

Research on the Design of Aging Friendly Living Space under the Background of Intelligence

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Abstract. The issue of aging population is a focus of social concern, and more and more aging related problems will emerge in the future. At the same time, the rapid development of technology brings convenience and intelligence to life, and smart home design continues to enter ordinary people's homes. Various smart devices are emerging like mushrooms after rain. In this context of social development, how to use intelligent means to improve the comfort and safety of elderly people's lives has become the key to solving the aging problem. This article analyzes the behavior and physiological characteristics of elderly people, explores the application of intelligent design in aging friendly living spaces, and analyzes the combination of floor layout, the development of smart homes, intelligent control, etc., providing theoretical basis and practical guidance for improving the comfort of elderly living spaces, It also expands ideas for the integration of intelligence in elderly friendly spaces.

Keywords: Intelligence; Suitable for Aging; Residential Space Design.

1. Introduction

China's population aging is developing very fast. By 2024, the population over 60 years old in China has reached 310 million, accounting for 22% of the national population. By 2035, the proportion of the population will reach 30%, entering the super aging society. Such rapid aging development will inevitably lead to new social needs. The development of intelligence has also formed a new term, intelligent pension. It can be seen that intelligent technology plays an increasingly important role in the design of aging space.

2. The Current Situation and Problems Faced by Intelligent Elderly Friendly Living Spaces Both Domestically and Internationally

At present, multiple departments including the National Development and Reform Commission and the Ministry of Finance have issued relevant notices to support home aging adaptation and smart home consumption, and specific implementation plans have also been introduced in various regions; In terms of industrial development, whole house intelligent aging adaptation has become a hot topic in the field of smart homes, with numerous technology companies and communication operators actively participating to promote the integration of the elderly care industry and intelligent technology; At the technical application level, intelligent health monitoring systems, smart home control systems, emergency call systems, etc. are widely used in living spaces, and it can be said that the design of aging friendly living spaces has received strong support from all aspects; Foreign countries such as the Japanese government fund the development of nursing robots, install sensors to track elderly dementia patients, and some companies also use artificial intelligence to analyze videos and sounds to determine whether elderly people need help.

The intelligent elderly friendly space also faces some problems: firstly, at the technical level, it is necessary to ensure the stability and usability of smart devices, simplify the operation process and interface, and reduce the learning cost for the elderly; Resolve compatibility issues between different brands and types of smart devices, and achieve interconnectivity between devices; Secondly, in terms of security and privacy, smart devices collect a large amount of life and health data from the elderly. The secure storage and transmission of data is crucial to prevent data leakage and malicious

exploitation; At the third cost and popularization level, the current high cost of renovating intelligent elderly friendly living spaces limits their popularity, and it is necessary to reduce costs and improve cost-effectiveness; Finally, in terms of humanistic care, family members and community members should be encouraged to participate more in the lives of the elderly, in order to avoid emotional loss caused by excessive dependence on equipment.

3. The Life Needs and Behavioral Characteristics of Elderly People under the Background of Intelligence

The living characteristics of elderly people are closely related to their physiological and psychological conditions. In terms of physiology, their physical functions are gradually deteriorating, and many elderly diseases occur frequently, resulting in many problems that cannot be taken care of by themselves; The disconnection from the times makes them feel gradually forgotten and eliminated by society, unable to integrate into society, which greatly affects their psychological changes. They need the care and help of others, as well as the need to communicate and express themselves to others.

3.1 Physiological Needs

The aging of the elderly leads to the gradual decline of various bodily functions, such as decreased vision, hearing, and mobility, which makes them have higher requirements for light, sound, spatial scale, and other aspects in their daily lives. Elderly people often suffer from various chronic diseases and require real-time monitoring of physical indicators such as blood pressure, blood sugar, heart rate, etc., in order to obtain timely health advice and medical services. Intelligent digital technology provides the possibility to meet this demand.

3.2 Psychological Needs

Older people have a strong need for a sense of security and belonging in their living environment, and they hope to maintain a certain degree of independence and be able to independently complete daily activities. Intelligent digital technology can provide comprehensive security for the elderly through smart door locks and monitoring camera devices; The design of these digital products should fully consider the operating habits and abilities of the elderly, making them easy to learn and use, allowing them to enjoy technological convenience while maintaining their independence and self-esteem. Creating a warm and comfortable living atmosphere in spatial design, incorporating family elements and regional cultural characteristics with a sense of aging, can enhance the sense of belonging of the elderly.

3.3 Social Needs

Older people crave to maintain close contact with family and friends, share their daily lives, and smart devices break the limitations of time and space, allowing them to communicate and interact with their loved ones and friends anytime and anywhere. The application strategy of digital technology in the design of intangible cultural heritage display.

4. Design Principles and Strategies for Intelligent Elder

The design principles for elderly friendly living spaces need to be analyzed based on the living needs and behavioral characteristics of the elderly, and the following principles can be summarized. Firstly, safety is the primary principle. Due to age, various bodily functions of the elderly are declining, which affects their safety and may lead to various unexpected situations; Secondly, the principle of usability should be considered in the design, taking into account the factors of declining physical function, cognitive and learning abilities of the elderly. The design should simplify the usage as much as possible to improve recognition and provide living facilities that are easy to operate and use; The third principle of comfortable living is to achieve intelligent control of the living

environment through the introduction of intelligence, in order to improve the comfort of aging friendly living room design and meet the physiological and psychological needs of the elderly.

In terms of design strategy, it combines the physiological and psychological needs of the elderly with design principles to analyze the spatial functions, and combines the advantages of intelligence to achieve the goal of comfortable and convenient use of the space. Specifically, it can be summarized as follows:

4.1 Function Layout Partition Optimization

Firstly, the dynamic and static zoning should be reasonable. Based on the living habits of the elderly, the living space should be divided into dynamic and static zones. Dynamic areas, such as living rooms, dining rooms, kitchens, etc., are used for daily activities and socializing; Quiet areas, such as bedrooms, study rooms, etc., are used for rest and sleep. Clear dynamic and static zoning can reduce noise interference and provide a quiet and comfortable resting environment for the elderly; Secondly, in terms of barrier free access design, ensure that the passages in the living space are spacious, flat, without height differences or obstacles. Install handrails at key locations such as doorways, corridors, and bathrooms to facilitate walking and support for the elderly. Reasonably design the placement of furniture, leaving sufficient space for activities, and facilitating the passage of wheelchairs or walkers for the elderly.

4.2 Application of Intelligent Facilities

The intelligent health monitoring system installs intelligent health monitoring devices in the living room, such as smart mattresses, smart bracelets, etc., to monitor the sleep quality, heart rate, breathing and other physiological indicators of the elderly in real time. Once abnormal situations are detected, the system can automatically issue an alarm and transmit the data to family members or medical institutions for timely measures.

Through the smart home control system, elderly people can easily control lighting, curtains, appliances, and other devices through voice commands. They can lie in bed and turn off lights and adjust air conditioning temperature through voice commands without the need to get up, improving the convenience and comfort of life.

The emergency call system sets up emergency call buttons in areas prone to accidents such as bedrooms and bathrooms. When elderly people encounter emergency situations, they only need to press the button to send distress signals to their families or community service centers. The system can automatically locate the elderly's location, providing convenience for rescue work.

4.3 Design and Creation of Spatial Environment

Fully utilize natural lighting and ventilation to create a healthy and comfortable indoor environment for the elderly, increase window area, design window opening methods reasonably, and ensure sufficient sunlight and fresh air indoors; In terms of color and material selection, warm and soft tones such as beige, light yellow, light blue, etc. can be chosen to create a warm and comfortable living atmosphere; Priority should be given to using environmentally friendly, non slip, and easy to clean materials, such as wooden floors, non slip floor tiles, etc., to ensure the safety of elderly residents.

5. Design and Analysis of Intelligent Elderly friendly Living Space

5.1 Entrance Hall Space Design

The entrance hall space should consider the convenience of entry and exit, and should be designed to be more spacious, taking into account the behavior of elderly people with limited mobility. It should be convenient for elderly people with limited mobility to enter and exit the house through wheelchairs, and handles should be installed as much as possible to facilitate safe entry and exit for the elderly. In

terms of intelligent design, smart door locks can be considered, which use various unlocking methods such as fingerprint, password, and facial recognition to facilitate elderly people who forget to bring their keys to easily open the door, and family members can remotely check the status of the door lock; Set up an automatic sensing shoe changing stool. When the elderly person approaches, the shoe changing stool will automatically pop up, and after sitting down, it can automatically adjust its height according to the body's sitting posture, reducing the burden of getting up; Intelligent lighting guidance, equipped with human body induction lights, automatically lights up when the elderly enter the entrance, providing clear illumination to guide them smoothly into the room. When they leave, the lights automatically turn off, which is both convenient and energy-saving.

5.2 Living Room, Bedroom, and Living Space Design

As a space for daily activities of the elderly, the layout and zoning design of residential space is very important. It is necessary to divide the dynamic and static areas according to the physiological characteristics of the elderly. The furniture scale should be arranged according to the living habits of the elderly, with special attention to detail protection and convenient use. In terms of intelligence, TVs can integrate voice search function, allowing elderly people to quickly find the programs they want to watch without manual input. Voice interaction can obtain weather, news, and enrich daily life by listening to broadcasts; Intelligent environment regulation, equipped with intelligent air conditioning and air purifiers, can automatically adjust the operating mode according to indoor temperature, humidity, air quality and other environmental parameters; The smart sofa has an electric adjustment function, allowing elderly people to adjust the angle of the backrest and leg support according to their own needs, find the most comfortable sitting or lying position, and also has a massage function to relieve physical fatigue in the elderly.

The bedroom, as a resting place for the elderly, is very well integrated with smart applications and daily living. Smart health monitoring and smart mattresses can monitor the elderly's sleep quality, heart rate, respiratory rate and other physiological indicators in real time. Once the data is abnormal, the system automatically sends alarm information to the bound family members' mobile phones or community medical service centers, making it convenient to take timely medical measures; Set up an intelligent control panel at the head of the bed, and the night light will automatically turn on when you wake up at night to avoid strong light stimulation affecting your ability to fall asleep again; Install emergency call buttons on both sides of the bed head, connected to the whole house intelligent system. When elderly people encounter unexpected situations in the bedroom, such as falling or feeling unwell, they can quickly send a distress signal to their family or community service center by pressing a button, and automatically locate their location to save valuable time for rescue.

5.3 Bathroom Bathing Space

The bathroom is the place where elderly people are most prone to safety accidents. It is necessary to fully consider the situation of elderly people who do not take care of themselves, the movements of elderly people in different situations, the location of accessible handrails, the range of wheelchair movement, the position and height of benches when bathing and changing clothes, and the position of nursing staff. These safety issues should be introduced into intelligent safety systems, and fall detection sensors should be installed. When an elderly person falls in the bathroom, an alarm should be immediately sent to their family or community service center; Using human body sensing lighting, the lights automatically turn on when elderly people enter the bathroom and turn off automatically when they leave; The intelligent ventilation system can automatically turn on or off according to the humidity and odor situation in the bathroom.

5.4 Kitchen Cooking Space

The kitchen space should avoid hot work as much as possible, and use kitchen appliances with safety assistance functions, such as smart cooking equipment, smart rice cookers, smart ovens, etc., with one click operation and preset menu functions. Elderly people only need to prepare the

ingredients, select the corresponding cooking mode, and the equipment can automatically complete the cooking process; Intelligent security monitoring function, once an abnormality is detected, it will immediately issue an alarm, automatically shut down and cut off the source of danger, and send notifications to family members' mobile phones to avoid security accidents.

By integrating intelligent design into various living spaces, we can fully meet the needs of the elderly in terms of convenience, health management, safety, and other aspects of life, improve their quality of life, and enable them to enjoy a more comfortable, convenient, and safe home life in the era of intelligence.

6. Conclusion

The continuous development and innovation of intelligent technology bring more opportunities and challenges to the design of aging friendly living spaces in the future. Continuously exploring new applications and models of intelligent technology in aging friendly living space design will be a key direction for future research. Strengthen interdisciplinary cooperation, integrate knowledge from multiple disciplines such as architecture, medicine, psychology, and information technology, promote the development of aging friendly living space design towards a more intelligent and humanized direction, and provide a more solid theoretical foundation and technical support for creating higher quality and efficient aging friendly living spaces.

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