themselves healthy	"Apart from going to the hospital. Usually there are some commonly used medicines at home. If I am not feeling well, I will take some medicines based on experience. Then go out for more walks and exercise"
Security concerns	Old people consider Internet information may be unsafe	"The health information on the Internet is too messy. There are various opinions. A lot of information is false and deceptive"
Privacy concerns	Older people are unwilling to give publicity to their health conditions	"I know my own health. I don't want to talk to others"
Independent life	Old people are able to take care of themselves	"I think I'm in good health. I am fully capable of taking care of myself"
Medical difficulties	It's troublesome for the old people to go to the hospital	"It's really troublesome to go to the hospital. I need to queue up many times. I don't usually go to the hospital if it's not necessary"
Peer influence	Peer influence affects the attitudes of old people	"My friends often get health knowledge from the Internet. They consult some questions online with the help of their children. I think that's a good thing"
Knowledge level	Lack of knowledge among the old people	"I am lack of the knowledge and skills to use computers and smartphones. If I need to search health information online, I can only ask my children to help me"
Thirst for health	Old people want to keep healthy condition	"I'm old now. I think health is more important than anything. When I'm not feeling well, I want to know the reason and treatment plan as soon as possible"
Trouble others	Proxy health information seeking will get others into trouble	"Children are usually busy. I don't want to bother them. And I don't want them to worry about me"

Table 2. (*continued*)

Concepts	Connotation	Original data
Connection with children	Degree of communications among the elderly and their children	"The children don't live with me and have few contacts. I don't often talk to them about my own health"
Attitudes towards layman	The trust of old people on non-medical professionals	"I believe in the expertise of doctors. Others don't know medical knowledge"
Economic factors	Searching for health information on the Internet save money	"Visiting a doctor in a hospital requires registration and various examinations. It costs a lot of money. If you can find useful information on the Internet, I can save some money"
Relevance	Is the health information on the Internet relevant to my own situation	"There are many health information on the Internet. I'm not sure if this information is suitable for my situation"
Advertisement	Television advertising could influence the willingness of the old people	"I often see app advertisements on TV about online medical treatment, such as "Hao dai fu". I think it's convenient. I'd like to try it"
Accessibility of Internet	Old people have no access to the Internet	"I don't have a computer or a smartphone. My son has a smartphone"
Trust family members	Old people trust their families	"I will talk to my family if I feel sick. I am reassured that the children can help me search for health information online. They will certainly not deceive me or hurt me"

4.2   Axial Coding

Axial coding aims to discover and establish relationships among concepts and categories. Researchers constantly compared the relationship among concepts through micro-analysis, and gradually merged concepts to form an axis [27]. In this study, since the participants are old people in rural areas, their statements are not professional. Therefore, in the process of axial coding, researchers focused on the re-analysis and summary of the original concepts.

According to the initial concepts of open coding, we further summarized and classified them. Nine categories have been formed, including personal features, social situation, external motivation, affection needs, perceived benefits, distrust of the Internet, self-confidence, self-care, and family environment. In addition, these nine categories were further analyzed and summarized, and finally three fundamental categories were concluded. The correspondence of fundamental categories, categories and initial concepts are shown in Table 3.

Table 3. The results of axial coding.

| Fundamental categories	Categories	Concepts
The objective motivation of adopting PIHIS	Personal features	Health status
		Knowledge level
	Social situation	Medical difficulties
		Accessibility of Internet
	External motivation	Peer influence
		Advertisement
The subjective motivation of adopting PIHIS	Affection needs	Need care
		Trust family members
	Perceived benefits	Thirst for health
		Economic factors
Obstacles to PIHIS	Distrust of the Internet	Security concerns
		Relevance
	Self-confidence	Own experience
		Attitudes towards layman
	Self-care	Privacy concerns
		Independent life
	Family environment	Connection with children
		Trouble others

4.3   Selective Coding

Selective coding is designed to integrate and refine the classification, and then present findings in the form of theoretical framework [26]. The three main categories formed in the axial coding stage were analyzed concretely. Then, we revealed the typical relationship among the main categories and the behavioral phenomenon. The purpose of this paper is to explore the factors that influence the use of proxy Internet health information for older people. Therefore, the core issue is the adoption of PIHIS among the elderly. The typical relationship structure of the fundamental categories in this stage is shown in Table 4.

The results of the coding processes show that the factors that affect the adoption of PIHIS of old people include objective motivation, subjective motivation and obstacles. In addition, objective conditions are able to adjust subjective psychology to influence the intensity of adopting PIHIS. Based on the story line sorted out from the grounded analysis stages, the preliminary theoretical model of influencing factors of PIHIS adoption by old people is summarized, as shown in Fig. 2. It is worthwhile noting that this paper summarizes the influencing factors model of PIHIS adoption from the first-hand interview data, which has strong theoretical value. However, this model could not be directly applied to empirical analysis, and need to be combined with other theoretical foundations to build specific empirical models and frameworks.

Table 4. The structure of the typical relationships.

Typical relationships	Relationship structures	The connotation of the relationship structure
Objective motivation → adopt PIHIS	Causality	Personal features, social situation, and external motivation objectively motivate old people to adopt PIHIS
Subjective motivation → adopt PIHIS	Causality	Old people need the care and help of their families, and think that the Internet can bring benefits to them. Therefore, they have psychological motivation to adopt PIHIS
Obstacles → adopt PIHIS	Causality	There are some obstacles affecting the adoption of PIHIS by the elderly. For example, they want to live independently, they don't want to trouble your children, and they don't trust the Internet et al.
Objective motivation ↓ Subjective motivation → adopt PIHIS	Moderated	Some objective conditions faced by the elderly, such as personal features, social situation, and external motivation, can adjust subjective psychology to influence the intensity of adopting PIHIS
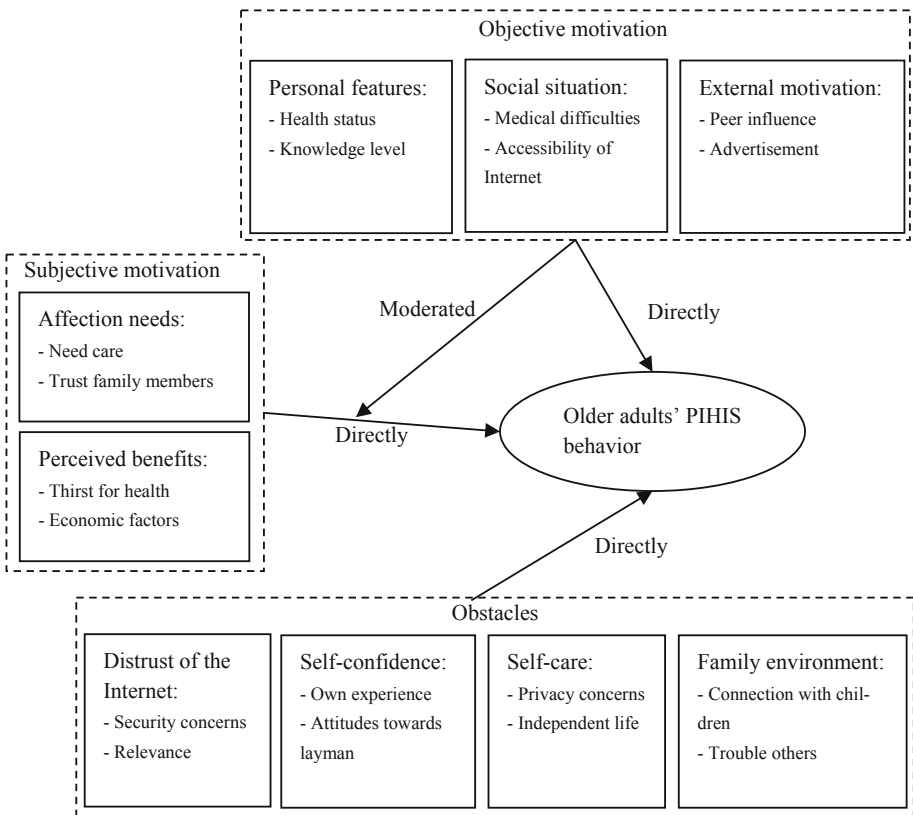
Fig. 2. Theoretical model.

5 Discussion

5.1 The Objective Motivation of Adopting PIHIS

According to the results of grounded theory, this paper argues that the objective motivation that affects PIHIS behavior of old people includes three aspects: personal features, social situation, and external motivation. There are some common characteristics of old people in rural areas. In this study, 70% of participants reported that they had chronic diseases, and 75% of them had a primary school education or below. In China, medical resources are limited and it is difficult for old people to see a doctor. Old people also report that they do not have computers or smartphones, have no access to the Internet. However, with the development of Internet application in China, all aspects of people's lives are impacted, even for old people in rural areas. In the process of communicating with peers and watching TV, old people are exposed to the idea that the Internet is beneficial to personal health management. Accordingly, on the one hand, old people have the motivation to obtain health information on the Internet due to health status, medical difficulties, peer influence and advertising. On the other hand, there are some objective obstacles to their use of the Internet, such as lack of access to the Internet and their lack of knowledge of using the Internet.

5.2 The Subjective Motivation of Adopting PIHIS

The research findings show that the subjective motivation that affect PIHIS behavior of old people includes two aspects: affection needs and perceived benefits. Firstly, 65% of the elderly reported they are not living with their children. Psychologically, old people in rural areas may be alone for a long time. They need emotional care from their children, especially when they are ill. Older people generally trust their families, and they believe their family numbers would do something beneficial to them. Secondly, 80% of the elderly reported that they considered the most important thing was to keep healthy. Five participants (25%) reported that they considered it would be useful and saves money to get health information on the Internet. Based on the analysis above, we proposed that old people in rural areas have subjective motivation to adopt PIHIS, regardless of their care needs from psychological level and perceived benefits from cognitive level.

5.3 Obstacles to PIHIS

Although there are some objective and subjective motivation to promote old people's willingness to adopt PIHIS, there are also some obstacles for the adoption. The elderly are also known as "digital immigrants" [28]. They have some difficulties in accepting the Internet. Nine participants (45%) reported that they believed that health information resources on the Internet could be deceptive and could have a negative impact on their security. Ten participants (50%) feared that online health information might not be appropriate for their conditions. Half of the elderly said they trusted doctors, followed by their own experience. After a long period of treatment, they know how to take medicines and exercises. In the group of laypersons, old people trust their college-

educated children rather than their spouse. Four participants (20%) said they were not willing to tell others about their illness, and they considered they had the abilities to take care of themselves. The most important obstacle is lack of communication among old people and their children, and they are worried they would influence their children's normal life. The analysis above shows that we still need a lot of work to make PIHIS truly benefit the old people.

6   Conclusion

Since the research of proxy internet health information seeking is still in the initial stage, there is no mature theory or framework for empirical analysis. This paper explores the factors that affect the adoption of PIHIS for the elderly in rural areas. The grounded theory was used to analyze the interview data from 20 participants. Eighteen concepts were extracted from open coding analysis, and the classification system of influencing factors of PIHIS among old people was summarized from axial coding and selective coding. The research results not only show the views of PIHIS adoption that the elderly in rural areas take, but also provide implications on how to improve the abilities of old people in rural areas for obtaining health information and maintaining healthy life in the future. However, only interview data is used for qualitative analysis, which is the limitation of the study. In the follow-up study, the authors will combine the relevant theoretical frameworks to model the elements extracted from the grounded analysis. We will use empirical methods to test our findings.

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