Art and Design Review, 2024, 12, 46-62
https://www.scirp.org/journal/adr
ISSN Online: 2332-2004
ISSN Print: 2332-1997

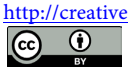
Unwrapping the Struggle: Unveiling the Packaging Challenges Faced by the Elderly through Interviews

Fang Gan

School of Art, Yangtze University, Jingzhou, China
Email: ganfang@yangtzeu.edu.cn

How to cite this paper: Gan, F. (2024). Unwrapping the Struggle: Unveiling the Packaging Challenges Faced by the Elderly through Interviews. *Art and Design Review, 12,* 46-62.
https://doi.org/10.4236/adr.2024.121004

Received: January 12, 2024
Accepted: February 20, 2024
Published: February 23, 2024



Abstract

The numerous challenges faced by older adults in everyday life have garnered much attention from stakeholders in the design industry. The purpose of this research is to insight into elderly packaging barriers and associated reasons. Empirical data were gathered by conducting in-depth semi-structured interviews with elderly individuals. It is found that elderly people encounter the following packaging issues based on the three key steps of packaging use: 1) identifying product information, 2) determining how to open packaging, and 3) packaging opening. The associated reasons underpinning their packaging barriers were perceived from two angles: 1) packaging design features and 2) deteriorating physiological functions due to ageing. The results of this research not only provide abundant detailed reasons for the packaging barriers of the elderly to supplement the knowledge gaps in existing research, but also analyze the relationship between these packaging barriers reasons. Therefore, packaging researchers and designers have a comprehensive understanding of the packaging barriers for the elderly and further better solve these packaging barriers.

Keywords

Packaging Barriers, Detailed Reasons, The Elderly, Barrier-Free Packaging Design

1. Introduction

Products used daily and consumers, including older users, are inextricably linked by consumer packaging (Hellström et al., 2017). In this vein, the rapidly growing ageing population (United Nations, 2023) is required to utilise packaging in nu-

merous ways. Users who interact with packages must 1) identify product information, 2) methods to open the package, and 3) open the package before use. Therefore, the consumer packaging design deserves a comprehensive and in-depth exploration because it determines the elderly quality of life and independence.

However, elderly people struggle to use the package for specific reasons (Li & Wang, 2022; Shen & Yan, 2021). The paucity of studies on elderly packaging barriers limits stakeholders' understanding of these complexities. They mainly focused on the obstacles of opening packaging among the elderly (Canty et al., 2013; Philbert, Notenboom, Bouvy, et al., 2014a; Philbert, Notenboom, Koster, et al., 2014b), while the product information identification barriers and difficulties to understanding packaging opening methods among the elderly are poorly understood. Meanwhile, the reasons for packaging opening barriers focused on physiological degradation of the elderly, such as decreased hand function (Ma & Dong, 2016; Notenboom et al., 2014; Philbert, Notenboom, Bouvy, et al., 2014a; French Packaging Council, 2016; Sudbury-Riley, 2014; Rowson et al., 2014; Butlewski, 2015), age (Ma & Dong, 2016; Rowson et al., 2014; Butlewski, 2015; Philbert, Notenboom, Bouvy, et al., 2014a; French Packaging Council, 2016) and chronic diseases (Philbert, Notenboom, Koster, et al., 2014b; Sudbury-Riley, 2014; Rowson et al., 2014) were being mentioned often. In contrast, only a few articles mentioned that the essential functions of protection products cause tight packaging sealing (Butlewski, 2015; Ma & Dong, 2016), which makes it difficult for the elderly to meet the opening requirements and skills.

Hence, this comprehensive study explored elderly packaging difficulties and underlying reasons to further provide a viable basis for future studies to address these issues. The current work offered a sound understanding of current elderly packaging barriers, theoretically enriched current literature on barrier-free packaging design, and improved elderly people's living standards.

2. Methods

The study samples in this qualitative research encompassed elderly people residing in China, who were selected via purposeful sampling. The elderly participants' perceptions of packaging barriers and corresponding reasons were elicited from semi-structured interviews.

2.1. Research Sample

Citizens over 60 years old in China fall under the ageing population (Ministry of Civil Affairs of the People's Republic of China, 2019). This empirical work selected the study samples based on two prerequisites: 1) aged between 60 and 70 years and 2) no severe chronic disease that affects their ability to perform their daily tasks. Counterparts from 60 to 70 years old who do not live independently due to chronic ailments and those above 70 years old were excluded from the study. The qualitative research design mainly focuses on the saturation of the gathered data (Saunders et al., 2018). When the information provided by the

participants is similar, the gathered information becomes saturated. Overall, 10 elderly citizens (five men and five women) with an age distribution from 61 to 70 years old participated in this research. All tables in this paper use "F+number" for female participants and "M + number" for male participants.

2.2. Packaging Samples

In order to better identify the elderly packaging barriers and causes, the packaging samples' criteria are consumer packaging types that are challenging for elderly people to utilise daily. Packaging samples were selected based on research surveys conducted by other scholars and endorsed by older adult participants. As a result, the packaging samples applied in this present study were thin film packs (Canty et al., 2013; Liu, 2016), jars, shrink wraps, laundry detergent bottles, flexible sealed bags, beverage bottles, and bottles with ring pulls (Carse, Thomson, & Stansfield, 2007; Ma & Dong, 2016).

2.3. Procedures of the Elderly Interviews

Semi-structured interviews were conducted to ascertain the key determinants of elderly packaging barriers and associated reasons. The elderly participants were used packaging samples and answered 1) whether the packaging information they sought could be easily identified, 2) if they could understand the package opening prompts, and 3) whether the package opening process was complicated or easy.

2.4. Data Analysis

The qualitative data elicited from the interview sessions were subjected to content analysis (interpretation and comprehension) via NVivo software. This study used pre-determined (a priori) and emergent codes for data coding purposes (Stuckey, 2014). The pre-determined codes resulted from the data needed, while the emergent codes implied specific interview text content that supported the pre-determined ones. As such, the pre-determined codes of the elderly interviews denoted the categories of packaging barrier types and reasons. **Figure 1** illustrates the emergency codes as empirical outcomes.

3. Results and Discussion

The following packaging barriers were determined from the elderly participants' viewpoints (**Figure 2**) upon gauging their packaging interaction status, discussing the interview questions and analysing the speech content and comments: 1) identifying product information, 2) knowing how to open a package, and 3) opening the package.

3.1. Barriers to Identifying Product Information and Corresponding Reasons

The elderly interviewees in this study could not identify product content and

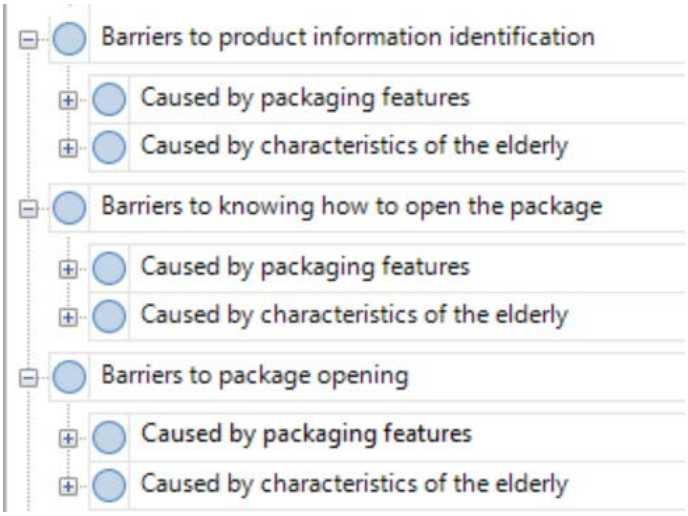


Figure 1. The elderly interviews coding structure.

Figure 2. Packaging barriers encountered by the elderly interview participants.

basic product information (capacity and storage life) through words and pictures displayed on the package owing to the small print, information typesetting issues, and visual impairment in line with existing studies. Other reasons were novel study findings, such as pictures not matching the product image in their minds, low colour contrast, extravagant packaging, reflectance of the packaging

surface, unfamiliar packaging, limited cognition, and the relative inability to accept new things.

3.1.1. Product Information Recognition Barriers Caused by Packaging Design

Past researches (Cheng, 2021; He, 2018; Qi et al., 2021; Wang, 2021; Wu et al., 2019; Yao, 2021) and nine elderly participants claimed the overly small font was the primary barrier to identifying product information. Seven interviewees could not determine the product information, as the packaging images failed to correspond to the physical product. The low colour contrast of fonts and images with packaging backgrounds deterred five of them from determining the product details presented via fonts and images (see Table 1).

Participants F2, F3, and M5 cited typesetting issues (information not printed on the regular side of the package and information typesetting errors) as barriers to identifying product information. Although Ward et al. (2010) concurred with this statement, the information typesetting issue in their study involved elderly consumers who failed to read product information printed on different packaging sides (see Table 1).

The ageing population could struggle to identify product information on over-designed packaging. Perceivably, packaging designers incorporated numerous visual elements (pictures, fonts, and bright colours) that cover the whole packaging. This leads to packaging design over-emphasising its marketing role and neglecting its role in conveying product information. Based on Participant F5, reflective product surfaces hindered elderly users from reading the package information, specifically under sunlight. A layer of bright film covers the package surface to protect its text information. Notably, all age groups encounter this situation (see Table 1).

When confronted with unfamiliar packaging, the older person's response was to not seek product information through the packaging but claim that they did not know what was inside, as they had never seen the packaging before (M4). Regardless, the interviewees' definition of unfamiliar packaging was inaccurate. The elderly participants had not seen such packaging for that particular product.

Table 1. Product information recognition barriers caused by packaging design.

Reasons	F1	F2	F3	F4	F5	M1	M2	M3	M4	M5
1) Too small font	●	●	●		●	●	●	●	●	●
2) Images and product mismatch	●		●	●	●		●		●	●
3) Low color contrast					●	●	●	●		●
4) Information typesetting issues		●			●					●
5) Too fancy packaging decoration	●									
6) The reflectance of the packaging surface					●					
7) Unfamiliar packaging									●	

As such, the unfamiliar packaging hindering them from gauging product information did not involve new package types (see Table 1).

3.1.2. Product Information Recognition Barriers Caused by Elderly Characteristics

Vision plays a pivotal role in seeking information. Eight of the interviewees and past publications highlighted that ageing-induced visual deterioration prevented elderly people from reading product information on the package (Cheng, 2021; He, 2018; Sudbury-Riley, 2014; Qi et al., 2021; Wang, 2015; Wang, 2021; Wu et al., 2019; Yao, 2021; Zavlanou & Lanitis, 2019; Zhao, 2016). Three of the these articles (Cheng, 2021; Wu et al., 2019; Zavlanou & Lanitis, 2019) claimed that critical ailments, such as presbyopia further hampered the elderly's identification of product information (see Table 2).

Participants F5 and M3 asserted the failure of some packaging images to intuitively convey the product information, which requires imagination or understanding. Elderly people struggled to identify product information following poor cognition, specifically visually-impaired ones who could not directly obtain information from the text. Nonetheless, past research on product information recognition barriers caused by low cognitive ability referred to the elderly inability to perceive the description text for products on packaging (Notenboom et al., 2014). Therefore, elderly consumers with low cognition may misconceive both the packaging text and images (see Table 2).

Elderly participants who encountered unfamiliar packaging types first highlighted the novelty of the packaging and ignorance of its content rather than actively determining the product information via the packaging text and pictures. One participant (M4) attributed this response to elderly individuals' inability to accept new things (see Table 2).

3.1.3. Relationship of the Two Cause Categories for Product Information Recognition Barriers

There is an inextricable link between the reasons underpinning product information recognition barriers owing to 1) the elderly physical characteristics and 2) packaging design (see Table 3). Low colour contrast and overly small packaging fonts might only slightly inconvenience young and middle-aged consumers. Regardless, the combination of both factors with visual impairment renders the identification of product information challenging for elderly people.

Designer, product brand image, and design purpose significantly influence the packaging design style. The elderly interviewees understood that packaging is

Table 2. Product information recognition barriers caused by elderly characteristics.

Reasons	F1	F2	F3	F4	F5	M1	M2	M3	M4	M5
1) Visual impairment	●	●	●		●	●	●	●	●	
2) Low understanding abilities					●			●		
3) Low ability to accept new things									●	

Table 3. Relationship of two cause Categories for product information recognition barriers.

Caused by the packaging features	Caused by the characteristics of the elderly
Too small font	Visual impairment
Low colour contrast	
Too fancy packaging decoration	
Reflectance of the package surface	
Information typesetting issues	Low ability to accept new things
Strange packaging	
Images and product mismatch	Low understanding abilities

elaborately designed to commercialise and sell products. Notwithstanding, such extravagance could confuse the elderly and hinder them from recognising product information following visual impairments. The bright surface film of the packaging irritates the eyes and hinders the ability to read. Elderly individuals should take a longer time to regain their vision when meet this situation (see Table 3).

Information layout issues arise when specific information is not printed on the common packaging side. Notably, this issue is associated with the elderly's ability to embrace novel entities and their confusion when encountering unfamiliar packaging. The elderly inability to recognise familiar products due to unfamiliar packaging may be also related to their reluctance to accept new things. The unfamiliar packaging does not mean the interviewees had never seen this packaging type, but they had not seen this packaging type used for this product. Elderly people with low cognition struggle to identify product information following the mismatch between image and physical product or the need for some degree of visualisation to perform the matching (see Table 3).

3.2. Barriers to Knowing How to Open Packages and the Corresponding Reasons

Elderly participants who 1) failed to obtain the sample package's opening method through the prompt design or 2) used an incorrect method to do so exemplified their ignorance in knowing how to open the packaging. Other reasons underpinning the barriers to understanding packaging opening methods apart from unfamiliar packaging, implicit and overly small package opening prompt settings (description text or icon), and poor cognition were novel study findings.

3.2.1. Barriers to Knowing How to Open Packages Caused by Packaging Design

Similar to what is seen in product information recognition disorder, when encountering unfamiliar packaging, the interviewee's first reaction was to express a complete lack of knowledge of how it was opened (Chavalkul, 2023). The participants derived the unfamiliar packaging and opening prompt settings from

different expressions for the same issue concerning soft drink bottles. A facilitative opening setting, commonly seen in toothpaste and medicine bottles, was placed on the top of the packaging sample's bottle cap for users to cut the film on the bottle mouth. Notwithstanding, this packaging type and prompt opening setting remained unfamiliar to the elderly, who had not perceived it in soft drink bottles. Following past works involving pharmacy technicians, even professionals could not immediately internalise the means to open new drug packages (Philbert, et al., 2014b), let alone elderly users (see **Table 4**).

The elderly participants could not obtain a suitable opening method given the absence of opening prompt settings in some packages. Even in cases where the packages included a package opening prompt, the interviewees could not recognise these overly small (Li, 2014) and negligible (Chen, 2014; Tang & Yuan, 2016) prompt settings description text or icon and low colour contrast between the opening prompt description text and the background. These reasons led the participants to deem these settings unusual and confusing (see **Table 4**).

3.2.2. Barriers to Knowing How to Open Packages Caused by Elderly Physical Characteristics

Low cognition (Carli Lorenzini & Olsson, 2015), poor observation, and lack of attention caused the elderly participants (n = 9) inability to understand the purpose of the package opening prompt settings and ignorance of package opening clues. The interviewees' inability to correctly open the package resulted from their lack of observation and focus when seeking the package opening clues. Not unlike the situation in product information identification barriers, participants F3 and M1 explain the reluctance of older people to consider opening unfamiliar packages due to the lack of ability to accept new things. Based on relevant research, visually impaired elderly adults struggled to see the opening prompt setting clues of the package (Li, 2014). Participants F2 and F3 concurred that deteriorating vision hindered the identification of packaging opening prompts. Three participants (F1, F3, and M1), who forgot the package opening methods, could not open the packaging (see **Table 5**).

Table 4. Barriers to knowing packaging opening methods caused by packaging design.

Reasons	F1	F2	F3	F4	F5	M1	M2	M3	M4	M5
1) Unfamiliar packaging	●	●		●	●			●		
2) Package opening prompt settings without introduction	●					●				●
3) Package opening prompt settings are not obvious		●		●			●			
4) Package opening prompt settings description text or icon is too small								●		●
5) Low color contrast between the opening prompt description text and the background										●
6) Unfamiliar packaging opening prompt setting									●	

3.2.3. Relationship of Two Cause Categories for Knowing How to Open Package Barriers

Unreasonable Package opening prompt settings mainly prevented the elderly participants from obtaining packaging opening methods, specifically when interacting with elderly physical attributes. Table 6 presents the relationship between the two cause categories for this package barrier. The interviewees could not comprehend the opening prompt intention without any introduction following the decline in cognition. When visual impairment with ageing interacts with packaging opening setting text, over-small icons, or low contrast with the background colour, older people have difficulty recognising them.

Poor vision, observation, and attention resulted in elderly consumers disregarding the opening prompts if the shape was not visible. Typically, these individuals were unaware of having neglected opening cues and assumed that the packaging design did not include this information until someone reminded them of the prompt setting. Older people unfamiliar with the open settings and types of packaging regarded them as novel. They only recalled seeing the packaging type and opening settings in other products upon being reminded by the researcher. This situation resulted from poor memory, understanding, and ability to embrace novel entities (see Table 6).

3.3. Barriers to Packaging Opening and Corresponding Reasons

The elderly participants' relative or outright inability to open the packaging denoted packaging opening barriers. The reasons from the cause category of packaging features paralleled previous works while also outlining several new findings.

Table 5. Barriers to knowing packaging opening methods caused by elderly characteristics.

Reasons	F1	F2	F3	F4	F5	M1	M2	M3	M4	M5
1) Low understanding abilities	●	●	●	●	●	●	●	●		●
2) Poor observation and attention	●	●	●	●	●	●	●		●	●
3) Low ability to accept new things			●			●				
4) Visual impairment		●	●							
5) Poor memory	●		●			●				

Table 6. Relationship of two cause categories for knowing how to open package barriers.

Caused by packaging features	Caused by characteristics of the elderly
Package opening prompt settings without introduction	Decline in understanding abilities
Package opening prompt settings description text or icon is too small	Visual impairment
Low colour contrast between opening prompt description text and background	
Package opening prompt settings are not obvious	Visual impairment; Poor observation and attention
Unfamiliar packaging and unfamiliar packaging opening prompt setting	Low ability to accept new things; Poor memory; Low understanding abilities

Meanwhile, detailed reasons following the elderly characteristics highlighted distributions among various data resources.

3.3.1. Packaging Opening Barriers Due to Packaging Design

Seven interviewees struggled to open packages when their package seals proved too tight. Similarly, past studies (Lorenzini & Olsson, 2015; Van Geffen et al., 2010) highlighted the difficulties arising from prioritising the packaging's protective function (tight sealing), which deterred elderly users from opening the package. The multitude of packaging functions resulted in contradictions that confused elderly users. A dominant protective function limits the opening requirements in the facilitating handling function. In addition, the oversized package requires more grips when opening. As big packages require a stronger grip, nine of the interviewees encountered challenges in opening a jar, which was too large to hold while opening it. Such package sizes instigated opening barriers for elderly adults (Van Geffen et al., 2010) (see **Table 7**).

From the perspective of six elderly participants, it was deemed impossible to open certain package samples. The opening requirement necessitated strength. Four past works underscored the complexities experienced by elderly individuals when the package's opening requirements proved intricate. Nevertheless, the packaging requirements presented in past works were biased towards the opening actions (coordination and dexterity) of elderly hand function (Chavalkul et al., 2011; Ward et al. 2010) rather than hand strength. Summarily, Packaging opening barriers inevitably occur when the associated prerequisites require users' hand functions beyond their mobility (see **Table 7**).

Package material and shape could also deter elderly users from opening a package. Seven of the interviewees struggled to fix and open glass bottles with

Table 7. Packaging opening barriers caused by packaging design.

Reasons	F1	F2	F3	F4	F5	M1	M2	M3	M4	M5
1) The package opening position setting is not obvious			●	●			●		●	●
2) Need some strength to open	●		●	●	●		●	●		
3) Large package size	●	●	●	●	●	●	●	●	●	
4) Slippery package surface material			●	●	●	●	●		●	●
5) Tight package seal	●			●	●		●	●	●	●
6) The package shape makes it difficult to grasp							●			
7) Small opening area	●		●	●		●	●	●	●	●
8) Soft package material		●				●				
9) Hard or fragile material for package opening prompt position			●		●	●				●
10) Thin opening area						●	●			
11) Fussy opening steps				●	●	●	●	●		

metal caps owing to their slippery surface. Another packaging material, which was too soft, hindered participants (F2 and M1) from opening the package following their failure to exert the required strength. Excessive force caused the liquid within to overflow when opening the packaging, while insufficient force failed to unpack the item. Specifically, a round-shaped package rendered it inconvenient for participant (M2) to forcefully grasp and open the packaging sample. Consequently, the participants found it challenging to open smooth and round glass jars (see **Table 7**).

The numerous packaging opening settings significantly affected the elderly's ability to open a package. Packaging with intricate steps is more cumbersome for the elderly than those with fewer opening steps (Cheng, 2021). Five of the participants conceded to this point. The first step of the opening procedure entails identifying the opening position. Notwithstanding, the aforementioned individuals could not identify the opening position following low visibility (Chen, 2014; Tang & Yuan, 2016). The overly small opening area hampered elderly people from enacting the opening operation (Stone et al., 2019). It is easy for older participants to damage the opening location but still leave the packaging unopened when the opening areas are thin or covered with hard and fragile materials. The interviewees attributed this failure to the unreasonable package opening settings (see **Table 7**).

3.3.2. Barriers to Package Opening Due to Elderly Characteristics

Notably, a lot of articles revealed poor hand strength as the factor inducing the elderly's failure to open packages "(French Packaging Council, 2016; Li, 2015; Li, 2014; Sudbury-Riley, 2014; Butlewski, 2015; Notenboom et al., 2014; Philbert et al., 2014a; Rowson et al., 2014; Ma & Dong, 2016). Contrarily, only participants F1, F2, and F5 attributed this decline as the reason underlying the interviewees' package opening barriers (see **Table 8**).

In line with past researches, poor finger flexibility affected elderly people's package opening ability (Canty et al., 2013; Liu et al., 2021; Philbert et al., 2014a; Rowson et al., 2014). Only participant F4 conceded to this statement. Meanwhile, several empirical works disclosed that age-related physiological dysfunction

Table 8. Packaging opening barriers caused by elderly characteristics.

Reasons	F1	F2	F3	F4	F5	M1	M2	M3	M4	M5
1) The decline in hand strength	●	●			●					
2) The decline in hand coordination ability					●					
3) The decline in finger flexibility				●						
4) Aging		●								
5) Poor observation and attention	●							●	●	●
6) Visual impairment			●							
7) Chronic disease	●									

prevented older people from opening packages (French Packaging Council, 2016; Philbert et al., et al., 2014a; Qi et al., 2021; Rowson et al., 2014; Ma & Dong, 2016). Only participant F2 shared that ageing contributed to package opening barriers (see **Table 8**).

Past publications revealed that chronic illnesses exacerbated elderly individuals' physiological deterioration and package-opening challenges (Li, 2014; Notenboom et al., 2014; Philbert et al., 2014a; Qi et al., 2021; Rowson et al., 2014). Chronic illnesses adversely affect physiological functions involving hand strength, finger flexibility, and visual clarity when opening packages. Only participant F1 concurred with the aforementioned viewpoint (see **Table 8**).

Impaired vision and poor hand coordination ability were the two remaining physiological degradation characteristics. Only participants F3 and F5 emphasised the attributes. The elderly resorted to using scissors or knives when the package opening structure was not visible, thus damaging the structure and rendering it impossible to close the package again. In line with the already published articles, poor eyesight hindered the elderly from opening packages (Philbert et al., 2014a). Their uncoordinated hands could pose challenges when opening packages. Packaging that requires the elderly to do different movements with both hands at the same time proves challenging (Rahman et al., 2002) (see **Table 8**).

As opposed to the aforementioned reasons derived from elderly attributes, participants F1, M3, M4, and M5 observed that lack of observation and attention deterred them from opening packaging. No past research revealed this finding (see **Table 8**).

Notably, the variances between the interview outcomes and those derived from relevant works denoted the Hawthorne effect, in which participants improve their performance following their consciousness of being involved in the research process (Sedgwick, 2011). This effect was evident in the performance of participants who strived to open the sample packages. This finding was also attributed to the research sample requirement, which involved people between 60 and 70 years old without chronic ailments that seriously impact their ability to perform daily tasks. All 10 interviewees' health status was good, which coincided with fewer reasons from elderly consumers' views on physical degradation.

3.3.3. Relationship of Two Cause Categories for Package Opening Barriers

Elderly individuals encountered packaging opening obstacles when physiological characteristics deterred them from meeting the requirements for opening specific packaging features. Based on the interview data, other reasons from the package features (excluding invisible package opening position) were associated with the participants' hand functions. **Table 9** depicts the relationship of elderly packaging opening barriers from two cause categories.

Age, chronic illness, and physiological degeneration could be interconnected. Hand strength and coordination, finger dexterity, and vision gradually occur

Table 9. Relationship of two cause categories for package opening barriers.

Caused by Packaging features		Caused by characteristics of the elderly
Package basic protection functions	Need some strength to open; Tight packaging seal	Decline in hand functions (strength, coordination & flexibility); Ageing; Chronic diseases
Package size	Large package size	
Package materials	Soft packaging material; Slippery package material; Hard or fragile material for package opening prompt position	
Package shape	Package shape is difficult to grasp	
Package opening settings	Fussy opening steps; Small and thin opening area	Decline in hand functions (strength, coordination & flexibility); Visual impairment; Poor observation and attention; Ageing; Chronic diseases
	Packaging opening position is not obvious	Visual impairment; Poor observation and attention; Ageing; Chronic diseases

with ageing. As chronic ailments deteriorate these physiological functions with age, this research associated critical illnesses and age with degrading physical activities.

Packages that require a certain amount of force to open and are well sealed can be inconvenient for older individuals, which highlights a contradiction between the core package functions of protection and facilitating handling. Prioritising the packaging's protective function necessitates elderly consumers to possess adequate hand dexterity to fulfil the physiological requirements to open the packaging (see Table 9).

Likewise, deteriorating hand functions rendered the elderly helpless when the package size was too big, the packaging material too soft and slippery, the (round) packaging shape too difficult to grip, and the package opening settings used hard or fragile materials. These features, which need a pair of hands' strength, coordination, and dexterity, require the elderly to hold the packaging with one hand while opening it with another (see Table 9).

Declining hand function, impaired vision, poor observation, and lack of concentration contribute to older adults' inability to perform the delicate task of unpacking. They failed to completely enact opening actions and processes with intricate opening steps. Due to reduced hand function and eyesight, these individuals selected the most direct but dangerous way to open the packages. The use of such hazardous tools (scissors and knives) could also jeopardise elderly users' safety, but also destroy the packaging so that it can no longer protect the product. Regarding the overly small opening position, visual impairment, poor observation, and short attention span deterred the elderly from identifying the opening position in step one. Furthermore, the individuals' deteriorating hand functions rendered it challenging to open packages, even if they found small opening areas. This decline has also made some delicate manual handling impossible, but an operational packaging opening with a thin area happens to be

such. Due to poor vision, observation and attention, older people may overlook or have difficulty recognising opening positions. If the shape and position of the opening setting were not palpable, the elderly experienced package opening barriers (see Table 9).

4. Conclusion and Recommendations

This research empirically explored elderly packaging barriers with corresponding reasons. Based on the interview data, elderly individuals commonly encountered barriers to 1) identifying product information, 2) understanding packaging opening methods, and 3) packaging opening. Conclusively, packaging barriers are daily occurrences in their everyday life.

The extent to which a user encounters a packaging barrier depends on the state of interaction between the user and packaging, whether the user can sufficiently act to meet the packaging interaction requirements in each stage, and whether the packaging design and setting enable them to engage in effective interactions. The elderly characteristics and packaging designs (two cause categories) were the reasons underpinning elderly people's susceptibility to packaging barriers. Overall, ageing-induced deterioration of physiological functions hindered them from fulfilling the packaging use requirements. At the same time, the packaging design industry has not seriously considered the elderly's needs in terms of packaging use.

Based on the essential findings and conclusions of the research, addressing the packaging needs of the rapidly expanding elderly demographic emerges as a critical imperative for the packaging industry. The packaging design should consider age-related physical and cognitive declines to ensure that older adults are not challenged by their diminished physiological capacities. This recommendation is not only benevolent in its intentions but also significant in practical terms, as it enhances the accessibility of the packaging design. In doing so, it effectively meets the specific needs of an ageing user population, thereby demonstrating the application of inclusive design principles.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

Butlewski, M. (2015). Unit Package Opening Design for the Elderly by Applying the Principles of Universal Design. *Applied Mechanics and Materials, 809-810,* 1263-1268. https://doi.org/10.4028/www.scientific.net/AMM.809-810.1263

Canty, L. A., Lewis, R., & Yoxall, A. (2013). Investigating Openability of Rigid Plastic Containers with Peelable Lids: The Link between Human Strength and Grip and Opening Forces. *Journal of Mechanical Engineering Science, 227,* 1056-1068. https://doi.org/10.1177/0954406212457729

Carli Lorenzini, G., & Olsson, A. (2015). Design towards Better Life Experience : Closing

the Gap between Pharmaceutical Packaging Design and Elderly People. In *Proceedings of the 20th International Conference on Engineering Design (ICED 15)*. The Design Society.

Carse, B., Thomson, A., & Stansfield, B. W. (2007). Packaging and the Older Adult. In *Proceedings of the Include 2007: Designing with People, 4th International Conference on Inclusive.*

Chavalkul, Y. (2023). Packaging Design Tool: The Effectiveness of Opening. *Humanities, Arts and Social Sciences Studies, 23,* 445-464.

Chavalkul, Y., Saxon, A., & Jerrard, R. N. (2011). Combining 2D and 3D Design for Novel Packaging for Older People. *International Journal of Design*, *5*, 43-58.

Chen, Y. Q. (2014). Analysis of Food Packaging Design for the Elderly. *Packaging Journal, 6,* 50-60.

Cheng, J. Q. (2021). Research on Pharmaceutical Packaging Design Based on Cognitive Psychology of the Elderly. *Green Packaging, No. 11,* 93-97.

French Packaging Council (2016). *Packaging for All Ages*.

He, T. (2018). Extended Research on Normal Packaging Design for Aging Social Environment. *Packaging Engineering, 39,* 35-39.

Hellström, D., Olsson, A., & Nilsson, F. (2017). *Managing Packaging Design for Sustainable Development*. John Wiley & Sons, Ltd. https://doi.org/10.1002/9781119151036

Li, F. (2015). Design Exploration of Packaging Opening Methods for Aged Products. *Industry and Technology Forum, 14,* 43-44.

Li, H. R. (2014). Design and Analysis of Product Packaging Opening Methods for the Elderly. *Popular Literature, 20,* 113.

Li, H., & Wang, L. (2022). Barrier-Free Design of Drug Packaging Based on Visual Communication. In *Proceedings of the 2022 International Conference on Social Science, Education and Management (ICSSEM 2022)* (pp. 288-292). Clausius Scientific Press.

Liu, L. (2016). Analysis on the Open Mode of Barrier Free Packaging Design. In *Proceedings of the 5th International Conference on Social Science, Education and Humanities Research (SSEHR 2006)* (pp. 1429-1434). Atlantis Press. https://doi.org/10.2991/ssehr-16.2016.305

Liu, W. L., Li, M., & Ma, S. L. (2021). The Principles and Methods of Interactive Packaging Design for Elderly Drugs. *Packaging Engineering, 42,* 225-230.

Lorenzini, G., & Hellström, D. (2015). *Pharmaceutical Packaging Design for Elderly People: Design Research as a Link for Innovation towards Better Life Experience*. Lund University.

Ma, X. Z., & Dong, H. (2016). 'Difficult' Packaging for Older Chinese Adult. In P. Lloyd, & E. Bohemia (Eds.), *Future Focused Thinking—DRS International Conference 2016*. https://doi.org/10.21606/drs.2016.206

Ministry of Civil Affairs of the People's Republic of China (2019). *Law of the People's Republic of China on the Protection of the Rights and Interests of the Elderly*. https://www.mca.gov.cn/n152/n165/c37177/content.html

Notenboom, K., Beers, E., Van Riet-Nales, D. A., Egberts, T. C. G., Leufkens, H. G. M., Jansen, P. A. F., & Bouvy, M. L. (2014). Practical Problems with Medication Use that Older People Experience: A Qualitative Study. *Journal of the American Geriatrics Society, 62,* 2339-2344. https://doi.org/10.1111/jgs.13126

Philbert, D., Notenboom, K., Bouvy, M. L., & Van Geffen, E. C. G. (2014a). Problems Experienced by Older People When Opening Medicine Packaging. *International Journal of Pharmacy Practice, 22,* 200-204. https://doi.org/10.1111/ijpp.12070

Philbert, D., Notenboom, K., Koster, E. S., Fietjé, E. H., Van Geffen, E. C. G., & Bouvy, M. L. (2014). Pharmacy Technicians' Attention to Problems with Opening Medicine Packaging. *Journal of Pharmacy Technology, 30,* 3-7. https://doi.org/10.1177/8755122513512111

Qi, W. Q., Li, S., & Wei, Y. T. (2021). On the Humanistic Care of Packaging Design of Online Products in the Aging Society. *Packaging Engineering, 42,* 256-262.

Rahman, N., Thomas, J. J., & Rice, M. S. (2002). The Relationship between Hand Strength and the Forces Used to Access Containers by Elderly Women with Arthritis. *American Journal of Occupational Therapy, 56,* 78-85. https://doi.org/10.5014/ajot.56.1.78

Rowson, J., Sangrar, A., Rodriguez-Falcon, E., Bell, A. F., Walton, K. A., Yoxall, A., & Kamat, S. R. (2014). Rating Accessibility of Packaging: A Medical Packaging Example. *Packaging Technology and Science, 27,* 577-589. https://doi.org/10.1002/pts.2049

Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., Burroughs, H., & Jinks, C. (2018). Saturation in Qualitative Research: Exploring Its Conceptualization and Operationalization. *Quality and Quantity*, *52*, 1893-1907. https://doi.org/10.1007/s11135-017-0574-8

Sedgwick, P. (2011). The Hawthorne Effect. *BMJ Clinical Research*, *344*, d8262. https://doi.org/10.1136/bmj.d8262

Shen, X., & Yan, W. (2021). Research on the Barrier-Free Package Design Based on the Oriented Needs of the Elderly. In *Proceedings of the 7th International Conference on Arts, Design and Contemporary Education (ICADCE 2021)* (pp. 376-380). Atlantis Press. https://doi.org/10.2991/assehr.k.210813.064

Stone, R., Sobczak, Z., Fales, C., Mumani, A., Abdelall, E., & Schnieders, T. (2019). An Ergonomic Evaluation of Pop-Top Can Opener Design. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 63,* 1339-1343. https://doi.org/10.1177/1071181319631145

Stuckey, H. L. (2014). The First Step in Data Analysis: Transcribing and Managing Qualitative Research Data. *Journal of Social Health and Diabetes, 2,* 6-8. https://doi.org/10.4103/2321-0656.120254

Sudbury-Riley, L. (2014). Unwrapping Senior Consumers' Packaging Experiences. *Marketing Intelligence & Planning, 32,* 666-686. https://doi.org/10.1108/MIP-02-2013-0027

Tang, F. X., & Yuan, Q. (2016). Analysis of the Packaging Opening Method of Elderly Health Care Products Based on Humanization. *Intelligence, No. 10,* 234-236.

United Nations (2023). *Leaving No One behind in an Aging World*. United Nations Publication.

Van Geffen, E. C. G., Meuwese, E., Philbert, D., & Bouvy, M. L. (2010). Problems with Medicine Packages: Experiences Reported to a Dutch Medicine Reporting System. *Annals of Pharmacotherapy, 44,* 1104-1109. https://doi.org/10.1345/aph.1P052

Wang, L. J. (2015). Humanized and Rational Design Principles of Drug Packaging for the Elderly. *Printing Technology, 8,* 16-18.

Wang, Y. D. (2021). Research on the Visual Design of Drug Packaging for the Elderly. *Art Design, 2,* 51-53.

Ward, J., Buckle, P., & Clarkson, P. J. (2010). Designing Packaging to Support the Safe Use of Medicines at Home. *Applied Ergonomics, 41,* 682-694. https://doi.org/10.1016/j.apergo.2009.12.005

Wu, X. L., Xu, Y. Q., Mao, Y., & Cui, H. C. (2019). Humanized Packaging Design Method of Geriatric Medicine Against Behavioral Disorders. *Hunan Packaging, 34,* 36-38.

Yao, S.-R. (2021). Study on the Design Method of Color Pattern in Food Package for the

Aged. *Green Packaging, 7,* 75-77.

Zavlanou, C., & Lanitis, A. (2019). Product Packaging Evaluation through the Eyes of Elderly People: Personas vs. Aging Suit vs. Virtual Reality Aging Simulation. In T. Ahram, W. Karwowski, & R. Taiar (Eds.), *Human Systems Engineering and Design. IHSED 2018. Advances in Intelligent Systems and Computing* (Vol. 876, pp. 567-572). Springer International Publishing. https://doi.org/10.1007/978-3-030-02053-8_86

Zhao, L. H. (2016). Improved Design of Medicine Bottle for the Elderly. *Since and Technology Innovation Herald, 17,* 32-33.