

Analysis of the Home Environment Needs of the Elderly in Chinese Cities Under the Background of Intelligent Society

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Abstract. Since 2020, with the support of technologies such as 5G, big data, and cloud computing, more and more smart homes have entered thousands of households. This study aims to analyze the new changes in the housing needs of elderly people in the context of intelligent society through interviews. In home design, attention should be paid to reducing the obstacles of people with mobility difficulties, providing an easy to maintain environment, and combining intelligent technology to provide better security monitoring and social support. By deeply understanding the life needs of the elderly and designing a living space closer to the actual needs, it will help to improve the quality of life and residential satisfaction of the elderly.

Key words: Intelligent Society, The elderly, Aging housing,

1 Introduction

In the context of an intelligent society, the home environment needs of elderly people in Chinese cities are increasingly receiving attention. With the rapid development of technology and the increasing trend of aging population, how to create a safe, comfortable, and intelligent living environment for the elderly has become an important issue in social development. As a combination of modern technology and traditional home life, smart homes not only bring convenience to daily life, but also provide personalized living experiences for the elderly. I hope that through this study, more people can be aroused to pay attention to the issue of elderly living environment, and work together to build a livable, intelligent, and friendly elderly living environment.

2. Literature Review

Based on Maslow's hierarchy of needs theory, the needs of the elderly are interpreted hierarchically, and an information needs model for the elderly is constructed ^[1]. In 2014, Myung Eun Cho and Mi Jeong Kim. The article points out that with the improvement of global longevity trend, the development of intelligent technology to maintain the independence and quality of life of the elderly in their own homes has brought great challenges. By combining intelligent devices, the elderly's activity range and ability can be expanded ^[2]. In 2015, Shubhangi R. Parkar pointed out in elderly mental health: needs that the

overlap of depression and anxiety is very common, and nearly half of the elderly patients reported obvious symptoms of depression and anxiety. The mental state of the elderly deserves more attention ^[3]. In 2019, according to the analysis of the basic influencing factors of the adaptive design of the home environment for the elderly, Liu Fei constructed the correlation system of the influencing factors of the adaptive design of the home environment for the elderly, so as to provide a basic reference for the adaptive design of the home environment for the elderly ^[4]. In 2021, Liu Shu believed that the current era is the intersection of population aging and social digitization, and accelerating the digital integration of the elderly is the new demand and important content of promoting active aging in a digital society. In order to bridge the digital divide between the elderly, promote active aging, and empower the elderly through digital integration ^[5].

3 Theoretical Basis

Analysis of the demand for home space of the elderly in China, The theoretical basis of the study mainly covers the following aspects:

Maslow's hierarchy of needs theory: The theory categorizes needs into five levels: physiological, security, social, esteem, and self-actualization, aiding researchers in understanding the elderly's hierarchical needs in home environments and guiding the design process to better meet their actual needs.

General design theory: it emphasizes that the design should take into account the needs of all people, including the elderly, the disabled and other special groups, to ensure that the designed products, services or environment are equal, accessible and available to all.

Environmental behavior theory: This theory examines how the environment influences behavior, aiding researchers in understanding how the elderly perceive and use their living space to design environments that meet their needs.

4 Research Methodology

4.1 Participant

This study takes the elderly living in the city as the research object, aged over 60 years old, using the method of random sampling, so that each member has an equal opportunity to be selected.

4.2 Data collection

On the one hand, literature research methods are used to conduct extensive literature retrieval, including academic journals, books, papers and related research reports. At the same time, academic databases and library resources are used to retrieve the literature related to this topic. In addition, the literature found was carefully screened and evaluated, and the data and views of the influencing factors related to the needs of the elderly were extracted. Finally, the main viewpoints and research results of the residential needs of the urban elderly are summarized, which is helpful for further research.

For another, interview method is necessary. Secondly, this study uses semi-structured interview method, including eight open-ended questions, to explore the elderly's needs for safety and convenience, social interaction, medical treatment and smart home technology in home life. Then, face-to-face interviews and telephone interviews were conducted with the selected participants by recording.

4.3 Data analysis

Firstly, this study uses statistical software (such as Excel, NVivo) to analyze the content or theme of the interview data, and find out the recurring themes, patterns and other real and specific needs in life.

5 Research results

5.1 Demographic variables of the participants

In the study, 10 elderly people were interviewed. The male and female participants were 4 and 6 respectively. The participants ranged in age from 60 to 75. More importantly, these participants have been living in the city and the living environment is relatively stable, which is very helpful to study the real needs of the urban elderly in their home life. Table 1 shows the demographic variables of the participants.

Table 1:Dynamic variables of the participants.

No	Participants	Age	Gender	Academic stage	Time of residence in the current house
1	Senior A	67	Male	Junior College	2
2	Senior B	69	Female	Senior high school	6
3	Senior C	70	Female	Senior high school	5
4	Senior D	73	Male	Senior high school	15
5	Senior e	60	Female	Senior high school	20
6	Senior f	62	Male	Bachelor's degree	6
7	Senior G	68	Male	Senior high school	8
8	Senior H	71	Female	Senior high school	20
9	Senior I	66	Female	Bachelor's degree	18
10	Senior J	75	Female	Master's degree	24
11	Senior K	70	Male	Junior high school	16

5.2 Main findings

5.2.1 The most concerned needs of the elderly in daily life.

In terms of the most concerned needs of the elderly in daily life, the interview found that 7 elderly people (63.63% of the total sample size) need health. Female accounted for 71.43%, male accounted for 28.57%. As an old man said, "good health is fundamental. Without a healthy body, you can't do anything. With a good body, you can live the life you want.". The interview found that two elderly people (18.18% of the total sample size) needed medical treatment. Women accounted for 100% and men accounted for 0%. There are also two elderly people who are concerned about food safety and wealth respectively.

5.2.2 Existing problems in the kitchen and toilet of the current residence.

In the living space of the elderly, there are 8 people who think that there are design problems in the toilet, accounting for 72.73% of the total number. The problems are that the toilet needs handrails, the toilet has peculiar smell, the space is small, there is no intelligent toilet, the toilet is dark and natural lighting is poor, and the toilet is not heated. An old man said, "the toilet seat needs an armrest. When you are old, your legs are weak, so you can stand up without too much effort."

There are 6 people who think that there are design problems in the kitchen, accounting for 54.54% of the total number. The main problems are non slip on the ground, relatively hot when cooking, poor smoke exhaust effect of the range hood, narrow space, and low intelligence of the stove. An old man said, "the stove should have safety settings to avoid forgetting to turn off the fire. It should have prompt function. It has networking function to pay attention to family safety issues."

5.2.3 Layout, area, sound, etc. of ideal home space.

In the ideal home space, there are 9 elderly people who choose the North-South transparent layout, accounting for 81.82% of the total number. Some elderly people said that "the lighting in the south must be sufficient, and the North-South transparent house type can increase the air flow and make the indoor air fresher". There are 4 people in 60-79 m², 5 people in 80-99 m², and 2 people in 100-200 m². Some old people said that "the spacious and bright big house, three generations can live together, very happy". In terms of noise, all the 11 elderly chose to be quiet and quiet.

5.2.4 The elderly currently use medical or health care equipment at home.

At present, there are 9 elderly people using medical or rehabilitation equipment at home, accounting for 81.82% of the total number. Most of the tools used during the period are health care and household standing tools. Most of the health care equipment are massage chairs, physiotherapy devices, health buckets, etc. the medical equipment are sphygmomanometers, oximeters, oxygen respirators, blood glucose meters, respirators, etc. One old man said, "if you feel uncomfortable at home, you can check it at any time."

5.2.5 The way elderly people socialize.

In daily life, elderly people mainly interact with other elderly people in daily life affairs. Eight people choose to take a walk with their neighbors after meals, accounting for 72.73% of the total number; Six people choose to buy groceries and go shopping together, accounting for 54.55% of the total number of people, with males accounting for 16.67%; 5 people choose to pick up and drop off their children, accounting for 54.55% of the total number of people; Four people choose to play cards, accounting for 36.36% of the total number of people; And males make up 75%. The way they communicate with each other is through WeChat.

5.2.6 Smart home products and services needed in life.

Among the smart home products and services in life, 10 elderly people chose to use smart door locks, accounting for 19.91% of the total number, and 5 elderly people chose sweeping robots, accounting for 45.45% of the total number. The number of people who chose emer-

gency call equipment was 3, accounting for 27.27% of the total number. Some old people said, "smart door locks are very convenient. You don't have to think about taking the key when you go out.

5.2.7 Physical indicators that should be monitored by intelligent medical monitoring system in daily life

Among the physical indicators that should be monitored in daily life, 10 elderly people chose to detect blood pressure, accounting for 19.91% of the total number, and 5 elderly people chose to detect blood glucose, accounting for 45.45% of the total number. There were 4 elderly people who chose to test the heart, accounting for 36.36% of the total. There were 2 elderly people who chose to detect blood oxygen, accounting for 18.18% of the total. Some old people said, "when you feel uncomfortable in your life, you should prepare some commonly used blood pressure and blood glucose detection equipment to simply judge the condition and whether you can go to the hospital.

6 Discussion

6.1 Analysis of the needs of the elderly

6.1.1 The most concerned needs of the elderly.

As the previous data analysis shows, the elderly are most concerned about health. With the growth of age, the elderly pay more attention to their own health status and health management. They hope to maintain good health, prevent and manage chronic diseases, and delay the decline of physical function. According to Maslow's hierarchy of needs theory, the focus on health is actually the first level of the theory's needs. The elderly return to the most basic needs. Only meeting the health needs is an important guarantee for the elderly's pursuit of happiness and a comfortable life.

6.1.2 Problems in kitchen and toilet.

Through data analysis, elderly people may face many problems when using kitchens and bathrooms. Firstly, safety hazards. The kitchen and bathroom floors are prone to getting wet and slippery, and elderly people are particularly prone to falling. The behavioral ability of elderly people decreases, and there is a risk of burns and fire during the cooking process. Secondly, there is a lack of auxiliary facilities. In residential buildings, there is a lack of auxiliary facilities for the elderly, such as handrails, anti slip mats, intelligent call devices, etc., which cannot provide sufficient living assistance and safety guarantees. Thirdly, the facilities are outdated. Old facilities are prone to accumulating dirt and bacteria, affecting the hygiene environment and posing hidden dangers to the health of the elderly. According to the universal design theory, interior design should have adjustability. As the physical condition of the elderly changes, some auxiliary facilities can be installed later to meet their new physical needs.

6.1.3 Use of medical or health care equipment.

At present, 9 elderly people use medical or rehabilitation equipment at home, accounting for 81.82% of the total number, indicating that most elderly people will choose one or more medical or health care products according to their physical conditions. According to the relevant research report of the medical device industry in 2023, the scale of China's medical device market is expected to reach 958.2 billion yuan, with a compound growth rate of about 17.5% in the past seven years, and has leapt to become the world's second largest market after the United States. According to Maslow's demand theory, many elderly people buy a lot of medical and health care products, mainly based on the safety needs in this theory, so that the elderly themselves can get medical treatment faster in their daily life, and slow down their physical weakness.

6.1.4 Social style of the elderly.

According to data analysis, firstly, elderly people's social interactions have strong daily and regional characteristics, and they are more inclined to interact with familiar people around them. This way of communication is often accompanied by trivial matters in daily life. Secondly, there are significant gender differences in certain social activities. For example, in the activity of picking up and dropping off children, although it is not specifically stated who is picking up and dropping off their children, it may imply the traditional concept of division of roles in certain families, and male participation is relatively low. In the activity of playing cards, the proportion of males is as high as 75%, which may reflect the differences in interests and hobbies between genders. Thirdly, social activities among the elderly often have characteristics of collectivity and mutual assistance. They not only enhanced their friendship but also achieved mutual help and support by participating in activities such as walking and shopping together. This collective activity helps elderly people reduce loneliness and improve their quality of life. Fourthly, elderly people are also adopting digital methods for social communication, such as using social media tools such as WeChat. This indicates that elderly people are gradually keeping up with the times in their social habits and adapting to the development of modern society. Digital social media provides older adults with a more convenient and efficient way of communication, helping them overcome geographical limitations and expand their social circles.

6.1.5 Smart home products and services needed in life.

According to the survey data, the smart home products used and contacted by the elderly are rarely developed and used specifically for the elderly, especially for the elderly's rehabilitation, medical and other smart home products. According to the theory of ergonomics, smart home products should have a simple and top-notch interface and operation mode, so as to reduce the cognitive and operational burden of the elderly.

From the perspective of the overall sales of smart home, according to statista data, the proportion of consumers aged 55-64 in China's smart home products was 9% in 2022. Compared with countries with a high degree of aging such as the United States and Germany, the consumption contribution of China's elderly population to the smart home market was low. In the future, with the acceleration of aging process, the proportion of China's elderly consumers in all smart home markets is expected to increase ^[6].

6.1.6 Detection of physical indicators.

Statistics show that the elderly primarily focus on physical health indicators like blood pressure, blood lipids, and blood glucose. In 2022, the National Health Commission of China introduced standards for assessing elderly health, covering physical, mental, and social health dimensions. Physical health evaluation includes nutritional status, sleep quality, vision, hearing, daily activities, and disease status. Mental health assessment considers cognitive function, anxiety, depression, and life satisfaction. However, there's limited attention to mental and social health, with a predominant focus on physical health alone. A comprehensive, three-dimensional health evaluation for the elderly is lacking [7].

6.2 Enlightenment of research results on aging housing design

The research findings hold significant implications for aging home design, concept of pension life, and pension policies in China. It underscores the imperative of integrating aging design considerations into home space planning, including provisions for intelligent home system interfaces to facilitate future upgrades. Given that over 90% of the population in China will require home-based care, smart home systems are vital in assisting the elderly with daily tasks, communication, medical needs, and healthcare.

7 Conclusions

7.1 Conclusions of the study

This study uses the methods of literature, interviews and data analysis to explore the main needs of the elderly's home life, and provides valuable insights for China's aging design. Based on the above research results and discussions, several key conclusions can be drawn.

First, physical health is the biggest demand of the elderly, which is related to the quality of life, happiness and independence of the elderly. Second, in the actual living environment, due to the influence of economic conditions, traditional consciousness, laws and regulations, residential location, family structure and other factors, the aging residential design of home-based care has not been paid attention to, which affects the quality of life of the elderly. Third, there are many portable health care and medical devices, and the efficacy and safety of some health care devices need to be carefully purchased. At the same time, some elderly people buy health care devices as medical devices. Fourth, The social activities of the elderly run through the trivialities of daily life, and there are differences in the activities that men and women participate in, but they are more closely connected through social software. Fifth, the use of intelligent products is a general product for ordinary families. There is no product specifically designed for the elderly. Most of the products follow the use of young people at home. The elderly feel that the price of intelligent products is high and are not willing to spend. Sixth, while paying attention to physical health, we ignore mental health and social health. They may have psychological problems such as anxiety and loneliness due to physical aging, or they may feel disconnected from society due to the narrowing of their social circle.

In summary, In short, due to economic, cultural, legal, and family limitations, elderly friendly housing designs often lack attention and affect their well-being. Social activities vary by gender, but social apps are increasingly providing convenience for them. Although smart products are widely used, they lack design specifically for the elderly and are often perceived by them

as expensive. Finally, although physical health is crucial, psychological and social health are often overlooked, leading to issues such as anxiety, loneliness, and social disconnection.

7.2 Limitations of this study and future research prospects

7.2.1 Limitations of the study.

Sample limitations: the study may only cover a small part of the elderly and cannot represent the entire elderly group. The sample size, representativeness and diversity may affect the universality and popularization of the research results.

Methodological limitations: there may be limitations in the choice of research methods. For example, the use of questionnaires may be affected by the memory, expression ability and subjectivity of respondents, while observation or experimental methods may be limited by environment and conditions.

Cultural and regional differences: China has a vast territory, and different cities may have differences in culture, living habits, and economic development levels. The research results should consider regional specificity.

7.2.2 Future research prospects.

Interdisciplinary research: integrate the knowledge and methods of architectural design, medicine, psychology, sociology and other disciplines to explore the impact of home environment on the physical and mental health of the elderly.

Focus on emerging technologies: study the application and effect of smart home technology and telemedicine in meeting the home environment needs of the elderly, and explore how to use technology to improve the quality of life of the elderly.

Recognizing these limitations will help researchers design research methods more carefully, expand the sample range, consider multifactor analysis, and continuously improve the quality and effectiveness of research in future research.

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