

# Study and Practice on Seat Products Design for Elderly People

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**Abstract.** This paper is about seat devices for elderly people, firstly the future of furniture market for elderly people and the present situation of furniture products for elderly people were discussed. Combined with the humanization design principle, detailed factors concerning the design of elderly furniture were studied physiologically and psychologically from aspects of spiritual needs, ergonomic, colour and model. Concerning about problems in seat products design for elderly people, some patent examples and design cases were given to further discussion.

**Keywords:** Seat products, elderly people, humanization, demands.

## 1. Introduction

According to international regulations, people who are more than 65 years old can be defined as elderly people. However, in China people over 60 years old are called elderly people. Besides, according to the sixth national census in 2010, 16.85 percent of those elderly people are unhealthy, among which 13.90 percent of them can take care of themselves, and 2.95 percent of them can not. Therefore, there are about 30 million unhealthy senior people. [1]

From ancient times, filial culture has taken a deep root in China. Now, aging problems like pension, medical treatment, spiritual support, and life quality etc. in China have aroused wide attention. The older they become, the worse their physical condition will be, especially their problems like muscle wastage, muscle strength decline, and decrease of control ability of knee joint, which may result in difficulties in sitting, decline in balance etc. [2]

## 2. Elderly people's physiological feature and seat products design

When people grow old, there are different physiological and psychological changes. According to natural physiology, old people's sensibility of hearing, sight, smell, touch and other aspects will decrease, which mainly manifests as the decline of appearance and body shape, the decrease of immune system function, gradual degradation of sensory function, sharp decrease of reactivity and sensibility, the decrease of memory and cognitive impairment of new things, and gradual decrease of physical function etc. [2] Therefore, elderly people's perceptive condition should be fully considered when seat products are designed. Safety, practicality, and convenience of the elderly home products should be optimized.

From social psychology, their mental characteristics mainly manifest as a sense of nostalgia, loneliness, sense of loss, lack of sense of security etc. The older they become, the easier they will



recall the past. When they are alone at home, it is easy for them to feel negative emotions like loneliness and lost. Since elderly people spent most of their time at home, proper spatial layout and pleasant furniture appearance can somewhat guide and regulate their emotions.

As a special group in China, researches should be conducted based on old people's real condition and their real demand in order to design high-quality furniture that satisfy old people's real need.

### **3. Analysis of humanization design of seat products for elderly people**

The seat products design for elderly people should be based on ergonomics and the change of old people's physiology and psychology in order to make those products safe, comfortable and practical. Besides, aspects such as structure size, material functions, and styles should also be considered. More cultural and spiritual connotation should be given to seat products on the basis of practical application. Therefore, there are two principles to follow: one is practicability, the other is artistry. Based on elderly people's physiological characteristics, the former satisfies elderly people's basic functional demands by proper design and selection of seat size structure and material comfortableness. And based on old people's psychological features, the latter caters to old people nostalgic and conservative characteristic by careful consideration of various aspects such as appearance, color, decoration, etc. [3]

#### *3.1. Elderly people's emotional need*

Elderly people's spiritual needs are strong, including emotional needs, communication needs, entertainment needs, knowledge needs and respected needs, etc. In the "Diversity-orderly Structure" of the kinship relations in China's country society, Mr. Fei Xiaotong proposes that the emotional needs and respected needs of elderly people are the most core and strongest demands for those old people, followed by knowledge needs, entertainment needs and communication needs.[4]

Due to retirement, social roles and economic status of elderly people are changing, resulting in depression, anxiety and loneliness. They are eager to be respected. To live happily and achieve something is the best living condition for elderly people. The elderly can communicate by Entertainment stimulate elderly people's communication and help them learn knowledge, and knowledge in turn can help them to communicate. Considering elderly people's emotional need, attention should be paid on the following aspects when designing elderly seat products: Firstly, precise target. Products designed should precisely satisfy different ages and hobbies of elderly people. Secondly, humanization design. Full consideration should be given to the physiological and psychological needs of elderly people to protect their emotion and dignity. Easy and safe and products should be designed to use. Thirdly, interactive experience process should be paid attention. When designing the products, consideration should be given to elderly people's sense of experience in order to make the products and users to integrate well with each other. [5]

#### *3.2. Size and Scale*

Ergonomics is the scientific discipline concerned with the interactions among "human, machine and environment system", and the profession that applies theory and methods to solve human efficiency and healthy problems in that system. [6]

When people become old, they tend to appear shorter in height and wider in body circumference. Besides, the reactivity to the outside world, mobility, elasticity and toughness of bones of elderly people will decrease and the fragility of their bones will increase. Therefore, seat products design for elderly people should focus more on safety and convenience. The design of size of elderly seat products includes sitting height, sitting width, sitting depth, armrest height, and helping angle, etc. First, sitting height. Sitting height are the key factor that affects the comfort of elderly people. According to sports biomechanics, it is concluded that the best sitting height suitable for old people is the height of knee and poples, [7] which is generally controlled between 450mm and 500mm. Second, sitting width. According to the study of ergonomics, the body size of old people tends to become wider because of their stooping body after they become old. The width of elderly sitting furniture should wider, generally controlled between 550mm and 690mm. [8] Third, sitting depth. The sitting

depth of elderly seat products should ensure that their legs get enough support when they sit down. Generally, the depth should be limited between 450mm and 550mm. Four, handrail height. The height of handrails affects the movement of joints and the transfer of gravity center. The handrail can support the hands and relieve shoulder pressure. The height usually is 250mm. fifth, helping angle. The study show that when sitting angle is 40 degrees, it is more helpful for sitting up.

### *3.3. Model and material quality*

The design of elderly seat products should consider elderly people's special mind. Its appearance should cater to old people's aesthetic and return to nature and innocence. In terms of functional operation, simplicity and humanization should be pursued as far as possible, and it should not be too complicated in case to increase elderly people's use of burden. In addition, in order to improve old people's self-esteem and self-confidence, the design of the elderly seat products should also be aimed at improving their ability to take care of themselves, postponing the period of nursing and prolonging the health period. What's more, for safety considerations, the edge of the furniture and accessories should be designed as smooth as possible. Sharp angle should be none to avoid the physical injury to those old people.

When elderly seat products are designed, consideration should be given to old people's psychological acceptance, which ranges from color to carry out reasonably color collocation. The design of elderly sitting devices should follow the following three principles: color harmony, low purity, low lightness principle, and natural color principle. [9]

On the other hand, the materials of furniture also play key role in comfort. Furniture materials are divided into contact materials and supporting materials. What should be emphasized is that the surface of seat products should not be too soft, which is bad for old people to get up and increases their burden to stand up. While hard surface provide counter-force which helps elderly people to stand up. The supporting materials for seat products include the structural materials, fittings and decorative materials. When supporting materials are used, the primary prerequisite is safety. The indicators include strength, stiffness and stability. Special attention should be paid to elderly people's supporting materials of seat products to the stability and safety.

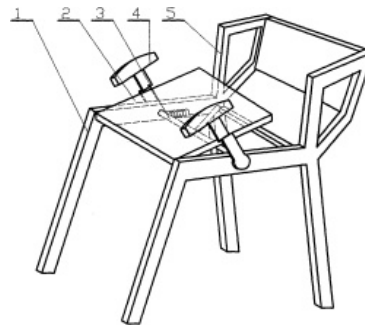
## **4. Analysis of design example**

With the advancement of the aging process, the growth of the demand for the elderly furniture market has become an inevitable trend, and the humanized design of the old products is also an important subject in the future of furniture design. Because of old people's particularity, the design of elderly furniture should not simply cater to old people's aesthetic from appearance. It should be noticed that the breakthrough and innovation in function are the real core competitiveness.

### *4.1. Armchair*

Armchair adopts the method that combines handrail and the seat to assist the angel to solve elderly people's sitting down and standing up problems.

A T-shape set up device connected with the end of handrail is installed under the seat to help elderly people to stand up. When the handrail is pressed forward, the rod of the device swirls and pops up to jack the seat to help elderly people to stand up. When he leaves, the seat will return to flat to make it convenient for elderly people to sit down again. This armchair is quite convenient for elderly people to use. It helps elderly people to stand up and has strong practicability and security.



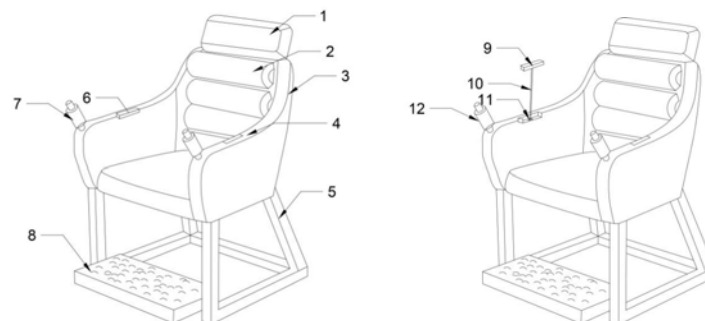
**Figure. 1.** A schematic diagram of structure of armchair

1. Chair seat, 2. seat, 3. set up device, 4. Handrail, 5. backrest

This armchair connects handrail and seat by the way of continuous motion and it also combines elderly people's strength of standing up and slanting seat together. Elderly people can control assistant angle flexibly according to their own condition. The armchair is convenient for safety and operation, which can effectively meet old people's need.

#### 4.2. Elderly fitness chair

Elderly fitness chair is designed for elderly people's need to exercise indoor. Functions like arm strength exercise, grip exercise, and ankle movement and so on are added to the chair which are quite suitable for elderly people since they only need minor amount of movement and their time and space for movement is quite flexible. And this fitness chair can be flexibly used at home and health care institutions.



**Figure 2** schematic diagrams of fitness functional chair

**Figure 3** The state of the stretch of an elastic rope.

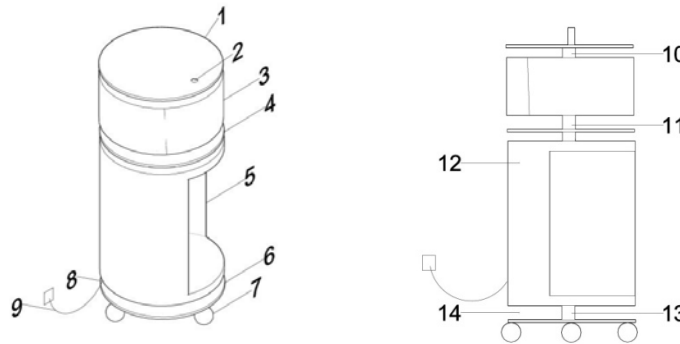
1. Upholstered headrest, 2. three segment backrest, 3. integrated backrest, 4. handrail, 5. triangular chair legs, 6. embedded pull rope, 7. Hand-muscle developer, 8. rotation pedal, 9. grip handle of pull rope, 10. Elastic rope, 11. Rope hope, 12. Elastic handle

The joint flexibility and arm strength of elderly people fall quickly when they grow old. By combining with fitness theory, this fitness chair enables elderly people to exercise themselves whenever they want to. Besides, the 180 degree flexibly rotating pedals and the massage stones on the surface of the pedals can help elderly people to move their ankle joint.

#### 4.3. Rotating multifunctional side tables

This multifunctional side table is designed for elderly people to live comfortably, to do exercise, to keep warm and to store things, etc. by using methods like rotation and stretch. Considering that elderly

people becomes weaker in strength, roller is adopted in the floor to make it convenient to move. This side table aims to meet old people's need to exercise at home and to get and store things conveniently. And it also is quite suitable for health care institution and ordinary home space.



**Figure 4** schematic diagrams of rotating multifunctional side tables

**Figure 5** front view of side tables

1. Desktop panel, 2. Fitness handle button, 3. Storage space, 4. intermediate baffle, 5. Heating space, 6. Floor, 7. Roller, 8. wire storage area, 9. wire, 10. middle connection circular axis, 11. Connection circular axis, 12. C external encircling, 13. Bottom circular axis 14. Wire winding ring

The desktop, storage space, intermediate panel and heating space are connected with each other by circular axis in order to rotate and make it convenient for elderly people to take items from the drawer. The same connection method is applied to the connection between heating space and floor, which makes the heating space can rotate flexibly 360 degree to facilitate elderly people to get heat from different angles. Moreover, the rotating circular axis between the desktop panel and the intermediate baffle adopts a spiral structure, which has the function of stretching up and down, and can adjust the height flexibly according to old people's height. A wire winding area is left between the heating space and the bottom plate to facilitate the storage of wires. When the desktop button is pressed, the embedded handle pops up, which makes arm movement around circle axis possible by using the rotation of the desktop. The side tables can flexibly meet elderly people's need by rotation.

## 5. Conclusion

The development of elderly people's market has aroused higher requirements for the design of elderly people's products. Humanization design is still the eternal theme and direction of development. By considering elderly people's actual need and real conditions, elderly people's life problems can be solved and products to improve their life can be designed.

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