Research on the Design of Interactive Furniture for the Old and the Young based on Universal Design Theory

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Abstract

With the deepening of aging and the influence of national fertility policy, the phenomenon of sharing between the old and the young is becoming more and more common in modern families. This paper uses universal design theory to study furniture by analyzing the physiological and psychological characteristics between generations and proposes design strategies for functional requirements, modeling, and structural design elements of interactive furniture for old and young with interaction, safety, fairness, and flexibility as design principles. It provides a theoretical basis for the research on the shared design of old and young and integrates the elements of intergenerational interactive furniture design under the universal design theory.

Keywords

Universal Design; The Interaction between the Old and the Young; Modular Design; Furniture Design.

1. Ideological Connotation of the Universal Design Concept

Overview of Universal Design

The term universal design first appeared in the middle of the last century and was introduced by Professor Ronald L. Mace of North Carolina State University in the 1980s, and the term "universal design" was officially used in 1985. According to him, universal design means "any product or environmental space designed to be used by all people as much as possible, regardless of age, physical condition, or ability level, so that anyone can use it easily. "Universal design" means that all products and buildings are designed to meet the needs of all people, regardless of age, ability, or social status, from both an aesthetic and a usability perspective to creating more inclusive environments and products that are accessible to all. In the 1990s, the seven principles of universal design were summarized: fair use, flexible use, simple and easy to understand, clear consultation, tolerance for errors, physical strength, appropriate spatial scale ,and easy to operate. In Europe and the United States, universal design has been promoted in various fields. With the development of the times, the coverage of universal design has been extended from the original barrier-free design to a more diversified and inclusive "universal design".

2. The Physiological and Psychological Characteristics of the Old and Young Analysis

2.1. Physiological Characteristics of the Old and Young Groups

2.1.1. Analysis of the Physiological Characteristics of the Elderly

The first is the degeneration of the sense of perception, such as blurred eyes, taste, smell, and touch are also gradually dull. Secondly, as age declines, the elderly are prone to osteoporosis and increased bone fragility, resulting in limited movement. Finally, there is a decline in

memory and thinking, and the sensory organs cannot receive information normally and effectively, especially the agility, fluency, flexibility ,and decision-making ability of thinking.

2.1.2. Analysis of Physiological Characteristics of Children

First of all, the structure and function of the brain are gradual, the body tissue structure and organ functions are easily enhanced, the nerve cells are fragile, and the body movement is more flexible. Physical strength is better, and energy is abundant. Secondly, children tend to be more active and energetic in terms of physiological characteristics. They have a strong desire for knowledge like observing things and reacting quickly to new things.

2.2. Analysis of Psychological Characteristics of the Old and Young Groups

2.2.1. Analysis of Psychological Characteristics of the Elderly

First of all, memory ability and thinking ability are decreasing, the flexibility of problem-solving is not enough, and mistakes are inevitable. It is easy to cause the feeling of "lagging", the initiative of thinking is reduced, and the imagination ability is weakened. Secondly, there is a change in emotions. Older people tend to be emotionally unstable, often showing excitement, agitation, nagging,and becoming emotionally fragile. Delayed mental ability and other causes anxiety, suspicion disease, inferiority complex, loneliness and loneliness,and other pessimistic psychological emotions.

2.2.2. Analysis of Children's Psychological Characteristics

Children's psychological characteristics are mainly reflected in the gradual expansion of the cognitive range, and a strong curiosity about new things and new and different activities. Attention is easily dispersed and not easily concentrated. They have some concepts of things connected with life experience, and their way of thinking has obvious intuitive action. Secondly, they have strong emotionality, poor self-control and impulsiveness, strong self-centeredness, a budding sense of planning, a vague sense of right and wrong, and a rich and vivid imagination. Finally, they have less life experience, cannot accurately distinguish right from wrong, and have a short attention span. At the same time, their emotions are characterized by instability and insecurity, often manifesting as anxiety, isolation, aggression, and fear.

3. Based on the Universal Design Theory of the Old and Young Furniture Design Principles

3.1. Safety Principle

In the process of interaction between the elderly and children, the safety factor is the designer should consider factors in focus, mainly focusing on the material, functional structure, the safety of the first in the functional structure, you can sharpen the corner part of the treatment, to avoid sharp corners, metal sharp corners directly touch the children and their elderly, the use of rounded, corner-wrapped structure. Secondly, the material meets the relevant standards, consider recycling and use environmentally friendly materials. Finally, to take into account the accidental situation, the need for emergency protection against the possibility of accidents, to avoid the complexity of the operation.

Secondly, material safety is required in the design and must use the national green certification of non-toxic non-polluting materials. In addition, the choice of materials, but also the need to pay attention to the psychological feelings of the elderly, the sense of affinity with nature, should not use hard materials. Design elements with a sense of sentiment and nostalgia should be tapped and applied to product design to evoke a sense of homecoming for the elderly and have some educational significance for the growth of children. In addition to the mobility of the elderly, should pay more attention to the design of waterproof and easy to clean, such as the

material of the sofa should try to choose leather and other skin-friendly, but also easy to clean the material.

3.2. Interactivity Principle

The principle of interactivity forms the "people - products - people" organic unified model. The intergenerational interaction paradigm in the intergenerational interaction behavior with the furniture as a carrier, emphasizes the interactive experience while promoting the emotional communication between the two generations. Let both sides participate in it, through the interaction in the timely feedback and suggestions, to understand the real needs of both sides, find the design pain points, practical solutions to the existing problems.

3.3. Principle of Flexibility

Focus on the principle of product flexibility, try to make the furniture present a simple shape, easy to disassemble, modular design principles, both to meet the psychological needs of both sides, but also to increase the series of product classification, to facilitate the reorganization of furniture design and disassembly, to achieve multi-functional needs. Its design guidelines are: the planning of multiple functions of the furniture can allow the elderly and children to meet their needs at the same time in addition to stimulating the creativity of both. Secondly, it gives the user a variety of options in terms of how to use the furniture and adds a sense of interactivity. Finally, the furniture can be disassembled to achieve the freedom of space arrangements and to meet the special needs of different applicable people. In addition, the design should take into account the behavior of users, but also comply with the ergonomic principles of furniture size standard design, more convenient for the elderly and children. For example, the design of an all-around cooking table, which is both a cooking table, a dining table as well as a working study table, satisfies the elements of daily life in intergenerational interaction and can enable the elderly and children to better integrate into the family scene.

3.4. Principle of Equitable Participation

First for different physical and ages can be fair to use the product, followed by the choice of different sizes and the principle of fairness of participation indicates the quality of user experience generated by the interactive system, emphasizing the interaction between the user and the product, emphasizing the fairness of the user in the use of participation, and considering the special needs of the user in the psychological as well as spiritual level. Make a combination of practical and playful. In addition, the function should also assist the elderly to complete the function of getting up inconvenience or support. As far as possible to take into account the different people and age groups of users can participate in the use of equality.

3.5. Green Design Principles

The furniture design should follow the green design principles, can use sustainable materials, minimize the waste of resources and environmental pollution, and the parts or materials can be recycled. Therefore, follow the concept of sustainability in furniture design, use environmentally friendly renewable materials, simplify the processing process, reduce energy consumption, and can be recycled. And the elderly like nostalgic products can use the original materials.

4. Summary

This paper is based on the old and young groups, using furniture products to meet the needs of both sides with different characteristics, to promote the emotional communication between the two sides, so that interactive furniture products become the medium of effective communication between the two sides, and provide a certain reference value of furniture design.

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