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Design and Research of the Recliner for the Elderly

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Abstract: Chairs are the most common furniture in household environments, and reclining chairs specifically cater to the functional needs of the elderly. With the gradually increasing aging population, our preliminary research has revealed that current reclining chair designs often fail to align with the physical dimensions and needs of older adults. Many designs appear to prioritize technology over usability, resulting in a homogenous product landscape. Using statistical analysis and the weighted average method, an elderly-friendly reclining chair that considers height, depth, and width is designed. The final design aims to meet the psychological and physiological needs of self-care, semi-dependent, and fully dependent elderly individuals. Adhering to the "people-oriented" design philosophy and targeting "convenience and efficiency," our ultimate goal is to create a reclining chair that helps the elderly lie down, stand up, and sit down with dignity. This innovative approach offers a new perspective for the market of aging-friendly furniture.

Keywords: Reclining chair; Self-care; Semi-dependent; Fully dependent; Aging-friendly

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1. Introduction

As China's population aging process continues to deepen, building an aging-friendly society has become an important national strategic initiative. Based on the theoretical framework of actively mitigating aging, there is an urgent need to improve the multi-level elderly care service system through systematic institutional innovation, while ensuring the basic material supply and spiritual and cultural needs of the elderly population. The "14th Five-Year Plan" for National Elderly Care Development and Elderly Care Service System issued by the State Council clearly proposes the construction of a composite elderly care service system with "family-based elderly care as the foundation, community and home-based elderly care as the support, and institutional elderly care as the supplement." This marks a new stage of institutional construction for China's elderly care industry and provides essential guidelines for furniture design.

The reclining chair, as a carrier for spatial transformation for the elderly, has evolved from a single resting function to an aging-friendly product that supports the activities of the elderly. Guided by modern ergonomic principles, reclining chair designs integrate multiple functions through modular functionality, effectively

enhancing the independent living abilities of elderly users. In the field of aging-friendly product development, academia has formed multi-dimensional theoretical paradigms such as functional compensatory design, emotional design, and universal design. However, with the increasing diversification of user needs, current products still face issues such as inadequate human-machine adaptation and inappropriate integration of smart technology. There is an urgent need to establish an evaluation system based on evidence-based design to advance the "human-centered" innovation pathway for aging-friendly products and provide design insights for aging-friendly reclining chairs.

2. Research and issues regarding current elderly reclining chairs

2.1. Online research

2.1.1. Classification of online furniture

An online survey was conducted on 60 types of reclining chairs (**Table 1**). The results showed that they could be broadly classified into four categories based on their functions.

With the intensifying phenomenon of population aging and the iterative upgrading of aging-friendly infrastructure, this study conducted a multi-dimensional demand analysis of self-care, semi-dependent, and fully dependent elderly groups through digital user profiling techniques. The data indicated significant differences among these three groups in terms of ADL (Activities of Daily Living) levels, degrees of physical function decline, and reliance on assistive devices. When facing the needs of different populations, different design approaches should be considered. However, the current designs of reclining chairs on the market struggle to meet the physiological and psychological needs of the elderly.

Table 1. Online reclining chairs

Categories of recliners	Medical rehabilitation recliner	Multi-functional office recliner	Leisure recliner	Outdoor recliner
Backrest	Adjustable feature	Designed with user stability and safety in mind,	Adjustable feature	Adjustable feature
Armrests	Made of soft and easy-to-grasp material	Made of strong supportive material, adjustable,	Made of strong supportive material, adjustable	Made of strong supportive material
Cushion	Made of highly resilient and breathable material	Made of relatively comfortable material	Made of highly resilient and breathable material	Made of lightweight material
Smart system	Equipped with a rich smart system	Less introduction of smart systems	Less introduction of smart systems	Less introduction of smart systems
Assisted living	Good comfort, but does not take into account certain activities	Satisfies basic sitting and lying functions, but does not take into account certain activities	Satisfies basic sitting and lying functions, but does not take into account certain activities	Satisfies basic sitting and lying functions, but comfort is poor
Nursing care	Considers the needs of elderly people who sit for long periods, but there are few recliners on the market that fit the elderly, and the data is incomplete	The overall price is relatively cheap, not suitable for long sitting and lying, poor comfort	Good comfort, but cannot meet the nursing needs of elderly people under nursing care	Satisfies basic sitting and lying functions, but cannot meet the nursing needs of elderly people under nursing care
Self-care	Rich in functions, but the cost is too high in the range of recliners used by self-care elderly	Has long-term development experience, but cannot meet the special sizes of the elderly	Has more size data, but fewer sizes that fit the elderly	Satisfies outdoor considerations, but comfort is poor

2.1.2. Literature review

Li *et al.* introduced mechanization principles to address the outdoor needs of the elderly, making reclining chairs portable, lightweight, and comfortable [1]. Similarly, Zhou *et al.* studied facilities to assist the elderly in standing up based on ergonomics, using a combined simulation method of ADAMS and ANSYS [2]. Building upon functional enhancements, Li incorporated a PVC conveyor device into the design of reclining chairs, facilitating easy bed access for semi-dependent elderly individuals and providing a 180° transfer function for those who cannot self-care [3]. Cheng further contributed to innovation by revamping traditional bamboo reclining chairs, integrating new materials, and considering the design trend of multifunctionality and office space integration, offering new ideas for traditional reclining chair innovation [4]. In addition, Cui *et al.* emphasized the importance of intelligent systems for aging-friendly furniture, proposing a high-intelligence equipment core to create a comfortable and smart environment for the elderly [5]. To support user-centered design, Chen *et al.* analyzed ergonomic data of the elderly, summarizing the range of special sizes for this population [6]. Expanding on this, Liu introduced the concept of continuous furniture, matching furniture changes with the aging process of the elderly [7]. Huang *et al.* further proposed furniture designs suitable for the daily activities of the elderly, based on their psychological and physiological needs, using a healthcare center as a case study [8]. Pan also studied aging-friendly furniture, allowing the elderly to experience the convenience brought by intelligent systems [9]. Continuing this trend, Zheng *et al.* modified existing reclining chairs from the perspectives of overall appearance, material, and specific functions, achieving innovation [10]. Gao conducted precise research on four levels: scale, form, and color, modern intelligence, safety linkage, and alarm systems, providing data support for aging-friendly reclining chairs [11]. Moreover, Hu designed aging-friendly furniture that not only meets the special needs of the elderly but also considers the usage of other family members, improving the utilization rate of reclining chairs [12]. Lastly, Wei *et al.* combined traditional Chinese reclining chair manufacturing techniques with special data on the elderly, innovating within the tradition to design aging-friendly reclining chairs suitable for Chinese elderly individuals [13].

2.2. Current situation investigation

By analyzing offline market research results, the market's range of reclining chairs and development trends are explored. Based on the visualization analysis of market research data from the offline survey of the Red Star Macalline furniture market in Chongqing (**Figure 1**), there is a significant structural imbalance in the current smart home system integration field. Additionally, an Augmented Reality (AR) operation guidance system that aligns with the cognitive characteristics of the elderly has not been established. It is crucial to focus on breakthroughs in core technologies such as non-contact vital sign monitoring and pressure injury warning algorithms to fill the strategic gap in this market segment and meet the unmet, rigid, and potential long-term needs of the elderly population.

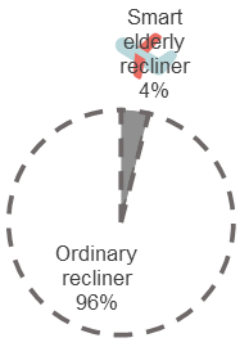


Figure 1. Proportion of smart features integrated into reclining chairs

A survey of 50 elderly people (**Figure 2**) (20 self-care elderly, 15 assisted elderly, and 15 nursing-care elderly) was conducted by distributing 50 questionnaires (Example 1). Among them, the eighth question asks, "What are the uncomfortable features of the reclining chair for you?" From the answers to this question, it can be seen that the two uncomfortable features of poor support (leading to difficulty getting up) and lack of adjustment function (difficult to fit the size of the elderly) account for a relatively large proportion. This can also reflect the growing demand of the elderly for reclining chairs on the market today, and the current market is lacking and ignoring solutions for this segment.

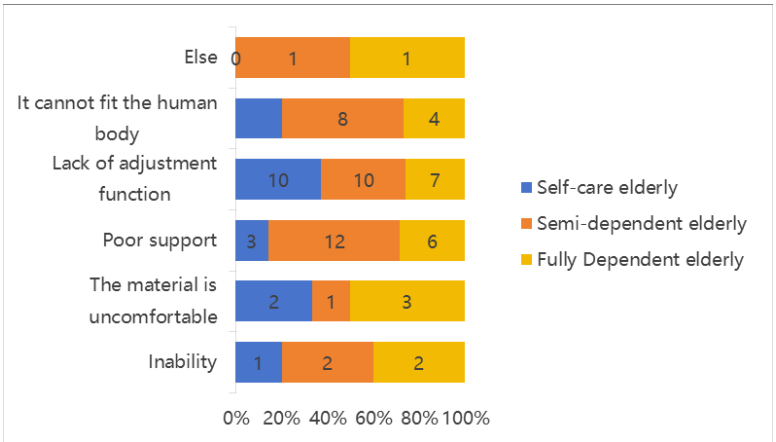


Figure 2. Scores on the uncomfortable features of reclining chairs

2.3. Problem statement

Furniture plays a crucial role in different types of spaces, not only providing practical functionality but also exerting a profound influence on the overall atmosphere and aesthetics of the space. Their functional design directly affects the quality of life and safety of the elderly. However, despite this, there are still some issues with aging-friendly furniture during use.

Firstly, according to Ji's research on multi-position reclining chairs for the elderly, there are differences in ergonomic dimensions between the elderly and the general population, and existing designs of aging-friendly reclining chairs fail to fully adapt to the special needs of the elderly [14].

Secondly, in the face of the material and spiritual needs of the elderly, existing aging-friendly reclining chairs have a single function and ignore essential needs. Currently, the design industry lacks standardized data for aging-friendliness, and most reclining chairs on the market are targeted at a wide range of groups, making it difficult to meet the special needs of the elderly and ignoring their uniqueness, which is the essential demand of the elderly.

In addition, there is a phenomenon of "smart but not wise" in current smart furniture design. The elderly have a low acceptance of new technologies and a poor willingness to use them, resulting in inadequate "aging-friendliness" of smart elderly care products and poor user experience.

3. Mechanism analysis of current issues with elderly reclining chairs

Based on data from the seventh national census, which reveals an accelerating trend of population aging (with those aged 65 and above accounting for 13.5% of the total population), multiple issues have been exposed in the elderly reclining chair industry in the context of economic supply-side structural reform.

3.1. Industry emphasizes economic needs while ignoring quality needs

Over the past four decades of industrialization since China's reform and opening up, the manufacturing industry

has achieved economies of scale through large-scale standardized production models and reliance on a factor-driven growth path. However, this development model has also given rise to multiple structural contradictions:

Firstly, cost optimization and quality imbalance are out of control, compressing overall product costs through value engineering analysis. Secondly, irrational market competition mechanisms lead to market equilibrium converging towards marginal cost pricing. From a long-term dynamic game perspective, industrial organization deteriorates into low-level repeated competition, resulting in triple failures of welfare economics in the elderly consumer market. In addition, there is a breakdown in user demand insight from a human factors engineering perspective. Due to the failure to integrate elderly physiological degradation curves and cognitive load theory into inclusive design, the usability and emotional design of the human-computer interaction interface are inaccurate in two dimensions, ultimately leading to an explicit deviation between product functionality and the physical comfort of elderly users.

Furthermore, customer asset maintenance fails under a service-dominant logic. Insufficient investment in after-sales service to reduce costs makes it difficult for elderly groups to obtain timely and effective solutions, ultimately leading to an unexpected increase in the discount rate of customer lifetime value. Lastly, the institutional quality signal transmission mechanism fails, and consumers face a sharp increase in information screening costs. This forms a failure of the Stackelberg separation equilibrium under the noise interference of quality signals, ultimately resulting in dual failures of the Pigouvian tax adjustment mechanism and Coasean property rights definition in market resource allocation.

3.2. Design emphasizes marketing needs, ignoring essential needs

With the development of the times, a humanistic paradigm of "ethical guidance and technological adaptation" has emerged within the framework of value-sensitive design. However, there is a dual paradox in the existing practice of embedding AI ethics, leading to a marginal decrease in ethical effectiveness at service contact points, which essentially constitutes a cognitive gap between technological utopia and design realism.

Firstly, the design lacks humanity. Designers overly pursue innovativeness in product appearance and functionality to attract consumers' attention, thereby ignoring the actual usage needs of the elderly. Secondly, comfort is inadequate. To cater to the market's pursuit of "high-tech" or "multi-functionality", various additional functions are incorporated into the reclining chair during the design process. However, most of these added functions do not enhance usage comfort.

In addition, within the framework of degenerative physiological characteristics of the elderly population, existing products lack supportive designs for the compensatory mechanism of the locomotor system. Furthermore, in the process of formalizing the alienation of function principles, there is a mismatch between the utility functions of safety margin and aesthetic value in design decisions. Social interaction is not adequately considered. The design may not take into account the social needs of the elderly, such as the arrangement of reclining chairs that are not conducive to communication with family members, or the lack of communication device interfaces that are easy for the elderly to use. Lastly, sustainability and environmental awareness are weak. In material selection and production processes, environmental protection and sustainability may not be fully considered, which is inconsistent with the increasingly green lifestyle that modern consumers are paying attention to.

3.3. Production emphasizes efficiency needs, ignoring individual needs

In the rapid development stage of the manufacturing industry, in pursuit of higher production efficiency and cost reduction, enterprises often tend to adopt mass production methods. This approach emphasizes speed and efficiency, aiming to increase production volume through large-scale production and gain a dominant position in

the market. However, this production method also poses some problems.

Firstly, product quality is uneven, and there is a lack of innovation. The market offers few products with special indicators for elderly use, resulting in a poor handling of the relationship between supply and demand. Secondly, in the new era, although the requirement to promote high-quality development has been proposed, many enterprises still overly focus on efficiency and output in the actual production process, ignoring research on and satisfaction of individual needs. This has led to severe product homogeneity in the market, making it difficult to meet the increasingly diverse and individualized needs of consumers. Purchasing power declines, and the development of the aging-friendly market is slow.

In addition, the emergence of uniform products has become a phenomenon of the times, greatly hindering the appearance of personalized production products. It also makes it difficult to meet the individualized needs of special groups. Putting product efficiency first ignores the added value of products, leading to vicious competition among enterprises, and the market atmosphere needs to be improved. Therefore, while maintaining a certain production efficiency, the manufacturing industry needs to pay more attention to the research of market segments and the development of customized services to meet the specific needs of different groups and even individuals.

4. Optimal design strategies for elderly recliners

4.1. Focusing on individual dimensions based on demand characteristics

Meeting the basic material and spiritual needs of the elderly population is an important reflection of a country's comprehensive national strength. When designing for the special group of elderly individuals, it is essential to go beyond basic ergonomic dimensions and place greater emphasis on the specific physical and psychological requirements unique to this population. This includes, but is not limited to, features that support their independence and dignity, such as increased storage space, intuitive and easy-to-use controls, and accommodations that enable both semi-independent and fully independent elderly individuals to perform daily actions like sitting, lying down, and standing without assistance.

Additionally, design considerations should include specialized backrest proportions and tilt angles tailored to the aging body's needs. Sitting and lying account for most of the time consumed in the daily lives of elderly people. Fast and convenient designs can reduce the transition time between these three actions. Based on different dimensions of elderly people, a special ergonomics scope (**Table 2**) can be established, laying a good foundation for subsequent designs. Taking Zhong's survey as an example, it was found that there are significant differences in the dimensions of elderly people compared to ordinary people [15]. Therefore, in the design of recliners, we should consider the dimensions of the elderly more carefully and create a "people-oriented" design atmosphere for this special group.

Table 2. Basic dimensions of the elderly

Three types of elderly people	Wheelchair height	Wheelchair width	Wheelchair seat depth	Backrest height	Seat surface inclination
Nursing care	500–530 [18]	500–530	480–500 [18]	800–1200 [18]	0–60° [19]
Assisted care	520–550 [18]	520–550	490–520 [19]	800–1200 [19]	0–60° [19]
Self-care	420–425 [17]	420–425 [17]	330–350 [17]	400–408[17]	5–10° [17]
Calculation formula/Based on data	A1=(439+330)/2+ 30-7=408	500–530mm, which is convenient for the elderly to wear thick clothes and place items, etc. [23]	Seat depth= [H(W,5%)+ H(M,95%)]	H=(830+665)/2=748mm	0–60°[21] is a comfortable recliner seat surface

Table 1 (Continued)

Three types of elderly people	Seat surface inclination	Backrest inclination	Armrest height	Headrest height
Nursing care	0–60° [19]	20–180° [19]	240–250 [19]	500–600
Assisted care	20–180° [19]	240–250 [19]	500–650	325–360
Self-care	110–130° [17]	240–250 [17]	640–650 [17]	325–400 [17]
Calculation formula/ Based on data	20–180° to meet the needs of the elderly in different situations [22]	240–250mm, the most suitable distance between the ischial tuberosity and the armrest surface [22]	H=(685+555)/2=620mm	82–495mm, to ensure that the arms are naturally adducted and facilitate operation by the elderly [23]

4.2. Basic product dimension data

The formula for the ideal working surface of the product [20] = [H(W,5%) + H(M,95%)] / 2, where H(W,5%) represents the sitting height dimension of 5% of Chinese elderly women (aged 60 and above), and H(M,95%) represents the sitting height dimension of 95% of Chinese elderly men (aged 60 and above). In practical design, issues such as clothing, posture, operation, and psychology of the elderly need to be further considered, so it is necessary to add a certain amount of correction to the theoretical dimensions.

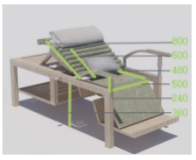
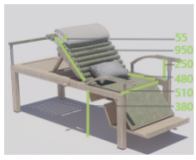
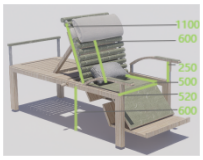
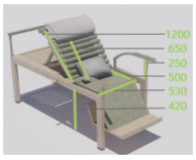
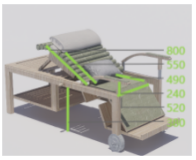
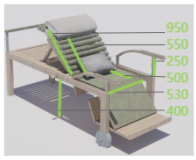
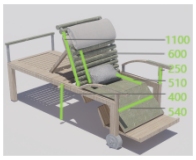
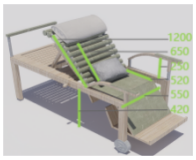
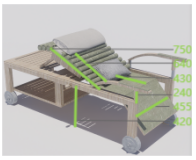
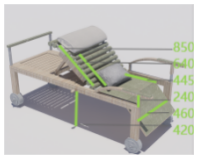
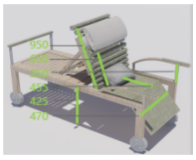
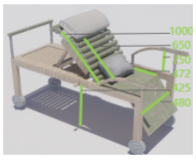
4.3. Focusing on diverse development based on group differences

By deeply understanding the needs and preferences of the elderly population, furniture can be designed that better fits their physical characteristics and lifestyle habits. For example, designing recliners for the elderly with adjustable angles, comfortable armrests, anti-slip functions, and moderate softness and hardness. Experts in ergonomics, furniture design, and geriatric medicine can be invited to evaluate and provide improvement suggestions for aging-friendly furniture, which can then be incorporated into the design to create a more scientific and reasonable recliner design. Liu proposal for furniture functionality can be referenced, using simple nouns to classify the basic attributes of furniture [16].

The main functions for three types of elderly populations: self-care, nursing care, and assisted care, can be summarized and categorized. Through research on the needs of these three types of elderly people and analysis of different design approaches for different elderly individuals, design ideas can be tailored to their specific needs. For example, for nursing care elders who have lost most of their self-care abilities and require care from others, the main design focus is on how to make it easier for caregivers to care for them and provide them with more comfortable nursing. For assisted care elders who have partial self-care abilities, the recliner design should mainly focus on assisting them to live better. For self-care elders, the recliner design should mainly focus on adding more functional facilities based on existing living facilities (whether to introduce smart facilities is distinguished by their acceptance of new things).

By distinguishing and analyzing the overall needs of these three types of elderly people, adhering to the principle of people-oriented, starting from their needs, and grasping the particularity of contradictions, improvements and innovations can be made to the recliner design to create a recliner facility that better fits the elderly population. Based on the needs of these three types of elderly people, adjustments and modifications can be made to the recliner design, resulting in three different types of recliners (**Table 3**) and their internal settings (**Figure 3**) tailored to the needs of the elderly.

Table 3. Recliners of different sizes and angles for three types of elderly people

Applicable to	Level 1	Level 2	Level 3	Level 4
				
Nursing care	Wheelchair seat height: 360mm Wheelchair seat width: 500mm Wheelchair seat depth: 480mm Backrest height: 800mm Armrest height: 240mm Backrest inclination: 160° Seat surface inclination: 60° Headrest height: 500mm	Wheelchair seat height: 380mm Wheelchair seat width: 510mm Wheelchair seat depth: 480mm Backrest height: 950mm Armrest height: 250mm Backrest inclination: 140° Seat surface inclination: 40° Headrest height: 550mm	Wheelchair seat height: 400mm Wheelchair seat width: 520mm Wheelchair seat depth: 500mm Backrest height: 1100mm Armrest height: 250mm Backrest inclination: 100° Seat surface inclination: 60° Headrest height: 600mm	Wheelchair seat height: 420mm Wheelchair seat width: 530mm Wheelchair seat depth: 500mm Backrest height: 1200mm Armrest height: 250mm Backrest inclination: 120° Seat surface inclination: 60° Headrest height: 650mm
				
Assisted care	Wheelchair seat height: 380mm Wheelchair seat width: 520mm Wheelchair seat depth: 490mm Backrest height: 800mm Armrest height: 240mm Backrest inclination: 160° Seat surface inclination: 60° Headrest height: 550mm	Wheelchair seat height: 400mm Wheelchair seat width: 530mm Wheelchair seat depth: 500mm Backrest height: 950mm Armrest height: 250mm Backrest inclination: 140° Seat surface inclination: 40° Headrest height: 550mm	Wheelchair seat height: 400mm Wheelchair seat width: 540mm Wheelchair seat depth: 510mm Backrest height: 1100mm Armrest height: 250mm Backrest inclination: 100° Seat surface inclination: 60° Headrest height: 600mm	Wheelchair seat height: 420mm Wheelchair seat width: 550mm Wheelchair seat depth: 520mm Backrest height: 1200mm Armrest height: 250mm Backrest inclination: 120° Seat surface inclination: 60° Headrest height: 650mm
				
Self-care	Wheelchair seat height: 420mm Wheelchair seat width: 455mm Wheelchair seat depth: 430mm Backrest height: 750mm Armrest height: 240mm Backrest inclination: 160° Seat surface inclination: 5–10° Headrest height: 640mm	Wheelchair seat height: 420mm Wheelchair seat width: 460mm Wheelchair seat depth: 445mm Backrest height: 850mm Armrest height: 240mm Backrest inclination: 140° Seat surface inclination: 5–10° Headrest height: 640mm	Wheelchair seat height: 425mm Wheelchair seat width: 470mm Wheelchair seat depth: 455mm Backrest height: 950mm Armrest height: 250mm Backrest inclination: 100° Seat surface inclination: 5–10° Headrest height: 650mm	Wheelchair seat height: 425mm Wheelchair seat width: 480mm Wheelchair seat depth: 472mm Backrest height: 1000mm Armrest height: 250mm Backrest inclination: 120° Seat surface inclination: 5–10° Headrest height: 650mm

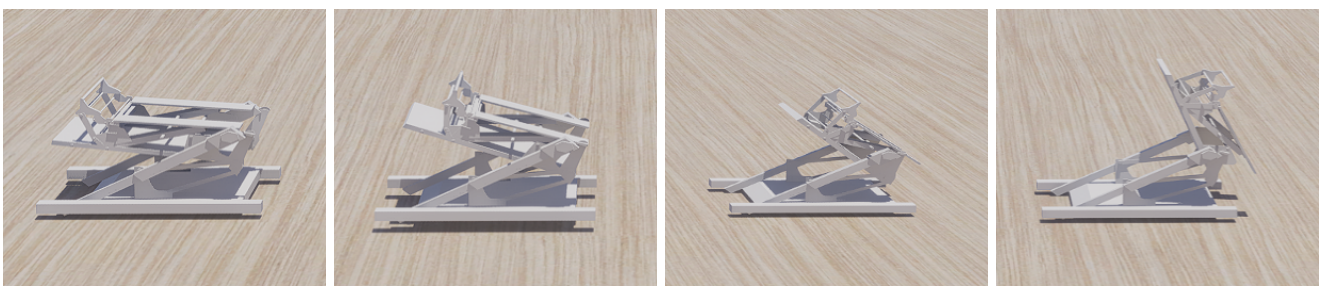


Figure 3. Internal devices of elderly recliners

4.4. Returning to design ethics based on scientific achievements

Based on the heterogeneity characteristics and digital divide effects of technology acceptance (TAM) among elderly groups, this study proposes a differentiated design framework for aging-friendly intelligent systems. The target users are divided into three categories based on their degree of nursing dependence, and differentiated design paradigms are established. Taking nursing care elderly as an example, the main design idea is to assist others in better caring for the elderly's daily life. A smart care ecosystem design model is adopted, with nursing efficiency optimization as the core goal. In terms of system architecture, a multimodal perception network (UWB positioning + flexible biosensor) and a distributed warning system (bed exit/fall detection algorithm) are deployed. In interaction design, a dual-end collaboration platform is constructed (the nursing end integrates a data visualization cockpit, and the family member end supports lightweight mini-program interaction).

For assisted care elders, the main design idea is how to better enable the elderly to take care of themselves and reduce the need for others to care for them. The system architecture is based on a multimodal perception fusion framework, integrating biological/environmental sensors and edge computing nodes. IoT data collaboration is achieved through the MQTT protocol, supporting scalable function modules such as fall warnings. In interaction design, a layered interaction system is constructed that integrates multimodal physical controls, AR visual guidance, and a dual-redundancy fault-tolerant mechanism. This ensures low learning costs and high system robustness through a composite operation layer of physical/voice/emergency devices, a three-step minimalist digital interface, and a self-healing logic for network disconnections.

For self-care elders, the essential demand source should consider the comfort of the recliner and the basic activities of self-care elders. In interaction design, a multimodal perception fusion architecture (biological/environmental sensors + edge computing nodes) and a layered redundant interaction system (AR guidance interface/three-step minimalist operation/composite layer of physical-voice-emergency controls) are adopted. From the system architecture perspective, modular health management function expansion is achieved through the MQTT protocol, and a dual-channel safety confirmation and network disconnection self-healing mechanism are integrated to ensure system reliability under low cognitive load. According to research results, the introduction of smart facilities is desired by the target population, with simplicity of operation, privacy protection, and manual assistance being the top three requirements (**Figure 4**). This also indicates the needs and future development direction of the elderly regarding the introduction of smart systems.

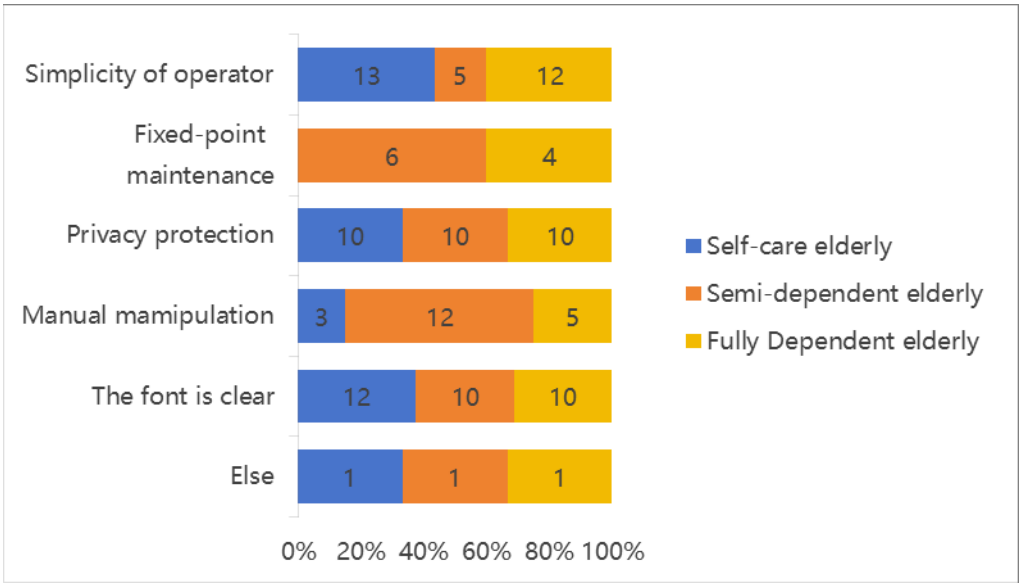


Figure 4. Results to the question "What are the hoped-for requirements for operating smart facilities?"

5. Conclusion

This study addresses the design challenges of recliner chairs for the elderly in an aging society. Through research and data analysis, a design solution more aligned with the needs of elderly users is proposed. Currently, most recliner chairs on the market suffer from poor fit, limited functionality, and difficulty in using smart technologies, making it hard to meet the diverse needs of self-sufficient, semi-dependent, and fully dependent elderly groups. In response, this study, based on the physiological characteristics and behavioral habits of elderly people, designs dimension standards tailored to different groups (such as seat height, backrest angle, etc.), and achieves precise service through modular functional design: focusing on caregiving support for fully dependent elderly, enhancing independent operation for semi-dependent users, and integrating lightweight smart health monitoring for self-sufficient individuals. At the same time, it emphasizes a "usability-first" interaction logic, adopting simple operation methods such as physical buttons and emergency calls to reduce the barrier for elderly users to adopt new technologies.

This design, centered on "practicality, comfort, and dignity," not only solves the problem of poor ergonomic fit in traditional products but also avoids excessive integration of smart features. In the future, further exploration can be made into the application of eco-friendly materials and the expansion of aging-friendly scenarios, so that the recliner chair becomes not only a functional piece of furniture but also an emotional companion that enhances the quality of life in old age. Through this study, it is hoped to provide a reference idea for aging-friendly furniture design and to promote the industry's transformation from "standardized production" to "personalized service," allowing every elderly person to enjoy a comfortable later life through thoughtful design.

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