Proceedings of the 4th International Conference on Art, Design and Social Sciences
DOI: 10.54254/2753-7064/2025.27306

Research on Inclusive Design Strategies for Packaging of OTC Drugs for the Elderly

Keyi Huang

Nanjing University of Science and Technology, Nanjing, China
123109011031@njust.edu.cn

Abstract. Based on the growing demand for OTC drugs among the elderly under the background of China's accelerating aging population, this study focuses on the problems in pharmaceutical packaging design, such as poor readability, operational difficulties, and weak auxiliary identification. By introducing the concept of inclusive design, and starting from the multidimensional characteristics of the elderly in terms of physiology, cognition, and socialization ability, a design strategy framework is proposed, centered on cognitive inclusion, functional inclusion, and emotional inclusion. Through specific approaches such as information hierarchy optimization, multi-sensory synergy, and linking to social resources, this study systematically constructs design methods that improve the usability, comprehensibility, and emotional identification of drug packaging. The aim is to provide the elderly with a safer, more autonomous, and dignified medication experience, while also offering theoretical references and practical guidance for pharmaceutical enterprises and design practices.

Keywords: Inclusive design, elderly, OTC drug packaging, medication safety, age-friendly design

1. Introduction

China has now become one of the countries with the largest elderly population and the fastest aging rate in the world. It is estimated that by 2040, the proportion of the elderly population aged 60 and above will exceed 28%, and the proportion of the elderly population aged 65 and above will exceed 20% [1]. This demographic shift directly drives changes in the pharmaceutical market. For example, the 2024 Special Population Consumption Trend Report released by Ali Health points out that the growth rate of online purchases of OTC drugs by users over 60 years old has reached 64.5%, the highest among all age groups. The elderly have a large demand for OTC drugs (over-the-counter drugs), which can be purchased in pharmacies or online without a doctor's prescription and are used according to the instructions of the drug leaflet [2]. According to the 2025–2030 Analysis of the Competitive Landscape of China's OTC Drug Industry and Forecast of Market Demand Potential compiled by China Research Intelligence, the market size of OTC drugs for chronic diseases among the elderly increases by 18% annually. Against the backdrop of population aging, innovative design targeting elderly groups is crucial, as it comprehensively considers their multidimensional needs in physiology, psychology, emotions, and aesthetics. Design not only provides a new perspective for

DOI: 10.54254/2753-7064/2025.27306

promoting supply-side structural reform but is also an important method and tool for systematically addressing aging issues.

2. Development of the pharmaceutical packaging industry and current situation of packaging design

Through market research, it is found that pharmaceutical packaging design in China still has three deficiencies: 1. Obstacles in information transmission and readability, making it difficult to access and understand key medication information; 2. Insufficient friendliness and usability, as packaging design does not fully take into account the actual use scenarios and abilities of the elderly, resulting in operational difficulties or inconvenience; 3. Weak visual recognition and memory assistance, whereby packaging fails to effectively support users in quickly identifying and remembering drugs in scenarios such as self-medication or managing multiple medications.

The decline in elderly abilities directly leads to usage barriers. If packaging design does not adapt to the changes in elderly abilities, medication safety risks will increase exponentially. Therefore, packaging design should be approached from the user's perspective, incorporating the elderly's physiological abilities, cognitive abilities, socialization abilities, and psychological needs into the design, while identifying the special needs of the elderly in the medication process.

Many scholars have already conducted design optimization research and practice on elderly users' behavioral cognition and innovative methods of pharmaceutical packaging design. For example, some scholars have carried out targeted design method research from different demand perspectives of the elderly [3-5], summarizing the multidimensional ability deficiencies of the elderly in medication scenarios. Other scholars have analyzed the inevitable trend of intelligent pharmaceutical packaging and the current application of new materials and technologies in this field [6-8]. The practical application of mature technologies such as smart ink, tracer particles, RFID (Radio Frequency Identification), NFC (Near Field Communication), and QR (Quick Response) codes has broadened the design dimensions of pharmaceutical packaging. These studies are beneficial for the development of the age-friendly pharmaceutical packaging industry. However, under the current context of new technologies and information expression methods, research on the relationship between the multiple needs of elderly patients remains insufficient. The interconnections and interactions among multidimensional abilities are often overlooked, and solutions to the risks of elderly users rejecting new technologies have not been proposed. Against this backdrop, the concept of inclusive design demonstrates important value—its core lies in considering user diversity at the design source and striving to create products that can be used barrier-free by the widest possible range of people.

3. Characteristics of elderly medication abilities

Compared with the general population, most elderly people clearly feel the decline in vision, memory, operational ability, learning ability, and the ability to mobilize external resources caused by aging. These abilities are interrelated and jointly influence the medication experience of the elderly. Therefore, this study analyzes from three dimensions: physiological ability, cognitive ability, and socialization ability.

First, the decline in physiological ability is a fundamental factor constraining the interaction between elderly patients and drug packaging. Due to the degeneration of ocular tissue functions, elderly people have difficulty recognizing low-contrast text and graphics, and their sensitivity to subtle color differences decreases. At the same time, due to joint degeneration and nerve function

DOI: 10.54254/2753-7064/2025.27306

decline, they may experience decreased finger dexterity, reduced grip strength, unstable holding of objects, and reduced tactile sensitivity, which manifest as difficulty in opening tightly sealed bottle caps, tearing blister packs, pouring tablets, or accurately grasping small pills. It is worth noting that changes in physiological abilities often profoundly affect cognitive processes, as there is a bidirectional reinforcing relationship between physiological perception and cognition.

Second, cognitive functional experience and cognitive decline profoundly affect medication comprehension and execution. Cognition mainly includes individual information processing processes such as attention, memory, imagery, and experience [9]. Due to brain function decline and neurological diseases, elderly people struggle more when understanding complex medication instructions, information on drug interactions, or dosage calculations. They are prone to missing key information and warnings, forgetting recently viewed dosage information, forgetting whether they have taken a dose, or when the next dose is scheduled. They may also find it difficult to plan the sequence of multiple drug intakes or deal with unexpected situations during medication.

Finally, socialization ability is a key external factor affecting elderly medication behavior. In a broad sense, ability includes not only physiological and cognitive functions but also knowledge and skills, tool resources, and social support networks [10]. Elderly people often face technology rejection, limited information acquisition channels, and shrinking social relationships, making it difficult for them to fully utilize auxiliary medication tools (e.g., smart pillboxes, medication reminder apps) or mobilize social resources (e.g., family assistance, community services). These external supports, however, may significantly alleviate medication barriers caused by physiological and cognitive decline.

4. Methodological basis for inclusive pharmaceutical packaging design for the elderly

Inclusive design emerged in the mid-1990s, aiming to alleviate mismatches between products or services and user abilities, so that more people could benefit from design [11]. Inclusive design for addressing the problems of an aging society has received widespread attention. Li Fang and Dong Hua pointed out the advancement of inclusive design principles compared with universal design. Many scholars have also integrated and practiced the concept of inclusive design, producing numerous innovative product designs for the elderly. Examples include dining plate designs for elderly patients with Parkinson's disease [12], age-friendly seat designs [13], and non-assisted walking aid designs for the elderly [14]. These studies are all conducive to the development and application of inclusive design theory. However, current research on the application of inclusive theory in the field of pharmaceutical packaging design is not in-depth. Therefore, this study, guided by the concept of inclusive design, attempts to construct a model framework and design strategy for inclusive pharmaceutical packaging for the elderly, providing theoretical basis and guidance for pharmaceutical companies and designers.

Research on inclusive design applications in China and other countries can be summarized into seven dimensions: cognitive inclusion, functional inclusion, emotional inclusion, action inclusion, service inclusion, identity inclusion, and spatial inclusion [15]. These constitute the specific paths, key considerations, and core components of achieving design inclusiveness, providing perspectives for proposing inclusive design strategies for elderly OTC drug packaging.

Among them, cognitive inclusion, functional inclusion, and emotional inclusion comprehensively cover directions for resolving conflicts between the elderly and drug packaging. This study aims to construct three strategies: functional inclusion, cognitive inclusion, and emotional inclusion. Functional inclusion ensures that the physical interaction with packaging can be completed independently, easily, and safely by elderly users with different physical abilities, while integrating

DOI: 10.54254/2753-7064/2025.27306

external tools to expand users' operational capabilities. Cognitive inclusion ensures that packaging information can be perceived, understood, and remembered barrier-free by elderly users, and supplements individual cognitive and knowledge differences by linking to external knowledge resources. Emotional inclusion ensures that packaging brings users positive emotional experiences and eliminates feelings of social exclusion caused by differences in resources.

5. Inclusive design strategies for OTC pharmaceutical packaging for the elderly

5.1. Cognitive inclusion strategy: reducing cognitive load and expanding cognitive resources

5.1.1. Hierarchical information presentation and external resource expansion

Information priority must be strictly followed, distinguishing between core, important, and basic levels to ensure optimal visual presentation of core information. For example, applying Gestalt principles in layout can form clear visual blocks and establish a Z-shaped reading path. Expanded information touchpoints should be provided, such as placing QR codes in prominent positions on packaging to link to voice explanation videos, community pharmacist consultation services, or family medication management platforms, helping users access real-time and personalized guidance while compensating for individual knowledge differences.

5.1.2. Multi-sensory synergy and integration of sensory compensation tools

The visual channel should be reinforced by using sans-serif fonts, ensuring high color contrast, and avoiding hue confusion. The tactile channel can be incorporated, such as using embossing or Braille for key information. External tool support can be coupled, for example, recommending compatible smart medication aids (e.g., smart pillboxes), providing adhesive magnifier labels, or pairing with voice medication reminders, thereby enhancing individual capabilities through auxiliary tools.

5.1.3. Embedded medication aids and social support systems

Innovative integrated medication record packaging can be designed, such as equipping packaging with a physical dial for recording medication dates/times or a wipeable writing area. Visualized dosage aids can be provided, such as printing large scales on liquid medication packaging combined with color blocks to mark dosages. Social support pathways can be offered, such as including local community pharmacy contact information, medication guidance hotlines, or family doctor appointment QR codes inside the packaging, thereby connecting users with social support resources and reducing medication barriers caused by disparities in social resources.

5.2. Functional inclusion strategy: expanding ability range and integrating operational resources

5.2.1. Ergonomic optimization of opening design

Overemphasis on child safety often causes difficulties for elderly users in opening packages, even leading to medication spillage or packaging damage due to improper force. High-friction surface treatment technology can be introduced, such as applying rubber coating or deep-etched textures on bottle caps, tear strips, or press points, to increase surface friction. In this way, the operability of opening can be effectively improved without sacrificing child safety structures.

DOI: 10.54254/2753-7064/2025.27306

5.2.2. Simplification of operation processes and tolerance design

"One-step" opening structures can be promoted, such as using tear strips or pre-cut points, while clearly indicating operation methods through shape, color, and texture. Tolerance design can be integrated with tools, such as enlarging tear-off areas or designing wide nozzles, while considering compatibility between packaging and common auxiliary tools (e.g., cap openers, anti-shake spoons), thereby providing clear paths to expand operational capabilities.

5.2.3. Precision dosage control and customized dosage services

Self-stabilizing nozzle designs and flexible silicone materials can be used to precisely control single drops, or integrated dispensing tools can be designed by combining measuring cups, droppers, and dispensers with the main packaging to avoid dosage errors caused by insufficient compatibility of additional tools. For users with severe hand tremors, dosage dispensing services at community pharmacies can also be provided, leveraging social resources to address individual ability deficiencies.

5.3. Emotional inclusion strategy: design beyond function to promote social integration

5.3.1. Visual reliability and social trust connection

Materials and processes conveying quality should be adopted, such as matte and warm textures, or fine printing. Calm and rational color schemes should be used, with blue, green, or white as primary tones, avoiding conflicting colors. Professional and authoritative resources should be displayed, such as showing cooperation with authoritative medical institutions, elderly associations, or well-known brands on the packaging, or providing visible anti-counterfeiting labels and official website QR codes, thereby enhancing trust and compensating for differences in users' social trust resources.

5.3.2. Enhanced sense of control and social resource mobilization mechanism

Intuitive visibility should be conveyed, ensuring that functions are self-explanatory and respectful of user abilities. Adaptive grip shapes should be provided, with multiple grip points to suit different hand sizes and postures. Multiple options and resource supports should be provided, not only offering two ways of opening but also including information on how to access community elderly services to help open medications, so that users realize they can mobilize social resources and thereby enhance their sense of control.

5.3.3. Respectful design and community belonging

"Adult-oriented" aesthetic design should be emphasized, adopting a simple, elegant, and modern style while avoiding infantilization. Positive language and tone should be used to encourage elderly people to connect with society, conveying the concept of "active aging." For example, information about community group medication encouragement programs can be included, thereby enhancing users' social identity and sense of belonging while eliminating stigmatization.

DOI: 10.54254/2753-7064/2025.27306

6. Conclusion

At present, pharmaceutical packaging in China cannot effectively adapt to the special needs caused by the decline in physiological, cognitive, and socialization abilities of the elderly. In response, this study introduces the concept of inclusive design as a methodological foundation, transcending the traditional "single-dimension" optimization approach, with the aim of creating solutions that can benefit users of varying ability levels. Starting from the ability characteristics of elderly medication, this study systematically constructs a strategy system for OTC pharmaceutical packaging design, comprising three dimensions: cognitive inclusion, functional inclusion, and emotional inclusion. This provides pharmaceutical companies and designers with concrete and operable design guidelines, translating inclusive design theory into practical applications. At the conceptual level, it emphasizes that excellent age-friendly design should not merely compensate and substitute for functions but should empower elderly users through systematic design innovations, enabling them to manage medication independently and safely with greater dignity and confidence.

Looking to the future, how to further integrate intelligent technology with inclusive concepts, and how to conduct effective usability testing to verify the effectiveness of strategies, will be important directions for subsequent research. Ultimately, it is hoped that the power of design can truly improve the medication experience and quality of life of the elderly, contributing to the construction of a more inclusive and caring aging society.

References

[1] Pang, G. F., Hu, C. Y., & Yang, Z. (2021). Trends and countermeasures of population aging in China. Chinese Journal of Geriatric Care, 19(01), 3-5.
[2] Deng, D. M. (2008). Pharmaceutical packaging strategies based on the characteristics of OTC drug demand. China Medical Herald, (23), 189-190.
[3] Wu, X. L. (2019). Construction of evaluation system for humanized packaging design of elderly drugs. Packaging Engineering, 40(18), 90-94.
[4] Ma, C. L., Wang, L., & Zhao, Y. D. (2021). Research on packaging design strategy of elderly drugs based on color psychology. Packaging Engineering, 42(12), 292-297.
[5] Liu, W. L., Li, M., & Ma, S. L. (2021). Research on principles and methods of interactive packaging design for the elderly's drugs. Packaging Engineering, 42(20), 225-230.
[6] Zhou, D. F., & Xiong, L. M. (2022). Intelligent design of pharmaceutical packaging under the background of Healthy China construction. Packaging Engineering, 43(02), 235-239.
[7] Wang, S., Yu, P., Fan, G. L., et al. (2022). Research on the application of intelligent pharmaceutical packaging materials in multi-sensory dimensions. Packaging Engineering, 43(19), 76-87.
[8] Lin, H. J., Tian, S. Q., Mei, L., et al. (2023). Research progress of pharmaceutical packaging materials. Chinese Journal of Pharmaceuticals, 54(03), 339-346.
[9] Du, H. M., & Jiang, J. J. (2022). Information visualization design from the perspective of cognitive thinking and visual thinking. Packaging Engineering, 43(08), 217-224.
[10] Li, F., & Dong, H. (2018). Development and challenges of universal design and inclusive design principles. Journal of Nanjing University of the Arts (Fine Arts & Design), (05), 71-78+210.
[11] Zhang, K., & Zhu, B. W. (2021). Research progress, hotspots and trends of inclusive design. Packaging Engineering, 42(02), 64-69+103.
[12] Gao, H. H., Zhao, Q., & Lü, J. L. (2022). Design of dinner plates for the elderly based on inclusive design. Packaging Engineering, 43(12), 297-305.
[13] Zhang, W. Y., & Jiao, L. J. (2023). Research on inclusive seat design in aging environment. China Forest Products Industry, 60(09), 51-56.
[14] Chen, Y. B., Zheng, S. L., & Tang, X. Y. (2022). Research on the development of walking aids from the perspective of inclusive design process. Packaging Engineering, 43(24), 167-179+188.
[15] Sun, T., Shen, L., & Wang, Q. (2024). Comparative study on inclusive design methods from the perspective of aging. Packaging Engineering, 45(22), 30-40.