Research on Aging Space Design from Intelligent Perspective

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Abstract. With the rapid development of science and technology power, the era of artificial intelligence has arrived, home endowment mode of the elderly for the requirement of living space is generally increased, this paper is based on the perspective of modern intelligent analysis and according to the actual needs of the elderly, considering their physical characteristics and psychological characteristics, comprehensive analysis for the elderly living space intelligent facilities and household products, and adopt intelligent technology to solve the problem. This paper aims to eliminate a series of obstacles in the living environment of the elderly as far as possible, improve the convenience and safety of the elderly living space, create an appropriate living space environment suitable for aging, and escort the life of the elderly.

Keywords: artificial intelligence; suitable for aging space; intelligent home

1 Introduction

According to the 2021 National Aging Development Bulletin released by the National Health Commission and the National Aging Office, by the end of 2021, the elderly population aged 60 and above was 267.36 million, accounting for 18.9% of the total population, and the elderly population aged 65 and above was 200.56 million, accounting for 14.2% of the total population[1].The growth of the elderly population follows the living environment of the elderly under the home care mode. With the rapid development of society, digital technology has promoted the innovation of architectural design methods and tools, and the application of digital technology provides greater possibilities for more innovative and scientific design of public building space[2].Intelligent technology has been widely used in the pension residential space and pension mode, and more and more elderly people are gradually accustomed to living in the intelligent living space. In order to better meet the actual needs of the elderly in the independent home care, improve the convenience of the elderly and enhance the security, intelligent technology has been popularized on a large scale. The application of intelligent technology can significantly improve the quality of life of the elderly, improve their quality of life, and further improve the satisfaction with the surrounding living environment. Therefore, the development of intelligent home care model has become a major trend of the elderly care life.

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2 Research background

2.1 Intelligent era

The era of intelligence refers to the era in which intelligent technology is widely used and popularized under the background of the continuous development of science and technology. In the era of intelligence, artificial intelligence, the Internet of Things, big data and other technologies have become an important force in promoting social progress and change. For example, artificial intelligence technology is widely used in various fields, such as autonomous driving, robotics, speech recognition, natural language processing and so on. By simulating and mimicking human intelligent behavior, the application of artificial intelligence enables many tasks to be automated, improving efficiency and accuracy. Secondly, the Internet of Things technology enables various devices and sensors to connect to each other, forming a huge network. Through the Internet of Things, people can realize data sharing and remote control between devices, and realize intelligent and automated functions, smart home, smart city, etc.

The intelligent era has brought great changes and opportunities. The wide application of intelligent technology has changed people's working style, life style and social structure, and improved the efficiency and convenience. However, attention should also be paid to the impact of intelligent technology on privacy and security to ensure a balance between progress in the intelligent era and human value.

2.2 Smart home and suitable for aging space

Smart home refers to a living environment that connects various home devices, home products and systems through the Internet and the Internet of Things technology to realize remote control, automatic operation and intelligent management. Smart home can provide people with a more convenient, intelligent and comfortable living experience, and improve the quality of life.

With the increase of the number of the elderly population, increasing their life span, income level and education level, the demand of the elderly for the living environment has also changed. They want to live in a more comfortable, safe and convenient environment, and the aging-friendly design exists precisely to meet this need. Aging-friendly design is a design method that focuses on the living characteristics and needs of the elderly. It comprehensively optimizes the living space from the aspects of architectural design, equipment configuration, interior decoration and furniture layout. In the design, it is necessary to consider the physical function, cognitive ability, psychological needs of the elderly, and consider the behavior and needs of the elderly in all aspects, so as to solve the problems that the elderly may encounter in the case of mobility, vision loss, weakened hearing, and other situations. By creating a warm and comfortable family atmosphere, create a safe, comfortable and convenient living environment, improve the quality of life of the elderly.

Today, our country pension problem is still an urgent need to solve the realistic problem, social pension system lack of pension, most of the elderly will choose in the community family endowment, the home endowment model slowly established, but there are also corresponding problems, such as the lack of pension facilities, the space design without the

elderly to design, for such problems, can consider suitable aging space and intelligent home to give full play to the role of intelligent home improve space comfort, household efficiency, living security, etc., to further improve the quality of life of the elderly.

3 Physical and mental characteristics of living in the elderly

3.1 Physiological characteristics

The people with the growth of the age, the body function began to decline, show as table 1. Performance in the following four aspects, mainly including sensory, movement, digestion and respiratory function, elderly motor function decline bring muscle atrophy muscle strength, balance and prone to fracture phenomenon, sensory function decline may lead to decreased vision, taste, slow response, respiratory function may lead to respiratory failure, cerebral blood supply and cerebral diseases such as infarction, The decline of digestive system function is mainly due to the decline of digestive organs and the reduction of teeth and chewing ability, which may lead to constipation and other diseases in the elderly.

Table 1 Table of physiological decline in the elderly

Functional category	decay
Sensory function	A reduction in vision, hearing, taste, smell, etc
motor function	Muscle atrophy, muscle strength decline, weakened balance ability, osteoporosis is prone to fracture phenomenon
Digestive function	Decreased digestive function may lead to lower weight and increased number of excretions in older people
Respiratory function	Geriatric emphysema "; weakened respiratory muscle strength, poor cough effect, decreased bronchial cilia activity, prone to respiratory tract infections and cardiovascular disease, etc

3.2 Psychological characteristics

On the psychological level, the elderly show decreased psychological security, weakened adaptability, sense of loss, inferiority complex, loneliness and suspected old psychology. Due to the limitations of physiological conditions, such as the decline of short-term memory ability and the degradation of thinking ability, elderly people have relatively low ability to accept new things and need longer time to learn and understand new things. At the same time, their ability to adapt to the social and living environment will also be weakened, and they are prone to lonely emotions. Show as table 2.These factors may cause older people to feel lost, lonely, and have a feeling of inner emptiness. Therefore, for age-appropriate design, attention is needed to their mental health and social support in addition to meeting their living needs and providing a comfortable living environment. Providing a sense of security, building support networks, encouraging social participation in social activities and hobbies are all measures that can help to improve the psychological characteristics of the elderly. Help them to maintain a positive attitude and self-esteem, enhance the ability to adapt to new things, and help to improve their quality of life and happiness.

Table 2. Analysis of the elderly

State Age	60-65 Years old	66-70 Years old	Over 71 years old	overall number of people	percentage
Lonely psychology	30	55	75	160	80%
inferiority complex	11	26	43	80	40%
Suspicion old psychology	60	25	15	100	50%

3.3 Behavioral characteristics

In addition to the performance of psychological characteristics, the elderly may also show some characteristics in their behavior. The first is stubbornness. They may be more committed to their own views and habits, and have a strong resistance to new ideas and changes. The second is the tendency to nostalgia. They have a deep emotional connection between past memories and traditional values, and cherish past experiences and customs more. Moreover, older adults' interest may decrease with age, and they may no longer pursue new experiences and recreational activities, and more likely prefer familiar and stable things.

4 Principles of intelligent pension space design

4.1 Safety principles

In the design of intelligent pension space, security is a crucial principle, which needs to focus on the safety needs of the elderly. With the increase of age, the body function of the elderly gradually decreases in action, auditory auditory decline, visual vision decline, so the first point of the design process of the elderly should pay attention to the safety of the aging space for the elderly. For example in the material of ground and stair of anti-slip measure should choose the material with good anti-slip performance, avoid to produce slip accident when old people walk, can be laid on ground and stair anti-slip mat or device armrest, in order to provide better support and stability[3].Install intelligent emergency call systems, such as emergency call buttons or voice-controlled equipment, so that the elderly can quickly call for help in case of emergency. In order to improve the visibility and safety of the living environment, ensure appropriate lighting in both indoor and outdoor areas. In addition, you can also consider using intelligent induction light and automatic dimming system, according to the activities of the elderly and light conditions, automatically adjust the lighting brightness, the introduction of intelligent monitoring technology, such as surveillance cameras, doors and Windows sensors and leakage detector, real-time monitoring of environmental changes and potential security risks, through intelligent alarm and remote monitoring, timely discover and deal with possible security problems, to create a safe and comfortable pension environment for the elderly.

4.2 Practical principle

Intelligent home endowment space must pay attention to practical principle, whose abodes are the Center of virtually all of their activities. Adaptations to the home, the provision of practical

domestic aids to daily living and appropriately designed households for those elderly people whose mobility is restricted or who are otherwise disabled to continue to live in their own homes[4]. the elderly itself belongs to the vulnerable groups of human groups, the design of the endowment space should be based on the elderly physiological, psychological, and behavior habits, really understand the problems encountered in the elderly life, intelligent endowment space to solve the problems in the elderly life, real can help the elderly daily life, for example, in order to improve the practicability, using simple and easy to use intelligent control system. Through touch screen, voice control or remote control, let the elderly easily control lighting, temperature regulation, curtains, household appliances and other equipment, to ensure that they can freely operate and manage living environment and in the bathroom, kitchen and other areas use easy to clean materials, such as antibacterial floor, waterproof metope, in order to improve the effect of health and cleaning. Additional, can install intelligent induction faucet, automatic clean toilet and other equipment, reduce the elderly labor and inconvenience in daily life. The integration of intelligent technology can create a practical and convenient intelligent space for the elderly, and improve the quality of life and autonomy of the elderly.

5 Intelligent aging-appropriate space design method

5.1 Build an intelligent detection system

Intelligent detection system is an important technology in the design of intelligent pension space, which is used to monitor and identify the behavior, health status and environmental changes of the elderly. The system uses sensors, cameras, sound recognition and other technologies to realize the monitoring and analysis of wearable devices, living environment and daily activities of the elderly. First, through indoor cameras, door and window sensors, smoke detectors and other equipment, monitor the living environment of the elderly in real time, timely detect fire, theft, falls and other emergencies, and generate corresponding alarms and notifications. Second, artificial intelligence algorithms and machine learning technologies are used to analyze and identify the daily activities of the elderly, such as getting up time, eating conditions, washing habits, etc., so as to provide personalized care and services. Third, through acceleration sensors and other equipment, real-time monitoring of the elderly fall, and trigger the alarm in time, so as to take rescue measures. According to the personal needs and habits of the elderly, use voice reminders or mobile apps to send reminder messages to help them remember important matters such as daily tasks and medication time. Fourth, with the increase of age of the elderly, their memory may be significantly reduced, and the events of missing and forgetting to take the key occur from time to time. By setting up the access control system, the access control system has infrared perception, luminosity perception, temperature and humidity perception and other functions. See the main content of access control system, "Unlock linkage" and "lock prompt" system. "Unlock linkage", when you open the door lock, automatically open the indoor curtains, lights, fresh air and so on. When the old man goes home at night, he automatically turns on the lighting, which not only liberates his hands, but also provides convenience when his hands can not turn on the light."Unlock prompt", give children to reflect the time of the elderly home or out, so that children can understand the safety situation of the elderly[5]. By using location technology,

such as GPS, Bluetooth, the location of the elderly can be tracked to ensure their safety and find them in time.

The construction of intelligent detection system can provide real-time monitoring and feedback, help the elderly to keep safe and healthy, and provide personalized care, provide a higher level of intelligence for the elderly space, and enhance the quality of life and comfort of the elderly.

5.2 Construction of intelligent medical system

In the elderly with the increase of age, the body function gradually decline, the risk of disease is increasing year by year, build intelligent medical system can help the elderly reduce the risk of sick death, also help to reduce family medical costs, intelligent medical system can real-time monitoring of the elderly health indicators, such as blood pressure, blood rate, blood sugar, etc., and timely alert or remind, so as to take necessary medical measures as soon as possible, it helps to prevent potential health risks and emergencies. For the elderly, travel to the hospital may be inconvenient or difficult, intelligent medical system to provide remote medical services, the elderly can through video communication and consultation, reduce unnecessary travel and waiting time, this kind of remote medical service can provide timely medical support and advice, convenient elderly management health problems also reduces the cost of medical and family labor. Provide personalized health management, intelligent medical system can be according to the elderly personal health data and demand, the system can generate for each elderly health plan and nutrition advice, help them better manage their own health, which enables the elderly to better understand and master their own health, take corresponding prevention and management measures. The intelligent medical system can provide a full range of medical services and health management in the pension space, bringing a more comfortable and secure living environment for the elderly. It can not only detect and deal with health problems in time, but also reduce the medical burden of the elderly and improve the quality of life.

5.3 Construction of intelligent fire protection system

The application of intelligent fire protection system in the pension space can provide a higher level of fire safety protection and ensure the safety of life and property of the elderly. The intelligent fire protection system can monitor the signs of fire in the environment in real time through smoke sensors, temperature sensors and other equipment. When the system detects smoke or abnormal temperature, it will immediately trigger the alarm and send notices to relevant personnel, so as to take emergency evacuation measures in time to ensure the safety of life and property of the elderly. By building intelligent fire control system can also be through the emergency help button or remote control, acoustic and optical alarm device, mobile phone SMS or phone calls to the elderly, staff and security personnel to send fire alarm for help, build intelligent fire control system can be integrated automatic fire extinguishing device, such as spray fire extinguishing system or gas extinguishing system, when the system detected the fire, automatic start fire extinguishing equipment, quickly put out fire, reduce the risk of fire spread.

The application of intelligent fire fighting system in the pension space can improve the fire detection and response speed, and reduce the threat of fire to the safety of the elderly. At the

same time, the automation and remote management functions of the system can also reduce the work burden of management personnel, and improve the processing efficiency of fire events.

5.4 Build an intelligent scenario system

By analyzing the physiological, psychological, and behavioral characteristics of the elderly population, it is found that the elderly often exhibit negative emotions such as psychological loneliness and low self-esteem. This poses an escalating harm to the elderly. Utilizing the intelligent scenario system can effectively alleviate the psychological problems of the elderly. For instance, it can be combined with the living characteristics of the elderly or the entire family in terms of home, home life, getting up at night, sleep, entertainment, and other aspects for one-click deployment or evacuation. Moreover, employing an AI voice system to simulate dialogue scenes with the elderly can create a warm and comfortable living environment. This can effectively alleviate the psychological problems such as loneliness and inferiority of the elderly.

6 Conclusions

The integration of intelligent technology into aging-appropriate space design not only complies with the development trend of The Times, but also meets the practical needs of modern aging-appropriate space design for improving the life of the elderly. It can provide a convenient, safe, personalized and interesting living environment for the elderly, as well as providing protection and support in emergency situations. The application of these intelligent technologies will further improve the quality of life of the elderly, promote their physical and mental health, and make the design of aging space more humanized and caring.

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