

# Strategies and Suggestions for the Optimization of Pension Space from the Perspective of Security

Siyu Zhang, Na Zou, Minkai Ma, Huanyu Sun

Jilin Normal University of Engineering Technology, Changchun, 130052, China

## Abstract

In recent years, China's aging process has accelerated, especially the number of elderly people over 70 years of age is on the rise. This puts more demands on the elderly apartments in China, which requires the designers of our country to make designs. The design, because the indoor environment of most of China's pension apartments still have many problems, especially in terms of safety, which will have a very serious impact on the elderly in their later years. Therefore, the indoor space is continuously transformed through scientific methods, environmental psychology is used to change the interior layout, and ergonomics is used to make unique designs in furniture and home details. Let the life of the elderly be better.

## Keywords

**Elderly apartment; Indoor space; Safety; Humanized design.**

## 1. INTRODUCTION

In the increasingly serious aging of China, the elderly over 60 years old has accounted for 15% of the total population. Due to the increasing aging, the demand for the elderly housing is higher and higher. For designers, the design of the elderly housing needs more and more efforts to build. And in recent years, the country has paid more and more attention to the requirements of the elderly housing, and the requirements of safety standards and the use of materials also tend to be perfect. This requires us to design more carefully.

## 2. PHYSIOLOGICAL CHARACTERISTICS OF THE ELDERLY

### 2.1. Physiological Characteristics of the Elderly

After the age of 70, the body muscles, organs and nerves of the elderly will decline sharply. For example, the digestive ability will decrease, the ability to see things will be blurred gradually, the memory ability will not be as good as before, the balance ability of the limbs will decrease, the immunity will decline, and the elderly will get sick easily. This article will focus on the analysis of the physiological characteristics of the elderly from the two aspects of musculoskeletal degeneration and sensory organ function decline.

### 2.2. Musculoskeletal Decline

Due to the decline of body organs and atrophy of limb muscles, the strength and toughness of muscles of the elderly are not as good as those of the young, which means that the elderly can not carry out strenuous exercise as the young. Relatively, activities such as jogging, walking and Taijiquan should be more in line with the physiological characteristics of the elderly. Secondly, the nerve gradually aging, the ability to control the body is not as good as before, so that the action becomes slow, unable to respond to external stimuli. In daily life, some difficult actions,

such as threading needles and wires, will become uncoordinated. Let the elderly go out to play life increases many difficulties, thus increasing the dependence on static space.

### **2.3. Functional Decline of Sensory Organs**

In daily life and entertainment work, it is not difficult to find that when the elderly enter the age of 60, their overall sensory ability is in direct proportion to their age. The older they are, the weaker their sensory ability is. This change is particularly obvious in hearing and vision. These sensory changes will affect the communication and contact between the elderly and the external environment, resulting in many inconveniences in the life of the elderly. For example, the reduction of listening ability will make it difficult for the elderly to communicate with others in chatting, and it is easy to listen to others wrongly, thus causing misunderstanding to others. In the long run, the elderly will become impatient, irritable, and then have psychological problems. The deterioration of eyesight will make the elderly appear security risks when they go out.

## **3. THE DESIGN PRINCIPLE OF THE OLD PEOPLE'S RESIDENCE**

In view of the physiological characteristics of the elderly, in the static space of the elderly, such as tea room, religious belief room, calligraphy and painting room, reading room, we should create a warm and comfortable space environment on the basis of barrier free design.

### **3.1. Safety Principle**

Safety is the most important issue in the design of residential space for the elderly. In the design of static space, we should first consider how to make it more convenient for the elderly from the layout and streamline of the space according to the physical quality of the elderly; secondly, we should use materials that are not easy to hurt the elderly; finally, we should take further protective measures for some places and corners that are easy to hurt the elderly directly or indirectly.

The elderly have poor ability of body control and slow response. When considering these problems, they should design in strict accordance with the relevant laws and regulations and safety standards. Analyze the relevant safety cases, get the relevant experience and lessons, and apply them to the actual design. This kind of analysis case summary application design method, can let us better do static space.

### **3.2. Applicability Principle**

In the daily life of the elderly, first of all, service facilities should be suitable for themselves, simple and practical. Therefore, the relevant barrier free design should meet its needs. On this basis, it should also meet the requirements of ergonomics to make the elderly comfortable and comfortable [11]. At the same time, sufficient size shall be reserved to reserve sufficient space for auxiliary equipment and devices needed by individuals.

### **3.3. Analysis of Related Theories**

#### **3.3.1 the role of environmental psychology in the elderly**

The environment has more or less impact on everyone, but also affects the health of the elderly. Safety is not only physical, psychological safety is also very important, and it is easy to be ignored. There are several viewpoints in environmental psychology, which can easily affect the adaptability of the elderly to the environment. First of all, it refers to the load. People will respond to the external stimulation brought by the environment. The ability of people to accept the stimulation brought by the environment is called load. Everyone's bearing range is different. The bearing capacity of the elderly should be smaller. In order to change this phenomenon, the decoration environment should not be complex, the material color should not be too heavy, and

the simplicity is more suitable. The second is arousal, which refers to the reaction of the environment to people's physiological and psychological influence. The old people's life is easily affected by the environment, such as the material of decoration and the manufacturing process of furniture. So the environment of decoration should be quiet, and the light should be sufficient, so that the awakening of the environment to the elderly becomes dull, and the influence of excessive or too little should not be allowed. Finally, the behavior constraints, indoor decoration and color, outdoor green space and road distribution will have different effects on the elderly, too closed space is easy to cause the fear of the elderly, too many streamline will affect the judgment of the elderly, complex process will make the elderly anxious. This requires us to open our space in the design, reduce unnecessary streamline, streamline should be single and open, so that the space can maintain a certain degree of freedom. Reduce the pressure of the elderly, and then eliminate the harm that small space may do to the elderly.

### 3.3.2 Ergonomics

In the health care space, ergonomics is very important for the space design. We should master the particularity of the elderly's body and the sensitivity of their organs. According to the understanding of scientific data, we can customize the corresponding supporting facilities in strict accordance with the living habits of the elderly, such as chairs, tables, beds and other furniture. The special elderly can be specially made.

## 4. ANALYSIS OF SAFETY NEEDS OF THE ELDERLY

### 4.1. Light Demand

Lamps and lanterns should be installed at the corners and doors, and the brightness and illumination angle should be adjustable. The eyesight of the elderly begins to decline, especially at night, which is easily affected by the light. Lamps and lanterns should not direct at the elderly. The light should be soft and the illumination range should be large. We should pay attention to the lighting of the elderly's activity area at any time, and make changes at any time according to the needs of the elderly. In some sunny rooms, change the size of the window appropriately, and then add some curtains to reduce too much direct radiation. In the room with weak light, we need to enlarge the scope of the window and increase the lighting equipment appropriately. Emergency or warning signs should be illuminated for a long time.

In the bedroom and other residential space, doors and windows are important parts, because they are not only the passage of lighting and ventilation, but also the media for the elderly personal privacy space and external public space, and they are often used by the elderly in their daily life, so we should pay attention to the design and use experience of the details.

In daily life, doors are generally divided into sliding doors and flat doors. For the elderly who can take care of themselves, sliding doors are easier to operate, but for the elderly who use wheelchairs, using flat doors will make the wheels move back and forth, so sliding doors are more convenient.

### 4.2. Design of Handrail

Due to the aging function of the body, the elderly are prone to physical instability, falls, bumps and other accidents, which lead to physical injury, especially in balcony, corner, stairs and other places. At this time, the role of the armrest is very obvious, can effectively reduce the probability of elderly injury. The height is not higher than 900mm, which is the best design according to the habits of the elderly. The edge of the armrest must be smooth, and the place where you often hold it should be added with anti-skid rubber material, so that the durability and safety can be improved.

### 4.3. Design of Floor and Wall

Because the elderly move slowly and are easily injured, they need to pay attention to their physical condition when choosing the materials of furniture and decoration. In the selection of floor decoration materials, according to the physiological characteristics of the elderly, such as poor balance, weak legs and feet, falling easily injured and not easy to get up, we should choose anti-skid materials as the first choice of floor pavement. In the choice of soft and hard ground materials, we can't choose too soft or too hard. Too soft carpet, for example, will further reduce the balance of the elderly and make them more prone to fall; too hard ceramic tile, for example, will increase the fatigue of the elderly when walking, and make them more vulnerable to injury after falling. The thermal insulation of floor materials is also very important. Materials with poor thermal insulation will not only make the indoor temperature difficult to control, but also cause damage to the health of the elderly on this basis. It is easy to cause colds and colds of the elderly at the same time, leading to further diseases.

The antiskid of the floor is very important. The floor of the bedroom is paved with the floor. It's best to pave the carpet near the bed in the room. It has good antiskid property, and it's not easy to make the old man's feet get cold. In the public space such as activity space, public bathroom and other places, it is easy to slip and get injured. The floor should use more anti-skid tiles, and the intersection of various spaces must be smooth, so as to reduce unnecessary protrusions and make the flow line more stable. The decoration of the wall should not be too fancy. The sound insulation and absorption are good. The elderly are easy to be affected by the small noise, which also requires us to design the wall more carefully.

### 4.4. Design of Auxiliary Facilities

Sliding doors should be used as far as possible. According to different elderly people, automatic induction sliding doors can be selected. There should be handrails with height no less than 900mm around the door. The window has good sealing performance, no air leakage, simple structure and convenient use for the elderly.

## 5. REGIONAL SECURITY ANALYSIS OF HEALTH CARE SPACE

### 5.1. Activity Area

The activity area in the health care space is the space for the elderly to use and demand the most. In order to meet the communication needs, the seats should be placed in the adaptive area, and the area of the main streamline should be increased in the space between the seats, so that the elderly can pass through the space most safely without affecting the elderly who rest in the seats. The air circulation in the open space is good, and the ground should be marked on the flowing lines. The space should be equipped with a workbench for staff, which should be placed in a place that does not affect the line. On the one hand, it will not disturb the communication between the elderly, on the other hand, it will not lack of protection for the elderly.

### 5.2. Toilet

In the health care space, the toilet is a relatively private space, and it is also the place that the elderly need to pay attention to in terms of safety. As the room that is most prone to fall, according to the data, the toilet is a high-risk area for the elderly to fall, so the design of the toilet can be said to be the top priority. The biggest problem is the size of toilet. Because the leg strength of the elderly is weak, and the elderly who use wheelchairs in the apartment should also be considered, handrails should be set on both sides of the toilet to help the elderly complete the squatting and standing movements smoothly; the height of the toilet should be slightly higher than that of the normal toilet, generally about 430mm, which can reduce the

burden on the leg muscles of the elderly when squatting, and the height of the toilet should be slightly higher than that of the normal toilet To set aside 1500mm space to facilitate the passage of wheelchair, the door is a sliding door, which saves space and is convenient for the elderly at the same time; many falls of the elderly are caused by water on the ground, so we need to make a heating system under the ground, so that the water on the anti-skid brick on the ground will dry faster, and the problem of the elderly falling will be solved; we should also distinguish the color of the toilet from the color of the back wall The night light is installed on the side of the toilet, which is convenient for going to the toilet at night.

When setting the washstand, the elderly who use wheelchairs should be taken into account. Therefore, it is better to set the washstand as a cantilevered type without storage at the bottom, and it can rise and fall within a certain height according to the physical condition of the elderly living in the room. This height is between 650mm and 850mm.

When setting the shower device, not only the anti-skid treatment of the ground and the auxiliary armrest should be fully considered, but also the shower stool should be set according to the situation, which can be installed on the wall, turned down when used, folded and leaning against the wall when not used.

### 5.3. Beds

The size and layout of the room should be reasonable. The bedroom is the main activity place for the elderly in the apartment for the elderly, and the reasonable layout is the most important. In the bedroom, the bed area accounts for the largest proportion. Its placement will directly affect the streamline of the bedroom, and affect the normal activities of the elderly, especially those who use wheelchairs. Therefore, in the layout of the bedroom, the bed, wardrobe and other furniture can not hinder the rotation of the wheelchair.

The plane size of the bed should be more than 2100mm × 1000mm, because the elderly sleep is shallow, if you can't relax the turn over, it is easy to make the elderly sleep uneasy. The height of the bed should be between 400mm and 440mm, and it is slightly lower than the knee. Too high or too low will only bring inconvenience to the upper and lower beds. Too high will cause inconvenience to the upper and lower beds. Too low will easily increase the movement range of getting up and lying down, increase the difficulty of getting up for the elderly, and make the elderly affected by the ground moisture. The softness and hardness of the mattress should be moderate, too soft will make the elderly turn over when they get up, so that they can not find the focus, cause difficulties in action, reduce the quality of sleep and other problems; too hard mattress will make the elderly muscles in a tense state for a long time, and can not be relaxed.

### 5.4. Toilet

Generally, the height of toilet on the market is 0.37-0.39m. For some elderly people, it's a little short. Because some elderly people with chronic arthritis have inflexible lower limb flexion and extension, in order to facilitate sitting up and reduce the burden of the elderly, it's better to choose the higher one. Even if there are elderly people using wheelchairs, the height of the toilet seat surface can be consistent with that of the wheelchair seat surface, about 0.4m-0.45m, and it's on the edge of the toilet The armrest with the same height as the sitting surface is installed to enhance the safety of use. The ground should be equipped with anti-skid mat to reduce the probability of the elderly falling.

## 6. SUMMARY

China is the only country with an elderly population of over 100 million in the world. According to the latest data from the office of the National Commission on aging, the elderly population in China will grow rapidly with an average of 10 million per year in the next 20 years,

and will reach one third of the national population by 2050. It can be predicted that the challenges faced by China's pension industry will continue to increase. We carefully design to create a better living environment for the elderly. Starting from the concept of healthy pension, we create a convalescent environment that meets the needs of the elderly.

## REFERENCES

- [1] Horui pension. Analysis of the physiological and psychological characteristics and behavior patterns of the elderly <http://m.jiemian.com/article/1900417.html>
- [2] Zhou Bei. Barrier free design of bedroom space for the elderly [J]. Art education research, 2012, 9:90-91.
- [3] Hu Zhongyan, Cao Yang. Psychological factors in product design for the elderly [J]. Packaging engineering, 2008, 5: 133-135143.
- [4] Wang Hui. Research on key points of bedroom space design for the elderly [J]. Theoretical research on urban construction (electronic version), 2015, 31:1.
- [5] Qian Zhike, Han Yong. On barrier free design of bedrooms for the elderly [J]. Journal of Qingdao University of technology, 2012, 4: 115-118.
- [6] Zhuang Yu. Discussion on the architectural detail design of pension housing [J]. Architectural engineering technology and design, 2018, 3:1.
- [7] Zhou Yanli, song Gangsheng. Analysis of barrier free design of kitchen space in elderly living space [J]. Art circles, 2014, 11:101.
- [8] Wang Qian. Analysis of communication space design of apartment for the elderly [D]. Southwest Jiaotong University, 2005.
- [9] Feng Lei, Hu Zhenyu. Exploration of new apartment design for the elderly under the background of aging [J]. Central China architecture, 2010, 28 (4): 59-61.
- [10] Hong Yan, Pudong Road. Exploration of apartment design for the elderly based on the psychological and behavioral needs of the elderly: a case study of Yile villa phase I in Putuo [J]. Central China architecture, 2007, 25 (9): 119-121.
- [11] Yang Chuanfang. A preliminary study on the design of new apartments for the elderly in Shanghai under the background of aging [J]. Shanxi architecture, 2009, 35 (1): 47-49.
- [12] Zou Guangtian. Planning and design of Japanese senior apartment [J]. World Architecture.