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AGE-FRIENDLY PACKAGING DESIGN: FEATURES AND CHALLENGES

The purpose: *to analyze and explore the application and development of age-friendly design in the packaging sector to address the challenges presented by aging. Provide assistance for the advancement and progression of future age-friendly packaging design, aiming to support relevant research and practical endeavors to drive forward.*

Methodology. *The methodology includes general scientific principles of systematization, comparison and generalization of the investigated problem, which made it possible to define and scientifically substantiate existing theories, conceptual approaches to understanding the features of packaging design. The use of the analytical method led to the establishment of conceptual foundations for the scientific perspectives of understanding the methods and practices of integrating of age-friendly approach into packaging design.*

The results. *A systematic review of the relevant theories of age-friendly packaging design was conducted, exploring the application methods and practices of age-friendly design principles in packaging design. The integration of academic research findings provided a comprehensive reference for practical implementation.*

Scientific novelty. *The integration of age-friendly design principles into packaging design, proposing solutions for aging-related challenges, is innovative and of practical significance, Bringing a human-centric perspective and intelligent methodologies to future packaging design.*

Practical meaning. *In response to the societal challenge of population aging, the initiative aims to draw attention within the packaging design industry to issues related to aging, fostering improvement and innovation in relevant products and services. Ultimately, this endeavor seeks to enhance the quality of life for the elderly population.*

Keywords: *Age-friendly design; packaging design; aging; human-centered care; design principles.*

Introduction. Currently, the global population is entering a phase of aging. On January 12, 2023, a new report released by the United Nations stated that by the mid-century, the population aged 65 and above will more than double, with a growth rate surpassing that of the younger demographic [1]. This phenomenon is likely to be one of the most significant societal trends of this century, impacting all areas of society. To address this situation, various sectors should collaboratively tackle the challenges posed by the aging population and work towards resolving current issues. The advent of an aging society has brought age-friendly design into sharp focus. Age-friendly design is not just a concept for designing products or services; it is also a manifestation of social responsibility and care. Current research on age-friendly design primarily focuses on product design, living space design, and service design.

Analysis of previous researches. According to the China National Knowledge Infrastructure (CNKI) as of 2023, there are a total of 11,234 records retrieved for the keyword "age-friendly design". Among these, there are 714 journal papers and 437 theses, primarily concentrated in fields such as architectural design, landscape design, and home design. Research in design studies related to aging issues in the Chinese academic community started relatively late, with relevant papers appearing on CNKI only from 2011 onwards. Meanwhile, age-friendly design has garnered attention within the academic sphere.

Currently, research on aging in China spans disciplines such as architectural science and engineering, automation technology,

sociology and statistics, fine arts, calligraphy, sculpture, and photography. The focus is primarily on community renovation, smart health aging, intelligent technology for the elderly, and research on smart devices, addressing key areas related to the elderly population, improving their quality of life, and optimizing infrastructure. Scholars are not only delving into the theoretical foundations of age-friendly design but also emphasizing the exploration of advanced design concepts and methods to broaden perspectives.

Jiang Rubo advocates for the rational utilization of the visual physiological characteristics of the elderly, promoting a reasoned understanding of the visual limitations of the elderly, and principled exploration of issues present in real-life situations [2]. The approach involves analyzing the visual characteristics of the elderly and considering age-friendly aspects in visual communication design from this perspective. The response to the challenges of age-friendly design is addressed through the lens of physiological issues such as cognitive abilities, sensory perception, and visual attention in the elderly.

Hu Fei and Zhang Xi systematically organized eight design concepts related to the elderly (Barrier-free Design, Universal Design, Cross-generational Design, Accessibility Design, Inclusive Design, Elderly Well-being Design, Nationwide Design, Elderly Services Design) [3]. They propose that, building upon barrier-free design, a focus on addressing the needs of the elderly should be achieved through cross-generational design. Additionally, they provide design-oriented considerations on how to respond to aging in China: strengthening top-level design, enhancing cross-disciplinary collaboration, and promoting educational outreach.

Zhao Chao proposes conducting inclusive design research from the perspective of human-computer interaction [4]. Designers need to understand how the perceptions, functions, and behaviors of elderly users change with factors such as age, disabilities, environment, and social context. It is essential to grasp the genuine needs of elderly users, including physiological, social, and cultural needs. The focus of the design should be on the physiological decline experienced by the elderly in terms of sensory, cognitive, and motor aspects during the aging process. Specific manifestations include: (1) as age increases, behavioral speed slows down; (2) however, the correlation between sensation and cognition strengthens with age; (3) and elderly individuals rely on intuitive information to assist in operational skills in specific environments.

These scholars, building upon the physiological and psychological aspects of the elderly, have engaged in in-depth discussions on age-friendly design from various perspectives. They have laid a foundation for future research and provided new insights. Learning and understanding these design concepts and thought processes are of significant guiding importance for design practice.

In some developed countries, such as Japan and Germany, they entered an aging society as early as the 1950s, leading to an early initiation of research on aging. These countries have a foundation in design and industrial design, meeting the living needs of the elderly while addressing their requirements for mental well-being. In foreign research, there is a substantial amount of literature on age-friendly packaging design and design for the elderly. Searching for "aging design" on SCIENCEDIRECT (Elsevier full-text electronic journals) yields over 1,000,000 relevant entries as of 2023. This is attributed to the integrated development of aging and age-friendly design in foreign countries, where sociology, demography, medicine, economics, management, and other disciplines have evolved in conjunction with targeted design for the elderly and comprehensive age-friendly design. There is less fragmentation between population structure and design research, and interdisciplinary approaches have been taken to

age-friendly transformations within specific disciplines. The focus has been on medical and healthcare disciplines, ensuring that the development process fully considers the elderly population. Age-friendly design has progressed synchronously with discipline development. While the development trajectory may not align with the aging population trends in developing countries, there are still valuable lessons and insights in aging design that can aid in advancing the process of age-friendly design. Germany and Japan, among which Germany can be considered a typical representative. Germany's design related to aging began with concepts such as safety design, barrier-free design, and universal design. Influenced by national policies and disciplines, coupled with the development of these design concepts, age-friendly design in Germany is relatively mature and tends towards practical innovation.

The design of aging, elderly care, and age-friendly design, along with their related scientific research, should keep pace with the times. It should guide positive aging, exploring conscientious development in age-friendly design research.

Statement of the problem. To analyse pharmaceutical packaging design and determination of the artistic and functional characteristics that affect modern packaging design, and systematize design solutions that take into account the features and needs of the elderly.

Results of the research and its discussion. Influenced by the characteristics of the elderly population, pharmaceuticals and healthcare products have become an integral part of the lives of many elderly individuals. However, most manufacturers nowadays focus solely on the efficacy of pharmaceuticals and healthcare products, neglecting the importance of packaging. This oversight results in issues for the elderly population when selecting medications, such as unclear packaging information or similar designs, leading to potential risks in medication adherence. Designing dedicated packaging for the elderly

population holds significant importance to enhance medication safety and convenience.

Liang Xiu proposes that inclusive design should extend beyond the packaging of pharmaceuticals. It should embody the concept of "accessible packaging design" by considering the cognitive levels and physiological characteristics of the elderly in the design of opening guidance and drug access [5], (Fig. 1-a). Liang Xiu specifically addresses the safety and convenience aspects of drug access design. Ultimately, the goal is to provide the elderly with a warm visual experience and psychologically barrier-free behavioral sensations.Wu Xinlin considering the concept of adherence in medication for elderly patients, approaches pharmaceutical packaging design [6]. He suggests utilizing the principles and methods of design semiotics and design pragmatics to comprehend the visual, structural, and functional aspects of pharmaceutical packaging design. Through design practice, he advocates for innovative designs in pharmaceutical packaging. Based on color psychology (Fig. 1-b). Ma Zhonglong [7] analyzes pharmaceutical packaging for the elderly and formulates four strategies for drug packaging color design: demand analysis, design positioning, establishing dominant positive colors, and color coordination with overall design (Fig. 1-c). Xu Jin provides a detailed analysis of the four requirements for achieving personalized packaging, considering the physiological characteristics of the elderly audience: visual requirements, easy recognition requirements, reminder requirements, and easy access requirements [8]. Moreover, recognizing the relatively lower educational levels of the elderly in China, which may result in weaker comprehension and interpretation of text, Xu Jin suggests that the use of simple visual language on packaging would be easier to understand and remember (Fig. 1-d).

Thus, researchers unanimously agree that addressing pharmaceutical packaging issues for the elderly involves considering the psychological perceptions of color. Simple

patterns and easily readable text are more favorable for the elderly to comprehend the instructions for medication use. Additionally, special attention should be given to pharmaceutical packaging to facilitate easy opening and retrieval, thereby enhancing operability. Overall, in recent years, there has been a high level of societal attention to the elderly population, and research approaches in the field of medication packaging design for the elderly have been innovative with diverse perspectives. However, in terms of practical application, there are relatively few instances where research has been successfully implemented. Therefore, further in-depth research is needed for medication packaging design targeting the elderly population.

Normal packaging, as the name suggests, refers to packaging under usual and original conditions, and it is also the most widely used packaging in the market. In addition to pharmaceuticals and healthcare products, normal packaging used in the daily lives of the elderly needs to take into account the differences between the elderly and middle-aged individuals. Otherwise, it may cause inconvenience and burden for the elderly population. The considerations and theories for normal packaging align roughly with those for designing pharmaceutical and healthcare product packaging. In addressing food packaging design suitable for the elderly, Yang Guang proposes the need for personalized design based on the physiological characteristics of the elderly [9]. This involves taking a human-centric approach from the perspective of ergonomics. Furthermore, it emphasizes the consideration of applying knowledge systems such as product design, structural design, and visual communication design to fulfill the functional requirements of the elderly population for food packaging. He Tong through the exploration of three aspects of normal packaging issues – visual expansion design, structural expansion design, and consolation expansion design – proposes new perspectives for innovation in normal

packaging [10]. Qu Yiqi mentioned that under certain conditions, the most reasonable design for packaging products for the elderly should be "for the elderly", reflecting the rationality and social responsibility of the design [11]. Different ages, genders, and health conditions among the elderly result in varying needs for packaging production. Analyzing the physiological and psychological consumption characteristics of the elderly can lead to better proposals for upgrading and improving the design of product packaging.

In summary, in the design process of normal packaging, incorporating age-friendly design considering the physiological and psychological needs of the elderly is an inevitable trend. Designing packaging from the perspectives of text, color, materials, etc., allows the elderly to better use the related products, enhancing their acceptance and usability of the products. In the design of product packaging, it is advocated to prioritize the needs of the elderly, recognizing that packaging is a detail of care for the elderly that cannot be ignored. The design should fully adapt to the various characteristic requirements of the elderly.

Taking into account the physiological characteristics and visual perception systems of the elderly population, age-friendly packaging should provide easily readable information through clear and prominent labeling, large-font text, and vivid colors (Fig. 2). In existing designs, increasing the font size of product labels and usage instructions has become a common practice to facilitate easy recognition for the elderly. Therefore, in addressing the psychological and physiological characteristics of the elderly under discussion, designers should pay attention to the specific requirements for color, font, and design in product packaging.

In modern packaging design, the concept of humanization adheres to the advocacy of flexible functionality, designed in accordance with human needs. Typically, packaging design should first meet the practical functionality of the product, then consider human factors.

a   b   c   d

Fig. 1. Examples of the design of pharmaceutical products for the elderly:
a – Intelligent Medicine Dispensing Device Diagram;
b – Wristwatch-style Medication Packaging Box Design (by Wu Xinlin);
c – Blood supplement packaging design;
d – Medication Packaging Design with Clear Typography, Striking Visual Identity, and Concise Information Synopsis

a   b

Fig. 2. Examples of the font and color for packaging design:
a – font design for Hair and Body Care Products;
b – Color Scheme for Medication Packaging Tailored to Aging Design

a   b

Fig. 3. Examples of Designs Facilitating Grip for Elderly Individuals:
a – Milk Packaging Designed for Use Without Holding;
b – Good-holding space bottle modeling

a   *b*
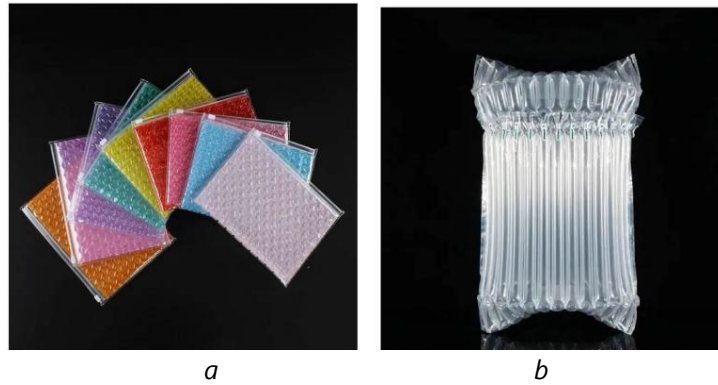
Fig. 4. Drop-resistant Packaging Material：*a* – Drop-resistant PE bubble wrap bag;
b – Shockproof Bubble Columns

a   *b*

Fig. 5. Examples of Designs Facilitating Elderly Individuals in Opening or Closing Packaging:
a – Packaging for Abbott Infant Formula with a Unique Groove Opening Design, Allowing Consumers to
Open and Close the Packaging with Just One Finger; *b* – Packaging with Easy-Tear Strips

Through the rational design of structure and functionality, it provides users with more comfort and convenience. Future packaging designs should place a greater emphasis on human-centricity, taking into consideration factors such as the grip strength and grasping methods of the elderly population, as well as the overall volume and weight of the product. Integrating principles of ergonomics in packaging design will enable the elderly to use the packaging more effortlessly (Fig. 3).

The elderly often encounters issues such as product detachment or difficulty in holding due to slipping. Age-friendly packaging should consider incorporating features to prevent such accidents. Utilizing anti-slip designs or incorporating materials to prevent falls can effectively enhance the safety of the packaging, reducing the risk of accidental injuries for the elderly during use. Opting for materials that are waterproof and slip-resistant, and utilizing various material combinations, ensures the product is easy to use with a comfortable tactile feel. This approach fully meets the needs of the elderly for packaging aesthetics and material safety, thereby providing them with a greater sense of security and comfort (Fig. 4).

The process of opening and closing packaging is a stage that requires a high level of manual coordination skills. One characteristic in existing designs related to age-friendly packaging is the emphasis on easy opening and closing to address the reduced hand flexibility and strength in the elderly. To facilitate the elderly in opening convenience food packaging more conveniently, innovative opening techniques such as one-touch or push-pull designs are adopted to enhance the speed and safety of packaging opening (Fig. 5).

To achieve better age-friendly design in the future, it is essential to integrate multiple disciplines such as medicine, engineering, psychology, etc., for a comprehensive understanding of the needs of the elderly

population. Manufacturers, packaging designers, healthcare professionals, and others need to collaborate to discuss and address the challenges faced by the elderly in using product packaging. Interdisciplinary and cross-sector collaboration can bring richer perspectives and innovative ideas, enabling researchers to better comprehend the physiological, psychological, and social needs of the elderly.

Considering the ongoing global trend of the aging population, age-appropriate packaging should also move towards sustainability by adopting eco-friendly materials such as recyclable or biodegradable materials and designs that allow for recyclability. This aligns with the requirements of future societies for sustainable development. Such materials are more environmentally friendly and healthy, effectively preventing health risks for the elderly caused by mistakenly consuming packaging materials that decompose into carbohydrates due to microbial activity. Opting for packaging methods with recyclable or biodegradable materials can meet product packaging needs while simultaneously reducing environmental pollution and promoting the health of the elderly.

Technological innovation plays a crucial role in the field of age-friendly design. The introduction of new technologies such as smart technology, the Internet, and virtual reality provides the elderly with more intelligent, convenient, and secure products and services. With continuous technological advancements, age-friendly packaging design can leverage new technologies, such as smart packaging and voice prompts, to enhance the usability and level of intelligence in packaging. Future research should further explore the integration of technology and design to better serve the elderly population.

It is essential to advocate for legal regulations in age-friendly packaging design, establishing a set of design standards to ensure quality and alignment with the needs of the elderly. This will provide clear guidance for designers and promote the standardized development of the industry.

Conclusion. With the development of society and the intensification of aging demographics, the demand for solutions to aging-related issues has become increasingly urgent. In recent years, there has been rapid development in research on age-friendly design, with scholars conducting studies and practical applications from various perspectives. Their research primarily focuses on product design, service design, residential space design, and the theoretical foundations of age-friendly design. These studies mainly target the urban elderly population. While significant progress has been made in age-friendly design research, there are still some challenges to address.

Future research directions include further strengthening interdisciplinary collaboration, delving deeper into the actual needs of the elderly, and promoting the deep integration of technological innovation and design. Age-friendly design is not just a design concept but an ongoing effort to create a more inclusive, caring, and sustainable society. Through future research, improving age-friendly design to better serve the elderly, enhancing societal attention to the elderly population, and yielding more impactful outcomes are the goals.

Due to the decline in the functions of various organs, elderly individuals may experience various physical issues. Therefore, it is essential for society to pay close attention to this demographic, providing them with ample care and creating a safe and comfortable environment for activities such as exercise, socializing, and reading. In daily life, one often encounters elderly individuals who, despite entering the senior stage, are still willing to contribute and realize their value. Aging-friendly design will help elderly individuals can spend their later years in stability and happiness.

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АДАПТИВНИЙ ДО ВІКУ ДИЗАЙН УПАКОВКИ: ОСОБЛИВОСТІ ТА ВИКЛИКИ

Мета: *проаналізувати застосування та розвиток дизайну упаковки, спрямованого на потреби людей похилого віку для вирішення викликів, що виникають у зв'язку зі старінням. Окреслити підходи у просуванні дизайн-продуктів та перспективи розвитку дизайну упаковки, орієнтованого на потреби людей похилого віку.*

Методологія. *Застосовано загальні принципи наукового пізнання: систематизація, порівняння та узагальнення в контексті досліджуваної проблеми, що дало змогу визначити та обґрунтувати існуючі теорії, концептуальні підходи до розуміння особливостей дизайну упаковки. Використання системно-аналітичного методу призвело до створення концептуальних засад для виявлення наукових перспектив розуміння методів і практик інтеграції у підходах, адаптивного до віку дизайну упаковки.*

Результати. *Проведено аналітичний огляд теорій дизайну упаковки, спрямованого на потреби людей похилого віку, визначено методи застосування та практики принципів дизайну, спрямованого на потреби людей похилого віку, у дизайні упаковки. Інтеграція висновків наукових досліджень забезпечила комплексне джерело для практичної реалізації.*

Наукова новизна. *Окреслено концепцію дизайну упаковки, що враховує проблеми старіння, надає інноваційні та практичні рішення, привносячи гуманістичну перспективу та інтелектуальні підходи до майбутнього дизайну упаковки.*

Практичне значення. *Відповідно до суспільного виклику щодо проблем старіння населення, ініціатива спрямована на привернення уваги у галузі дизайну упаковки до проблем з цим пов'язаних, що сприятиме вдосконаленню та інноваціям у відповідних продуктах та послугах з метою покращення якості життя людей похилого віку.*

Ключові слова: *адаптований до віку дизайн; дизайн упаковки; старіння; людиноцентричність; принципи дизайну.*

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