

Type of the Paper (Article)

# A Study on the Synesthetic Translation Design of Elderly Rehabilitation Products from the Perspective of Lingnan Regional Culture

Hongling Jiang<sup>1</sup>, Hong Li<sup>2</sup> and Sheng Huang<sup>3</sup>

<sup>1</sup>Guangzhou Huashang College, Guangdong, China, jianghl@gdhsc.edu.cn

<sup>2</sup>Guangzhou Huashang College, Guangdong, China, lihong576@gdhsc.edu.cn

<sup>3</sup>University of Science Malaysia, Penang, Malaysia, x7h093@gmail.com

\* Correspondence: Hong Li, lihong576@gdhsc.edu.cn

Received: 14 February 2026 / Accepted: 10 April 2026 / Published: 10 April 2026

**Abstract:** Against the backdrop of an increasingly global trend of population aging, the design of geriatric rehabilitation products is gradually shifting from purely functional considerations toward incorporating cultural connotations and sensory experiences. As a significant regional cultural resource in southern China, Lingnan culture embodies a rich system of visual, tactile, and auditory symbols, offering immense value for design and development. This paper first employs a literature review method to examine relevant literature on the characteristics of Lingnan regional culture, the theory of synesthetic translation, and the current state of geriatric rehabilitation product design, thereby establishing an interdisciplinary theoretical foundation. Second, it classifies and extracts morphological symbols, material properties, and color systems within Lingnan culture, summarizing their characteristics to identify core cultural elements suitable for synesthetic translation. Building on this foundation, design practice applies the multisensory features of Lingnan culture to the three design dimensions of form, materials, and color in elderly rehabilitation products, providing new theoretical references for culture-driven rehabilitation product design.

**Keywords:** Synesthesia; Rehabilitation products; Translation

## 1. Introduction

Against the dual backdrop of global population aging and the "Healthy China" national strategy, public health has been elevated to an unprecedented strategic level (Rudnicka et al., 2020). From the "Healthy China 2030" planning outline in the report of the 19th National Congress to the report of the 20th National Congress, both explicitly state that safeguarding people's health must be placed at the forefront of strategic development. This macro-level orientation not only calls for model innovation in the healthcare industry but also prompts a redefinition of the core value of health-related consumer products. The essence of these products must expand from merely fulfilling basic physiological functions to higher dimensions that embody emotional comfort, cultural identity, and the dignity of life.

China's healthcare sector is divided into four major domains: health maintenance, prevention, clinical care, and rehabilitation. Among these, rehabilitation is a vital component of the entire healthcare system (Sun et al., 2022). It is not only a critical step in restoring physical functions but also an essential process for rebuilding patients' confidence in life and enhancing their quality of life. At the same time, the integrated development of "Grand Culture" and "Grand Health" has gradually become a focal point of societal attention. The joint development of the "Grand Culture + Grand Health" integration aligns with the demands of modern transformation and the

---

trends of economic integration and globalization. This initiative concerns not only the innovation of healthcare service models but also the inheritance and reinvention of cultural values. Against this backdrop, cultural rehabilitation products have emerged as a key vehicle connecting cultural elements with health needs.

As a highly representative regional cultural system in South China, Lingnan culture has been influenced by Western culture in addition to its traditional aspects of religion, cuisine, calligraphy and painting, theater and music, architecture, and landscaping. This includes coastal foreign trade culture, Western religious architectural culture, and overseas Chinese culture, among others, providing a rich cultural foundation for the design of cultural rehabilitation products (Lao, Dao-ruang, & Daoduan, 2024). Integrating Lingnan cultural elements into the design of elderly rehabilitation products not only strengthens elderly users' sense of belonging and identity but also facilitates the modern transformation of cultural heritage, promoting the innovative dissemination of Lingnan culture in the context of the new era.

Based on the theory of synesthetic translation, multidimensional elements of Lingnan culture—such as visual symbols, material textures, auditory rhythms, and olfactory memories—can be transformed into multisensory interactive systems for rehabilitation products, achieving a cross-sensory mapping from cultural imagery to product experience. This not only enhances the cultural distinctiveness and aesthetic value of rehabilitation products but also effectively promotes the rehabilitation process and psychological well-being of elderly users through multisensory stimulation and emotional evocation, providing new design concepts and theoretical support for the integrated development of culture and the health industry.

## 2 Theoretical and Literature Review

### 2.1 Cultural Characteristics of the Lingnan Region

The Lingnan region encompasses Guangdong, Guangxi, Hainan, and the Hong Kong and Macao Special Administrative Regions in southern China, with the Pearl River Delta at its core. It is a vital area of ethnic integration in China. Over thousands of years of historical development, Lingnan culture has been influenced by Han culture from the Central Plains, surrounding ethnic minority cultures, and overseas cultures such as those of Southeast Asia, resulting in a distinct character of diversity, openness, and inclusivity.

First, Lingnan culture is inclusive and characterized by diverse coexistence. Historically, as immigrants from the Central Plains migrated southward, Lingnan gradually became fertile ground for the integration of multiple ethnic groups, including the Han, Zhuang, Yao, and Li. The region features linguistic diversity, encompassing Cantonese, Hakka, and Zhuang languages. Cuisine, clothing, and architecture also possess distinct characteristics. The culinary culture emphasizes lightness, freshness, crispness, and tenderness, highlighting the natural flavors of ingredients and health-conscious principles. Architectural styles feature forms such as arcades and "wok-ear" houses, which prioritize ventilation and moisture resistance, adapting to the subtropical climate characterized by heavy rainfall and high humidity (Li, Wu, & Zhang, 2022). This culturally diverse yet unified landscape reflects both the history of ethnic integration and the unique creativity and adaptability of Lingnan culture.

Secondly, Lingnan culture values practicality, champions innovation, and embraces openness. Due to its proximity to the sea and active foreign exchanges, Lingnan has long been an open economic hub. A pragmatic and pioneering spirit of innovation is deeply ingrained in the daily lives and productive activities of the Lingnan people. Whether it be the overseas trade and overseas Chinese culture of the Ming and Qing dynasties or the modern era of reform and opening-up, Lingnan society has consistently demonstrated a strong capacity for embracing new ideas and a vibrant innovative spirit. In the realm of handicrafts, Guangzhou-style furniture, colored porcelain, and brocades are renowned worldwide, while in the arts, the Lingnan School of Painting and Cantonese Opera stand out as distinctive traditions.

Finally, Lingnan culture emphasizes family ties, clan identity, and community belonging, valuing harmony and social interaction. Ancestral hall culture, clan activities, dragon boat races, temple fairs, and festivals reflect a strong sense of family cohesion and collective cooperation. These

---

---

social bonds reinforce regional stability and mutual aid, providing an important vehicle for the cultural belonging and spiritual comfort of the elderly.

## 2.2 Theory of Synesthetic Translation

Synesthesia is a multisensory phenomenon. It refers to the ability of an individual, when exposed to a stimulus from one sense, to simultaneously evoke perceptions in another or multiple senses, thereby forming multidimensional connections and imaginative associations. For example, the auditory stimulus of a musical melody can trigger the visual perception of changing colors.

The generation of synesthesia is related to synesthetic perception and primary perception. Synesthetic perception refers to the target imagery that designers hope users will perceive through association and empathy after receiving primary perceptual stimuli. It typically carries positive, pleasant emotional characteristics and embodies deep cultural connotations in cultural context-based products. Primary perception, on the other hand, refers to the design language through which a product can be directly perceived, including multisensory representations such as visual, auditory, and tactile elements. It serves both as a carrier of a product's meaning and emotion and as a medium for evoking synesthesia (Ricco, 2017). The higher the precision with which the primary perception concretely or abstractly expresses the synesthetic perception, the stronger the user's associations and emotional resonance (Kwon & Iedema, 2022). The points of connection between the two are key to triggering synesthesia; they exist in the overlapping areas between primary perception and synesthesia, forming a cross-section where multiple senses converge. Therefore, identifying these points of connection can significantly enhance the success rate of synesthetic translation and the product's cultural impact.

Synesthesia translation can be categorized into three primary forms, distinguished by the different manifestations of the source sensation and the target sensation. Among these, sensory transference is the most fundamental form of interaction between the source and target sensations, achieving the migration and transformation between senses through the user's associations; multisensory layering integrates multiple sensory experiences on the basis of sensory transference, creating richly layered perceptions; and imagery interconnection represents the highest level of synesthetic translation, incorporating human inner emotions on the foundation of sensory transference or multisensory layering. When a person perceives an "image" through sight or touch, association triggers an inner "meaning," achieving a dual resonance between the senses and emotions.

## 2.3 Current Status and Needs in the Design of Elderly Rehabilitation Products

With changes in the demographic structure of society, the elderly population is growing, and the demand for rehabilitation products continues to rise. Currently, elderly rehabilitation products primarily include mobility aids, cognitive training tools, sensory stimulation devices, and rehabilitation robots, all aimed at improving the quality of life and self-care abilities of the elderly (Bu et al., 2021). However, the overall design of current elderly rehabilitation products still has many shortcomings, which limit their practical effectiveness and user satisfaction.

At present, most rehabilitation products feature complex interface designs and cumbersome operating procedures, neglecting the elderly's need for simplicity and ease of use. Products exhibit significant homogeneity in appearance and functionality, lacking innovative designs that account for individual differences and regional cultures, making it difficult to meet the diverse needs of all users. A more prominent issue is that existing products generally lack cultural sensitivity and fail to effectively incorporate cultural elements and life scenarios familiar to older adults. This prevents products from fostering deep emotional connection and reliance, making it difficult for them to gain widespread acceptance and sustained use.

In terms of user needs, the elderly have higher expectations for rehabilitation products. First, designs must fully account for the characteristics of physical decline in older adults, such as deteriorating vision, hearing loss, and mobility issues, emphasizing user-friendly and accessible design. Second, products should incorporate smart features and interactivity, utilizing big data and artificial intelligence to dynamically adjust rehabilitation plans and improve rehabilitation efficiency (Kwon & Iedema, 2022). More importantly, designs should incorporate regional cultural elements,

---

---

respecting older adults' sense of cultural belonging and lifestyle habits. Cultural characteristics should be reflected comprehensively—visually, auditorily, and experientially—to strengthen the product's emotional connection and provide psychological comfort.

### **3 Synesthetic Translation Design Strategies for Elderly Rehabilitation Products**

#### *3.1 Synesthetic Translation of Form Symbols*

The form design of geriatric rehabilitation products serves not only as the external manifestation of functional composition but also as a carrier of cultural imagery and a medium for emotional transmission. In the context of Lingnan culture, the synesthetic translation of form symbols acts as a bridge connecting users' physical rehabilitation with spiritual comfort. Form symbols include a product's lines, contours, structure, proportions, colors, and textures. When these culturally significant morphological features are translated into rehabilitation products, they can trigger multisensory synesthetic experiences for elderly users on both visual and tactile levels, thereby enhancing psychological comfort and cultural identity (Gaspar et al., 2018).

First, the synesthetic translation of formal symbols must be grounded in the functional rationality of the product, integrating ergonomics with the physical characteristics of the elderly population to adopt forms that better evoke a sense of affinity and security (Balla, 2012). For example, the curved corridors, undulating roof ridges, and rounded roof tiles found in Lingnan architecture can be transformed into the handles of rehabilitation equipment, as well as the contours and support structures of seating. Visually, these elements create an image of fluidity and inclusiveness, while tactilely, they provide a comfortable grip and a sense of stable support. These symbols not only carry cultural memories but also evoke associations with users' hometowns and families, enhancing their sense of belonging to the space.

Second, formal symbols are closely linked to sensory pleasure. Aesthetic pleasure is often triggered by the connection between elegant, meaningful formal symbols and users' sensory memories. Elements from Lingnan gardens—such as water-patterned lattice windows, stone carvings, and natural plant forms—can be transformed into surface textures or decorations on products, evoking elderly users' longing for nature and a beautiful life. Designers can incorporate the Lingnan color palette—such as turquoise, vermilion, and beige—into product materials and finishes, enabling users to experience a multidimensional synaesthetic sensation through the interplay of sight, touch, and even smell. This pleasure first stems from sensory satisfaction, then triggers emotional resonance and memories, effectively alleviating loneliness and anxiety during the rehabilitation process (Krampen, 1989).

Furthermore, the synesthetic translation of formal symbols should prioritize their figurative and symbolic meanings. Auspicious motifs in Lingnan culture—such as blessings, longevity, and harmony—are commonly found on window lattices, furniture, and decorative objects. By skillfully integrating these symbols of good fortune and peace into product structures or decorations, products can be imbued with positive connotations and cultural care. For example, abstractly applying symbols such as bats, cranes, plum blossoms, or Lingnan banyan trees to the support components or surface textures of rehabilitation furniture allows elderly users to feel the blessings and comfort of local culture during daily use.

Furthermore, abstract cultural symbols can be transformed into concrete product experiences through anthropomorphic and narrative-driven design. For instance, translating Lingnan folk activities, traditional artifacts, and details of daily life into specific design elements of rehabilitation products can trigger unique memories or associations in elderly users during use, achieving a synaesthetic translation effect that evokes either real-life or nostalgic sensations (Figure 1, Figure2).

---

Symbol Categories	Typical Elements	Visual/Morphological Characteristics	Cultural Symbolism and Emotional Associations	Design Translation Direction
Architectural Components	Wok-Ear Gables	Curved gables resembling the handles of an iron wok, symmetrical, stable, and flowing.	Symbolising an official's hat, it signifies prosperity, good fortune, and family flourishing.	Abstract Geometrisation: Geometrising elements into chair backs/headboards/armrest contours for ergonomic fit, enhancing envelopment and security. Structural ornamentation: Serving as both structural support and decorative elements, reinforcing stability and trustworthiness.
	Manchu Window	Square or circular window panes crafted from stained glass, resplendent with vibrant hues and dazzling interplay of light and shadow.	A fusion of Eastern and Western wisdom, embodying aspirations for a better life; the shifting light and shadow evoke a tranquil sense of time's passage.	Colour and Light: Employing a Lingnan-inspired colour palette, paired with interactive light panels to modulate visual perception and mood. Modularity: Design puzzle-style cognitive training modules to develop hand-eye coordination and colour recognition.
	Arcade Columns	Continuous colonnades form grey spaces, with columns featuring clean, powerful lines and vertical alignment.	A community ethos of openness, inclusivity, and mutual support; practical shelter from wind and rain.	Structural Functionality: Adapted into vertical supports such as walking frames/handrails, providing continuous, reliable bearing and grip. Spatial Imagery (Product Application): Employing the rhythmic cadence of the colonnade for product arrangement or modular layouts, guiding movement pathways and usage sequences.
Nature and Garden	Lingnan water patterns	The ripples of ponds and waterways: fluid, dynamic, and endlessly flowing.	The highest virtue is like water, ever-flowing and unceasing; tranquil, dynamic, and full of vitality.	Surface Texture: Apply anti-slip/tactile textures to handles, treads and panels, balancing tactile feedback with visual identification. Form: Employing streamlined, rounded vocabulary to render the product's form gentle and non-aggressive.
	Banana Leaf Form	Broad, expansive, fan-shaped with distinct veins.	Verdant and cool; symbolising an expansive, open-minded disposition.	Bionic Form: Bionic design for protective or supporting components (cushions, trays, etc.), offering comfortable shelter and a natural feel. Textures: Applied as anti-slip or massage textures on hand and foot contact surfaces to support rehabilitation stimulation.

Figure 1. Synesthetic Translation Chart of Form Symbols for Elderly Rehabilitation Products 1.

Symbol Categories	Typical Elements	Visual/Morphological Characteristics	Cultural Symbolism and Emotional Associations	Design Translation Direction
Craftsmanship and Objects	Rattan Weaving Craftsmanship	Woven warp and weft create a permeable, lightweight, and resilient mesh texture.	The warmth and ingenuity of handcraft; breathable, cool, and close to nature.	Materials and Craftsmanship: Utilising breathable, flexible and sterilisable materials for backrests and storage elements to enhance comfort and maintainability. Textural Symbolism: Traditional textures like rattan weave are embossed or woven into contemporary materials, creating cultural identifiers.
	Shiwan Figurines	Clay figurines, vividly lifelike in form, with rich, rustic glazes.	Capturing the charm of everyday life, an optimistic and open-minded attitude towards existence; embodying a simple, rustic sentiment.	Emotional Form: Incorporating approachable facial expressions into alarms/alert devices to mitigate mechanical coldness. Colour Application: Incorporating ceramic glaze hues (e.g., Jun red, emerald green) as accents to enhance cultural resonance and emotional connection.
Folklore and Daily Life	Lion Dance	Vibrant colours (red, yellow, black), formidable yet endearing forms featuring forehead mirrors, horns, and colourful ribbons.	Warding off evil spirits and misfortune, bringing auspiciousness and good fortune; embodying liveliness, celebration, and community cohesion.	Colour and Patterns: Employ high-contrast, festive colour blocks to mark warnings or functional buttons, enhancing recognisability and engagement. Symbolic ornamentation: Simplify lion heads, ribbons, and other elements into iconic symbols for branding/functional labelling while infusing auspicious connotations.
	Teahouse Dim Sum	Shrimp dumplings, dry-steamed siu mai, etc., exquisitely shaped with thin wrappers and generous fillings, presented in a steamer basket.	Slow living, human warmth, the joy of sharing; taste memories and happiness.	Modularity and assembly: Design stackable training components for easy storage and flexible configuration. Rounded forms: Employing dimsum-inspired rounded corners to enhance safety and approachability.

Figure 2. Synesthetic Translation Chart of Form Symbols for Elderly Rehabilitation Products 2.

In summary, the synesthetic translation of form symbols not only leverages the unique advantages of Lingnan regional culture in elderly rehabilitation products but also expresses the humanistic care of the design, providing users with a multi-layered rehabilitation experience and contributing to the cultural significance and functional upgrades of elderly rehabilitation products under the Healthy China strategy.

### 3.2 Synesthetic Translation of Material Emotion

Materials serve as crucial vehicles for the sensory experience and emotional expression of rehabilitation products. Rooted in Lingnan culture, the selection and application of materials not only embody the region's natural and cultural essence but also resonate with the unique aesthetic needs and psychological identity of the elderly population. Traditional Lingnan architecture and artifacts extensively utilize local natural materials such as bamboo, wood, rattan, and pottery. These materials are natural, warm, and easy to process, embodying a regional philosophy of ecological harmony and a return to simplicity. If rehabilitation products appropriately incorporate materials such as bamboo weaving, wood, and rattan, they can stimulate users through multiple sensory experiences—including texture, color, and temperature—to evoke nostalgia for and a sense of closeness to the natural environment, thereby enhancing feelings of belonging and reassurance.

In the process of synesthetic translation, attention should be paid to the visual, tactile, and olfactory aspects of materials. For example, the fresh scent and delicate texture of bamboo can evoke the natural ambiance of Lingnan gardens, creating soothing and healing associations for the elderly during daily use. Wood, with its warm tactile feel and rich color, creates a cozy, home-like atmosphere and is suitable for parts that come into direct contact with the skin, such as rehabilitation chairs and armrests. Rattan, with its open structure and handcrafted aesthetic, reinforces a sense of cultural belonging through traditional craftsmanship, giving the product a gentle, refined texture.

Furthermore, the ecological attributes of these materials align with modern sustainability principles, reducing industrial and impersonal aesthetics while enhancing the environmental and human-centered qualities of rehabilitation products. It is important to emphasize that the selection of materials must integrate medical product standards such as accessibility, durability, and ease of cleaning to achieve a balance between emotional appeal and functionality (Figure 3).

Material Types	Lingnan Cultural Origins	Primary Sensory Attributes	Emotional Associations	Rehabilitation Product Design Applications
Bamboo	Lingnan gardens, bamboo-woven utensils	Pale yellow/greenish-blue texture; smooth fine grain; subtle fragrance	Fresh and natural, soft and tranquil	Seat backs, product casings, protective panel surfaces, bamboo-grain surface coatings
Timber	Courtyard structures, furniture carvings	Warm, nuanced tones; soft, supple texture; subtle woody fragrance	Domestic warmth, dependable and approachable	Armrests, handles, rehabilitation equipment frames
Rattan	Rattan chairs, storage vessels	Mesh ventilation; finely woven texture	Handcrafted aesthetic, warm and relaxed	Rehabilitation seat surfaces, cushion supports, breathable casings
Ceramic	Guangcai porcelain, garden pottery	Brilliant lustre; smooth, cool to the touch	Exquisite elegance, cultural resonance	Massager casing, moxibustion chamber, colour-glazed accents
Lime carvings/plaster bricks	Lingnan ancient architectural plasterwork	Steady grey-white; coarseness and fineness coexist	Rustic, safe, and durable	Footrest, anti-slip training platform
Shells	Marine cultural inlay	Pearlescent iridescence; smooth and refined	Gentle oceanic resonance, distinctive character	Button embellishments, product logo inlays

Figure 3. Application of Lingnan regional cultural materials in rehabilitation product design.

Most importantly, the synesthetic translation of material emotions involves not merely the selection of a single material, but rather the systematic integration of material properties, cultural symbols, and emotional imagery. It allows the elderly to experience visual warmth, tactile softness, and even the subtle, elegant scent of wood during use, fostering a deep fusion of cultural significance and the rehabilitation experience.

### 3.3 Synesthetic Translation of Colour Associations

Color not only directly stimulates the human visual system but also influences emotions, memories, and aesthetics through psychological associations. Lingnan regional culture is characterized by a color palette that is bright, fresh, and harmonious. For instance, the blue bricks, red windows, gray carvings, and colorful murals in Lingnan architecture; the vibrant flowers in gardens; and the unique shades of blue, green, yellow, and red found in folk art all embody the local people's aesthetic pursuit of revering nature, valuing emotions, and cherishing life. Translating these colors through synesthesia not only enhances the cultural distinctiveness of elderly rehabilitation

products but also helps evoke emotional resonance and a sense of belonging among users, thereby improving the rehabilitation experience and enhancing product value.

First, the synesthetic translation of color associations emphasizes the connection between color and other senses (such as touch, taste, and hearing). Specifically, warm reds, oranges, and yellows often evoke synesthetic associations with soft, gentle, and sweet tactile sensations, creating positive experiences such as familiarity, warmth, and vitality for elderly users during use. Conversely, cool blues and greens are frequently associated with freshness, tranquility, and comfort, helping to create a relaxing and safe rehabilitation environment that alleviates anxiety and tension among elderly individuals during the rehabilitation process. The unique color palettes of Lingnan—such as pale green, pale yellow, and artificially dyed indigo—can be skillfully integrated into designs through materials and surface treatments, ensuring that the overall product colors embody Lingnan characteristics while aligning with the visual preferences and psychological needs of the elderly.

Furthermore, color associations can evoke users’ cultural memories and emotional connections to life. For the elderly in Lingnan, specific colors often carry memories of past experiences and local stories. For example, the ink-blue of the Pearl River basin evokes nostalgia for the rivers of their hometowns; the vibrant red of dragon boat races brings back memories of family unity; and the crimson, pale yellow, and emerald green of Lingnan flowers evoke pleasant associations with springtime flower-viewing. These emotional memories awakened by color not only enhance the product’s appeal but also strengthen positive psychological regulation during the rehabilitation process, thereby promoting physical and mental recovery(Figure4).

Typical Colours	Cultural Imagery	Emotional Associations	Design Application Examples
Ink Blue	The waters of the Pearl River basin, Lingnan water towns	Nostalgia for the rivers of one's homeland, tranquillity, profoundness	Blue gradient textures on furniture surfaces, complemented by soft ambient lighting tones
Vivid Red	Dragon boat races, festive celebrations	Family cohesion, passion, and drive	Partial red accents on rehabilitation aids, alert buttons, decorative trims
Crimson	Lingnan-style floral motifs such as kapok blossoms	Springtime flower viewing, the good life, warmth and vitality	Cushions and seat pads in crimson fabric, product logos and pattern elements
Pale yellow	New buds, magnolia blossoms	Hope, vitality, youthful memories	Soft armrests, product details
Emerald green	Lingnan greenery, garden imagery	Freshness, serenity, natural belonging	Colour accents, use of signature colours Product surface texture Green gradient, breathable rattan weave material dyeing

Figure 4. Synesthetic Translation Map of Lingnan Cultural Color Associations.

Finally, the synesthetic translation of color associations should balance scientific rigor with humanistic care. Older adults exhibit physiological characteristics such as reduced visual sensitivity and diminished color discrimination. Therefore, color design for rehabilitation products should employ high-luminance, low-saturation contrast combinations, avoiding overly intense, glaring color clashes or excessively cold grayscales, to ensure visual comfort and clear information recognition. At the same time, techniques such as color guidance, gradient layers, and rhythmic accent colors can be used to enhance operational convenience and safety. Color can also be integrated with materials, craftsmanship, and form to expand multisensory synaesthetic experiences, organically combining Lingnan colors with the surface texture of products to achieve a deep integration of visual and tactile sensations.

## 4 Design Practice of Elderly Rehabilitation Products: Transcending Lingnan Regional Culture

### 4.1 Design Practice Positioning and Design Principles

This design practice targets individuals aged 60 to 75 who possess some mobility but require assistive devices to maintain daily walking or movement. It specifically focuses on users residing in Guangdong Province and the surrounding Greater Bay Area who hold deep emotional memories of Lingnan culture (including bamboo-garden cottages, Lingnan gardens, traditional arcaded streets, and folk festivals). Leveraging this strong foundation of cultural and emotional resonance,

---

this design aims to create rehabilitation products with a greater sense of humanistic care through synesthetic translation. 289  
290

In terms of product functionality, this design focuses on a dual-purpose approach—serving as both a push walker and a wheelchair—to provide a composite mobility assistance solution. 291  
292  
First, during daily walking, it functions as a push walker, offering support and balance assistance. 293  
294  
Second, when the elderly user feels fatigued or needs to travel longer distances, it can be quickly converted into wheelchair mode, allowing the user to sit in it while being pushed by another person. This design effectively addresses the practical needs arising from the decline in motor function among the elderly and significantly reduces the psychological burden of switching between different rehabilitation aids, thereby enhancing the continuity and sense of autonomy in their daily lives. Product application scenarios include high-frequency daily activities such as indoor mobility at home, walking in community parks, and shopping at the market, as well as walking training within rehabilitation facilities. By deeply integrating the product's functional adaptability, user-friendliness, and cultural attributes, we foster a positive emotional connection between elderly users and the product, transforming it from a passively used medical aid into a lifestyle companion that users actively choose and enjoy using. 295  
296  
297  
298  
299  
300  
301  
302  
303  
304

To achieve this positioning, this design practice adheres to the following principles: 305

(1) Safety First Principle 306

Due to the natural decline in physiological functions, older adults commonly face physical challenges such as reduced bone density, weakened muscle strength, and diminished balance and reaction speed. This exposes them to potential safety risks, such as falls and collisions, while using walkers. Therefore, the design process must adhere to ergonomic principles. The handle height is set within the standard range for the wrist when an elderly person's arm hangs naturally, ensuring the user does not need to bend over or raise their arms excessively while pushing, thereby effectively reducing fatigue-induced operational errors. The seat height and depth are based on average sitting depth data for the elderly to ensure a stable and comfortable sitting posture. 307  
308  
309  
310  
311  
312  
313  
314

Regarding material safety, all components in direct contact with the body are made from materials certified for medical-grade safety. The surfaces of the handles and seat cushion are covered with medical-grade anti-slip rubber, and the base is equipped with high-friction anti-slip casters to ensure reliable traction on various floor surfaces. In terms of structural safety, the product features a dual-folding locking mechanism to prevent the frame from suddenly folding due to accidental contact during use. Additionally, the product is equipped with a braking system, allowing users to quickly lock the wheels via the brake mechanism on the handlebar, ensuring the unit remains stationary and stable when sitting down or standing up. 315  
316  
317  
318  
319  
320  
321  
322

(2) Principle of Functional Integration 323

Traditional walkers and wheelchairs are two types of rehabilitation aids with relatively independent functions. Elderly users often need to prepare two separate devices for different scenarios, which not only incurs significant financial costs but also increases the complexity of usage and management, as well as psychological burden. This design integrates the dual functions of pushing and sitting, combining walking assistance with seating functionality into a single unit, allowing elderly users to seamlessly switch between walking assistance and temporary rest using the same product. 324  
325  
326  
327  
328  
329  
330

In walking mode, the product functions as a standard push-type walker. The elderly user grips the handles with both hands and walks with the support of the frame's stable structure, effectively distributing weight from the lower limbs and enhancing walking safety and confidence. In walking mode, the product functions as a standard push-type walker. The user simply grips the handles with both hands and walks with the support of the stable frame, effectively reducing the load on the lower limbs and enhancing walking safety and confidence. In rest mode, the user need only activate the seat deployment mechanism to quickly convert the walker into a seated wheelchair with a backrest, meeting the need for brief rest during shopping, in parks, or during long walks. This integrated design not only reduces the physical effort required to switch between assistive devices but also conveys respect and support for the elderly's independence in daily life through the product itself. 331  
332  
333  
334  
335  
336  
337  
338  
339  
340  
341

---

(3) Cultural Principle	342
Lingnan regional culture, shaped by thousands of years of historical accumulation, has formed a unique visual symbol system represented by features such as gable-roofed walls, bamboo-lined water villages, arcaded streets, and ceramic murals, as well as a tactile material culture characterized by the warmth of bamboo, the delicacy of rattan, and the smoothness of ceramics. These cultural symbols are deeply embedded in the life memories of the elderly in Lingnan and possess a strong capacity to evoke emotions. This design adheres to the principle of cultural integration, meaning that the incorporation of cultural symbols must naturally align with the product's functional structure, rather than being treated as a superficial decorative overlay.	343 344 345 346 347 348 349 350
In terms of form, the flowing curves of the Hu'er gable walls have been distilled into the design language of the walker's side panels, allowing the product's silhouette to exhibit the rhythmic beauty characteristic of Lingnan residential architecture while maintaining structural integrity. In terms of materials, bamboo and rattan—the most representative natural materials in traditional Lingnan life—have been incorporated into the handle wraps and seat weaving. Their warm tactile feel and natural textural qualities not only endow the product with distinct cultural identity. Regarding color, the pale green and pale yellow commonly found in Lingnan gardens have been designated as the product's primary color scheme. These two colors not only align with the chromatic imagery of Lingnan's natural vegetation but also visually convey a sense of freshness, tranquility, and warmth, helping to alleviate the psychological resistance elderly users may feel toward rehabilitation aids.	351 352 353 354 355 356 357 358 359 360 361
(4) Principles of Age-Friendly Design	362
This design identifies the characteristic patterns of the elderly population across four dimensions—physiological, cognitive, psychological, and social—and systematically translates these patterns into concrete, actionable design decisions. In terms of physiological aging-friendly design, this project addresses the decline in vision among the elderly by using high-contrast, large-font designs for all operational indicators and incorporating tactile raised dots on function-switching buttons, ensuring that even elderly users with severe vision impairment can accurately identify and operate the device. To address the decline in hand grip strength among the elderly, the handle diameter is designed to fit the hand size of older adults, and the surface features a non-slip textured finish to minimize the active force required for gripping. The overall weight of the product is kept within a reasonable range, ensuring that older adults can independently fold and store it during daily use without assistance.	363 364 365 366 367 368 369 370 371 372 373
In terms of cognitive age-friendly design, all operational logic follows the principles of intuitiveness and simplicity, allowing elderly users to perform all core operations intuitively without the need for systematic training. In terms of psychological age-friendly design, the product employs cultural integration strategies to mitigate the cold, clinical feel of medical devices, replacing the stigma of illness with a sense of cultural familiarity. This encourages elderly users to adopt a positive attitude toward actively using assistive devices, thereby maintaining their autonomy and sense of dignity in daily mobility.	374 375 376 377 378 379 380
<b>4.2 Design Proposal for the Multisensory Translation of the Walker</b>	381
Inspired by Lingnan bamboo weaving culture and Manchu lattice window decorations, this proposal constructs a comprehensive product that delivers a regional cultural and emotional experience through the synergistic translation of multiple sensory channels, including sight, touch, and smell. While maintaining the rigorous structural integrity of modern rehabilitation assistive devices, the product incorporates the warm and refined aesthetic of traditional Lingnan artifacts. This breaks the psychological stigma associated with traditional walkers for elderly users, transforming the product from a cold medical symbol into a vessel of lifestyle aesthetics that embodies regional warmth(Figure 5, Figure 6).	382 383 384 385 386 387 388 389 390



Figure 5. Usage scenario diagram featuring a walker as the main assistive device.

391

392

393



Figure 6. Usage scenario diagram featuring a walker as the main assistive device.

394

395

396

In terms of design language, the product employs a composition of curved round tubes, with smooth transitions at the joints of the tubing. It abandons the rigid, right-angled structures typical of traditional medical assistive devices, embodying the supple yet upright form and character of bamboo joints. The backrest panel serves as the most concentrated visual focal point of the entire product. The backrest is made of a molded mint-green panel, with a central openwork area featuring a radial fan-shaped grid pattern inspired by the geometric motifs of traditional Lingnan Manchu window lattices. Visually, this pattern translates the decorative symbols of Lingnan architecture into the aesthetic language of the product. As users perceive the openwork pattern, it evokes a sensory association with the dappled light and shadows filtering through the stained-glass window lattices of old Lingnan residences, fostering a cultural narrative of the region's human stories. The overall contour of the backrest forms a trapezoidal curved surface that is wider at the top and narrower at the bottom, creating a subtle echo of the traditional folding fan shape. This design not only meets the functional need for lumbar support but also conveys the cultural atmosphere of the Lingnan region through its form (Figure 7).

397

398

399

400

401

402

403

404

405

406

407

408

409

410

411



Figure 7. Product rendering.

The bamboo-woven storage basket in the center of the product features a herringbone weave pattern commonly found in Lingnan folk crafts. First, visually, the warm, natural tones of the bamboo weave create a harmonious material dialogue with the off-white metal frame, freeing the product from the cold, clinical aura typically associated with medical devices. Second, tactilely, the textured surface created by the woven bamboo strips produces a unique tactile sensation when users retrieve or place items, a sensation that can evoke deep sensory memories among elderly users in the Lingnan region of bamboo market baskets and bamboo furniture. Third, on the olfactory level, the faint, natural scent of bamboo creates a sensory experience during use, resonating across the senses with the aroma of plants found in Lingnan gardens. A foldable seat panel is positioned atop the storage basket; its surface is covered with soft, mint-green material, transforming into a comfortable seat when the basket is closed.

In the overall construction of the color synaesthetic system, off-white, bamboo yellow, and mint green serve as the primary tones. The off-white main frame draws from the color memory of the white walls in traditional Lingnan architecture, conveying a sense of simplicity and visual stability. The bamboo-yellow storage basket derives from the natural hue of bamboo, evoking warm, rustic, and homely sentiments. The mint green backrest and functional components draw inspiration from the cool tones evoked by the water features and humid air of Lingnan gardens, triggering a sense of freshness and transparency on a visual level. The three colors blend naturally with low saturation, resulting in a gentle overall palette that aligns with the visual comfort range for elderly users.

## 5. Conclusion

Previous elderly rehabilitation products have often emphasized the realization of assistive functions while neglecting the emotional needs of older adults as cultural individuals. The innovation of this study lies in breaking through the limitations of traditional rehabilitation product design, which focuses solely on product functionality, by incorporating cultural and sensory dimensions into the design considerations. This study demonstrates that when rehabilitation products serve as a medium for cultural memory, their value transcends mere physical rehabilitation, extending to multiple dimensions such as psychological comfort, cultural heritage, and social participation. This design approach offers new solutions to address the challenges of an aging society and explores viable pathways for the creative transformation of regional cultures. Furthermore, the synesthetic translation design method established in this study is transferable; it is applicable not only to Lingnan culture but also to the design and development of other regional cultural resources, providing methodological support for the living utilization of cultural heritage.

However, this study also has certain limitations. First, the sample scope is primarily concentrated on the elderly population in Guangdong; the cultural identity and acceptance among the

elderly in other regions require further verification. Second, due to time and resource constraints, the design practice has mainly remained at the prototype stage; issues such as the long-term effectiveness, durability, and production costs of the products await in-depth exploration in subsequent research. Third, the quantitative evaluation system for synesthetic translation remains incomplete; establishing more scientific standards for evaluating translation effectiveness requires sustained effort from interdisciplinary teams.

Looking ahead, this research can be deepened and expanded in the following directions. First, the scope of cultural resource exploration should be broadened. In addition to Lingnan culture, other regional cultures in China—such as Jiangnan culture and Bashu culture—also contain rich design resources. Comparative studies can be conducted to explore the patterns of synesthetic translation across different cultural contexts. Second, digital technologies should be incorporated. By utilizing virtual reality (VR) and augmented reality (AR), more immersive cultural rehabilitation experiences can be created, thereby expanding the technological boundaries of synesthetic translation. Third, attention should be paid to the social attributes of rehabilitation products, exploring their application in community-based and culture-based elderly care models to leverage the social function of products as media for cultural exchange.

In summary, this study provides a theoretical framework and practical paradigm for integrating regional culture into the design of geriatric rehabilitation products, demonstrating that the synergistic design of culture, sensory experience, and functionality can create rehabilitation solutions with greater humanistic care. Against the backdrop of an era characterized by both population aging and cultural confidence, this research direction holds significant academic value and social significance, warranting continued attention and in-depth exploration from both academia and industry.

**Author Contributions:** H.J.: Conceptualization, writing – original draft preparation; H.L.: Methodology, investigation, writing – original draft preparation, writing – review & editing; S.H.: Investigation, writing – review & editing. All authors have read and agreed to the published version of the manuscript.

**Funding :** Funding: This work was supported by the 2024 Guangzhou Huashang College Featured Project “Research on Evidence-Based Health Design Based on the Elderly’s Health Information Poverty” (2024HSTS10), and the 2025 Ministry of Education Humanities and Social Sciences Planning Fund Project “Evidence-Based Mechanisms and Design Intervention Strategies for Elderly Health Information Poverty from the Perspective of Digital Inclusion” (25YJAZH082). This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

## References

- Rudnicka, E., Napierała, P., Podfigurna, A., Męczekalski, B., Smolarczyk, R., & Grymowicz, M. (2020). The World Health Organization (WHO) approach to healthy ageing. *Maturitas*, 139, 6–11. <https://doi.org/10.1016/J.MATURITAS.2020.05.018>
- Ling, R. E., Liu, F., Lu, X. Q., & Wang, W. (2011). Emerging issues in public health: A perspective on China’s healthcare system. *Public Health*, 125(1), 9–14. <https://doi.org/10.1016/J.PUHE.2010.10.009>
- Junhong, L., & Padil, M. N. (2024). Exploring the Use of Visual Elements of Lingnan Culture in Packaging Design. *Asian Journal of Research in Education and Social Sciences*, 6(3), 667–678.
- Li, J., Wu, Z., & Zhang, Y. (2022). Research and application of climate-responsive design of traditional vernacular houses in Chaoshan, China. *Environmental Science & Sustainable Development*, 7(1), 47–65.
- Riccò, D. (2017). Synesthetic translations. Theories and practices for design content accessibility. *Design Is Translation: The Translation Paradigm for the Culture of Design*, Franco Angeli, Milano, pp. 149–171.

---

Kwon, J., & Iedema, A. (2022). Body and the senses in spatial experience: The implications of kinesthetic and synesthetic perceptions for design thinking. <i>Frontiers in Psychology</i> , 13, 864009.	499 500
Bu, L., Bu, L., Liu, H., Fan, Z., Yuan, X., Gu, X., Zhang, G., & Jia, G. (2021). A synthetical development approach for rehabilitation assistive smart product - service systems: A case study. <i>Advanced Engineering Informatics</i> , 48, 101310. <a href="https://doi.org/10.1016/J.AEI.2021.101310">https://doi.org/10.1016/J.AEI.2021.101310</a>	501 502 503
Gaspar, R. de P., Bonacin, R., & Gonçalves, V. P. (2018). Designing IoT Solutions for Elderly Home Care: A Systematic Study of Participatory Design, Personas and Semiotics. <i>International Conference on Universal Access in Human-Computer Interaction</i> , 226 - 245. <a href="https://doi.org/10.1007/978-3-319-92052-8_18">https://doi.org/10.1007/978-3-319-92052-8_18</a>	504 505 506 507
Balla, B. (2012). <i>Symbolism, synesthesia, and semiotics: A multidisciplinary approach</i> . Xlibris Corporation.	508
Krampen, M. (1989). Semiotics in Architecture and Industrial/Product Design. <i>Design Issues</i> , 5(2), 124. <a href="https://doi.org/10.2307/1511519">https://doi.org/10.2307/1511519</a>	509 510
<b>Disclaimer/Publisher's Note:</b> The statements, opinions, and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of IDAP and/or the editor(s). IDAP and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions, or products referred to in the content.	511 512 513

---