



Study on the Persuasive Design Method of Health Education for the Elderly Adults

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Abstract. In the aging society, it will play an effective role in preventing chronic diseases that the elderly adults improve the health knowledge and form a healthy lifestyle with health education. At present, people did not pay enough attention to the health education, because of some reasons. This paper explores the persuasive design method of health education in accordance with the PSD model and health behavior theory. Through literature review, questionnaire survey and focus group interviews, user's motivation and ability are studied and the corresponding persuasive design method and design principles are put forward.

Keywords: Aging health education · Persuasive design method · Healthy behavior theory

1 Introduction

1.1 Current Situation and Demand of Health Education for Aging

Health education is defined by the World Health Organization as “Consciously constructed opportunities for learning involving some form of communication designed to improve health literacy, including improving knowledge, and developing life skills, which are conducive to individual and community health.”, “fostering the motivation, skills and confidence (self-efficacy) necessary to take action to improve users’ health.....” [1].

This paper summarizes the status quo of community health education on elderly adults through literature review and user survey: (1) Lack of health education professionals. (2) The working platform of health education is not perfect. (3) The existing records and data of health education activities in the community are incomplete. (4) The form of community health education is out of date. (5) The content of community health education is simple and outdated, lacking uniform health education materials and systematic and individualized content.

Yang et al. [2] proposed that the appropriate difficulty of health education contents should be matched for users. The evaluation dimension of the level of textbooks should be difficulty, readability, content appropriateness and culture. Wang and Li [3] believe that the diversified demand of health education for empty nesters in community is needed. Modern technology should be combined to the health education with rich

knowledge, strong practicability and easy acceptance traits. Shan et al. [4] and Jiang et al. proved that exposure to health knowledge in We-chat can improve control level of blood pressure and ability of self-management in patients with hypertension [5].

The above research shows that the elderly group lacks effective health education services. The focus of this paper is to study the design strategy of health education for the elderly according to their learning motivation and learning ability, combined with the interactive characteristics of mobile phones, and to establish a set of persuasive design method of health education for the aging society through user research.

1.2 Persuasion Design Model and Health Education Theory

Health education persuasive design method combines persuasive design model, healthy behavior theory, and cognitive theory. There are two persuasion models that have the greatest impact in design. One is the Fogg Behavior Model (FBM) [6] proposed by Professor BJ Fogg, in which the user's behavior is mainly affected by motivation and ability, and the trigger of design. The other is the persuasion design model of interactive system proposed by Oinas-Kukkonen and Harjuma [7]. Interactive design persuasion system model is divided into four parts: task support, dialogue support, system reliability support and social support according to different persuasive strategies.

American scholar Prochaska holds that different motivations and needs are corresponded to people's behavior at different stages. People's behavioral patterns can be changed gradually due to different behavioral stimulus factors [8]. In carrying out these activities, we should pay attention to long-term effectiveness, systematizations and continuity of the health education, guiding people to change their lifestyle actively. There are many health behavior theories, such as rational model, health belief model, extended parallel process model, trans-theoretical model of change, planned behavior theory, activation health education model, communication theory, innovation diffusion theory, etc. In different designs, these theoretical methods should be selected reasonably.

Cognitive Behavior Theory is a kind of psychological and behavioral therapy which aims at eliminating negative emotions and unhealthy behaviors by means of reconstructing cognition, counseling psychology, solving problems and correcting behavior [9]. Daud et al. (2013) proposed a preliminary model of persuasion design based on Web Learning environment [10]. The persuasive design method is based on the above theories and models.

Motivation Study of Health Education Objects. Yang compared the traditional propaganda health education mode with health belief education mode, and concluded that health belief mode can significantly improve the compliance behavior of patients with coronary heart disease in community [11]. The object of health education should include users themselves and their relatives and friends [12]. Scholar Guilera et al. [13] concluded that the effect of comprehensive intervention group was better than that of traditional propaganda group. Laslett et al. [14] think that the long-term improvement of health behavior needs more efforts and self-control of users. Therefore, health education needs to be carried out regularly in order to strengthen users' health literacy, and to promote users' healthy knowledge and memory for a long time.

Study on the Ability of Health Education Objects. Xu et al. [15] believed that the factors affecting health education for the elderly included changes in sensory organs, memory, reaction speed, physical strength and personality. Mechanical memory and unfamiliar content memory should be avoided in the health education activities. Health education should respect the autonomous willingness of the elderly, and gradually expand from their known areas to the unknown areas [16]. According to the old people’s past experience and knowledge, a learning plan should be established to stimulate their interest and create a suitable learning environment. Health content should meet the individual’s different needs in different stages of life. Establishing task- or problem-oriented learning methods can help elderly users apply what they have learned and improve their motivation for learning (Table 1).

Table 1. Ability of elderly to receive health education - design strategies

Ability	Characteristics	Principles of health education product design
Sensory	Psychological ability	As to users’ anxiety, fear, social isolation, low self-confidence, low activity ability, change of perception, impaired language communication ability and impaired self-protection ability, elderly users’ interest and motivation should be stimulated
	Hearing loss	In health education, the speaking speed should be slower than usual and the tone be lower. At the same time, facial expressions, gestures, body language and audio-visual textbooks should be used to assist the explanation
	Vision change	Large font and the color with high contrast should be used. Blue, green and purple should be Avoid in design. Because of changes in crystals, it is not easy for the elderly to distinguish these shorter wavelength colors. In addition, keeping the environment quiet and full of light is very important
Memory	Information processing	The health content should be organized and processed for easy to remember. The situational logic strategy should be used to enhance memory with the fully developed of the user’s experience
	Memory strategy	In order to grasp the learning content easily, relevant memory methods should be adopted, such as association, categorization and repetition, location method and image card method
	Emotional preservation	According to health belief model, the elderly should be helped to pay attention to self-care, maintain emotional stability, happy mood and confidence to delay memory decline

(continued)

Table 1. (continued)

Ability	Characteristics	Principles of health education product design
Reaction rate	Slow down of the reaction rate	Educators should speak slowly so that the elderly have enough time to absorb what they have learned
	Change of thinking process	The time of health education should not exceed half an hour each time. Don't give too much information at a time. Health contents should be divided into multiple introductions, and the information should be simplified
	Language communication barriers	Use body language to communicate, and mostly use the click-and-choose
	Solidification of thinking mode	Let the elderly adults recall past life experiences and link those with new knowledge and skills
Physical strength	Spasm and soreness of Muscle, stiffness of joint	Old people often need to spend more time to complete every movement. It is need to prevent the occurrence of musculoskeletal diseases or minimize their impact on the elderly
	Total sleep time is Reduced	The rest time can be appropriately provided to maintain the appropriate physical strength of the elderly people
Character	Caution, conservatism, decreased in interest of life	Safety, Familiarity, Ease of use, Entertainment, To ensure that the operation of health education is simple and easy to use, and has a pleasant emotional experience [17]

Study on the Content of Health Education. Zhao summarized the content structure of health education needed by the elderly as follows: strengthening health education and behavioral intervention for chronic diseases, developing health education to establish a good lifestyle, take care of psychological nursing, popularizing knowledge of health care and disease prevention, and introducing the dietary structure [18]. The content of health education mainly involves establishing healthy lifestyle, maintaining stable and optimistic dietary structure [19]. The single factor analysis study of Jiang showed that smoking, drinking, inadequate intake of protein food, inadequate intake of vegetables and fruits, heavy diet, lack of physical exercise and excessive intake of seafood were the causes of chronic diseases [20]. The survey of Zhang et al. [21] showed that the subjective needs of the elderly for health education were mainly health diet, prevention and treatment of chronic diseases, medication, psychological health care and first aid. Some knowledge, such as sports, fall prevention, sleep and so on, are important but with inadequate attention. Wang [22] formed five parts of community health education system network by analyzing user needs: health information management module, doctor consultation and answering module, hospital doctor management module, personal health service module and health knowledge testing module (Table 2).

Table 2. System architecture of health education content

Major Categories	Subcategories	Contents
(1) Medical knowledge	Knowledge of Chronic Diseases	Knowledge modularization, knowledge systematization, knowledge customization, learning effect testing, etc.
	Medication knowledge	Main and side effects of drugs, methods of taking drugs, increase or decrease of dosage of drugs, first aid knowledge, etc.
	Psychological health knowledge	Focus on Alzheimer’s disease and depression knowledge, counseling of mental health in the elderly
	Healthy Lifestyle	Diet: Dietary structure, focusing on intake of oil, salt, vegetables, fruits, alcohol; Sports: Recommend types of sports, focusing on speed and time; Knowledge of sleep
(2) Elderly health records	personal data	General sociological data of patients
	Record of Medical Drugs	Records of physical examination, medical treatment and use of drugs in past years
	Intervention follow-up records	Diet and exercise intervention, follow-up records, etc.
(3) Stakeholders	Family members	Actively encourage, urge and cooperate with patients
	Community workers and Volunteers	Enhance communication with old people and their families by means of online interaction, and understand the implementation effect of users’ good living behavior
	Community hospital	Medical consultation and lecture guidance by medical experts

Persuasive Design Strategies of Health Education

Zhuang and Lv put forward various innovative ways of health education, such as setting up stations of community health life guidance and health counseling service, issuing health guide of health and disease prevention, conducting health education lectures and knowledge competitions, and setting up health training classes in senior activity centers [23]. Hua and Chen put forward health education methods, including establishing follow-up card, conducting regular group discussions and regular testing [24]. The suggestion of health education of Wen [25] is customize the training plan according to the education level, age and related health knowledge of elderly patients, and form a multi-batch, regular and diversified health education mode. Hu [26] studied the health education tool of picture-reading dialogue, that is, to let users participate in the interactive learning experience of pictures and text, and to discuss the topics and pictures that users are most interested in.

2 The Persuasive Design Method of Health Education for the Aged

According to Fogg model, on the basis of researching users' motivation and ability, following design strategies are built: first, to stimulate users' motivation through interesting interaction, social interaction, incentive system and other design strategies; second, to reduce users' difficulty in using product according to usability design strategy; third, to maintain users' behavior of accepting health education through timely reminder strategies.

The persuasive design method of health education for elderly adults can be summarized as follows: (1) user motivation and ability survey; (2) choice of health behavior theory; (3) decomposition of health education content as self-health status inquiry, health knowledge popularization and cultivation of healthy lifestyle; (4) consultation of health experts on system architecture; (5) learning tools design of easy-to-use: e.g. video learning method, game learning, dialogue graphics, etc. (6) Compare different persuasive design strategies; (7) Establish design prototype.

3 Research Process

3.1 Questionnaire Survey

(1) *Questionnaire star* was used to survey the health education status of the elderly adults. A total of 300 questionnaires were distributed and 287 valid questionnaires were collected, with a recovery rate of 95.7%. (2) Questionnaire analysis. The content of the questionnaire was formulated according to Fogg's persuasive model. The motivation, ability, interest and media of users' acceptance of health education were analyzed. (3) The focus group method and literature analysis method were combined to analyze the existing health education methods and media interaction characteristics, and the advantages and disadvantages of the existing health education are obtained through user interviews. (4) Combining the research results and the content of literature analysis, the expected structure and design strategy of health education system are confirmed, which will provide guidance for the interactive system design of health education that meets the needs of the elderly in the future.

3.2 Survey Result

Description	Classification	Frequency	Percentage
Gender	Male	137	47.74%
	Female	150	52.26%
Age	51-60	60	20.91%
	61-70	197	68.64%
	71 and above	10	10.45%
Education	Junior high school and below	135	47.04%

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Description	Classification	Frequency	Percentage
	Senior High School	116	34.49%
	Undergraduate	25	8.71%
	Master and above	11	3.83%
Occupation	Retire	68	23.69%
	Management	22	7.67%
	Ordinary staff	125	43.55%
	Workers/Farmers	72	25.09%

According to the data of health survey, 9.76% of users said they never did exercise, 28.22% said they did regular and quantitative exercise every week, and 62.02% said they only did sport occasionally. The situation of health check-up is that 8.36% of the respondents never do health check-up, 57.14% of the respondents do health check-up when they feel uncomfortable, and 34.49% of the respondents have at least one physical check-up every year. When answer the question “If you were ill, what would you do?”, 11.85% chose to “do nothing and wait for to be good by itself”, 43.9% chose to “buy medicine in pharmacy”, and 44.25% chose to “see a doctor in time in a hospital or other medical institution”. In response to the attitude of “participating in health education activities to improve their health status”, 36.59% of the people chose to be very willing, 45.64% chose to be willing, 12.89% chose to be indifferent, and 4.88% chose not to be willing, indicating that most people had the motivation to accept health education.

According to the proportion of users’ choices, the order of users’ concern about the content of health education is: doctor consultation, disease treatment, daily health care, chronic disease prevention, personal health records, etc. (Fig. 1).

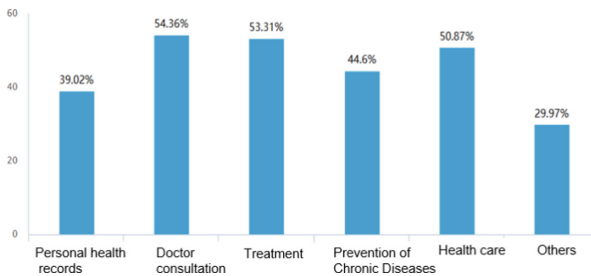


Fig. 1. Survey of health education concerns

Surveys on “common chronic diseases that need to be prevented in the elderly” showed that hypertension and cardiovascular and cerebrovascular diseases account the highest proportion (Fig. 2).

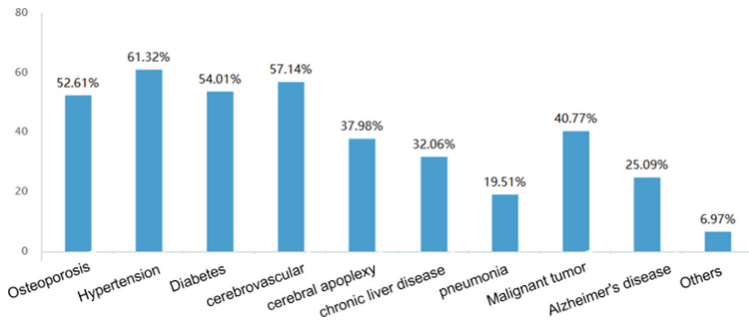


Fig. 2. Common chronic diseases in the elderly

According to the survey of “acceptance mode of health education”, many elderly people have a higher acceptability of the health education on network and mobile phone. 47.74% of the respondents chose the affirmative answer to the question whether they had ever used the medical health APP in mobile phones. To sum up, the advantages of various media should be fully used for reference in the design, so as to conform to the usage habits of the elderly (Fig. 3).

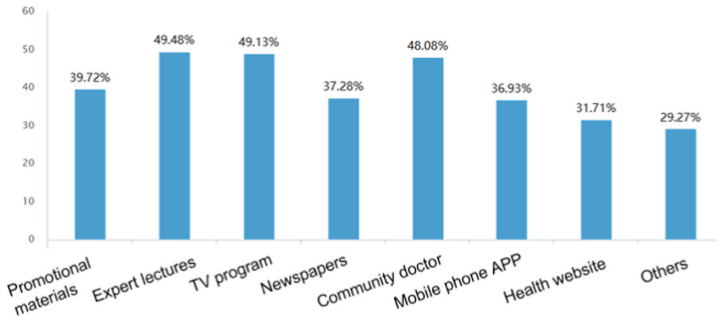


Fig. 3. Expected methods of health education

According to the survey on the purpose of receiving health education, self-health management is the strongest motivation, followed by improvement of existing diseases, prevention and health care, self-learning to treat and so on. The ranking results should be reflected in the system design of health education for the elderly (Fig. 4).

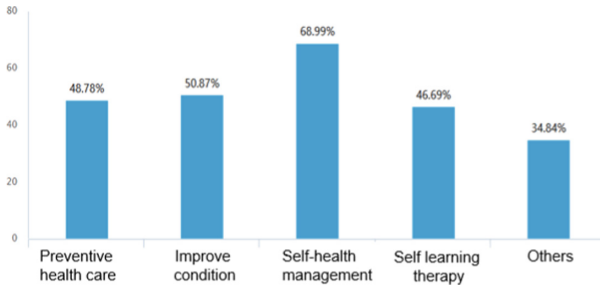


Fig. 4. Purpose of health education learning

3.3 Focus Group Interview

Fifteen elderly people aged 60 to 75 (8 females and 7 males) were invited to participate in the focus group discussion. Users were asked to compare the advantages and disadvantages of the existing community health education with the online health education to inspire design principles of health education on the mobile phone (Tables 3 and 4).

Table 3. Problems and needs of community health education

Type	Status	Design strategy
Memory effect	It is difficult to recall without deep memory	Provide long-term, high-frequency and systematic health education to Deep memory; reduce mistake of drugs and missed medication; limit the length of content, and avoid redundant information
Publicity	Less publicity	Long-term, repeatedly, coherent
Propaganda form	Banners, leaflets and brochures, propaganda boards, promotional films, Experts provide lectures and advisory services etc.	Content is refined, propaganda form is life-like and easy to remember, content is updated in time and keep up with the times
Content	Content is scattered and unsystematic	Content should be relevance, persistence and coherence
Easy to apply	Difficult to remember and apply in life	Different health education information is customized for different needs of elderly adults, and mobile health memorandums are provided to be consulted at any time

Table 4. Problems and needs of the online health education

Type	Status	Design strategy
Health Education Website	Self-regulated learning is supported, but the content of the interface column is too much, and the information is not organized effectively. The elderly has less chance to log in the website with the computer	Clear display to provide a better learning environment for the elderly. To overcome the disadvantage of inconvenience use
Application of Health Education Mobile Phone	<p><i>Chunyu Doctors APP:</i> Focus on online fee-based consultation with many advertisements</p> <p><i>Renwei MOOC:</i> Video courseware is abundant for professional doctors, and the content is not easy to understand for ordinary people</p> <p><i>WeChat Subscription of health:</i> content with daily push, rich and concentrated content, lack of user interaction and action promotion strategy. The authority and credibility of information cannot be guaranteed</p>	<p>Easy to use; Simplified content and easy to browse; Daily push; Easy to retrieve and apply; Convenient to record data; Have self-detection; Study at any time by Keeping it with you; Support multimedia format; Rich content; Select the content of health education according to user's need...</p>

Through focus group interviews and Research on existing health education websites and APPs, the persuasive design principles of health education for elderly adults are as follows:

- (1) The principle of demand-driven design: health education for the users should adapt to the cognitive characteristics of the elderly, and pay attention to the knowledge, science, interest and Understandability in content and form. Investigation and research confirmed that the main needs of the elderly for health education are doctor consultation, disease treatment, daily health care, chronic disease prevention, personal health records, etc.
- (2) Easy-to-use design principle: Health education should conform to the learning ability and health literacy level of the elderly adults. As every old person has different life background, acceptance ability of new technology and health literacy, health education should give effectively support according to users' different characteristics. User's health literacy level and difficult level of the health education should be assessment, so as to provide the appropriate health education content for users. Older people with higher education level is suitable to learn health information by reading, while those with lower education level are suitable for a simple and intuitive way of education, such as face to face explanation and watching videos.

- (3) Design principle of personalized customization: Serialized and targeted health education should be adopted according to the characteristics of individual diseases. Design strategies of personalized customization is a good way to improve user experience.

4 Result Discussion

According to the health behavior theory, the important strategy of health education is to disseminate health information systematically, promote people to accept, believe and voluntarily adopt healthy behaviors. On this study, Fogg's persuasion theory was used to investigate the motivation and ability of elderly. Focus group method was used to analyze the existing problems of health education, and corresponding persuasive strategies of the health education for the elderly was established.

In the follow-up study, we will study the relationship between different motivations and abilities of the elderly users in the selection of persuasive strategies. The user's satisfaction of various persuasive strategies will be discussed based on the prototype design method.

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