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Research on Design Strategies for Elderly Cognitive Health Products based on the Active Health Concept

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ABSTRACT

With the trend toward smaller family structures, the population of elderly individuals living alone with Mild Cognitive Impairment (MCI) is growing significantly. While coping with the decline in physiological functions such as memory, they often experience profound loneliness and social disconnection. However, existing health products for the elderly tend to have a “medical device” appearance, with functions limited to passive monitoring or daily living assistance. Such designs, which neglect psychological defense mechanisms, are prone to triggering feelings of stigma and resistance to use. Moreover, data silos between devices and a lack of emotional interaction make it difficult to truly preserve the dignity of older adults. To address this, this paper reconstructs the design philosophy of smart health products based on the concept of “Active Health,” elevating the underlying logic of age-friendly design from mere “physiological compensation”to “psychological dignity preservation.” The study proposes four core strategies: implicit intervention integrated into daily household items, emotionally interactive design for psychological comfort, non-intrusive autonomous assistance that eliminates a sense of surveillance, and human-machine symbiosis models promoting two-way companionship. Through environmental empowerment and digital connectivity, this paper explores the paradigm shift of health services from cold “instrumental rationality” to warm “humanistic care.” Finally, a multi-dimensional evaluation framework is constructed, covering functional usability, safety, psychological support, and environmental harmony, aiming to provide theoretical support and practical guidance for future innovation in health product development and design ethics governance.

KEYWORDS

Mild Cognitive Impairment (MCI); Elderly Living Alone; Active Health; Age-friendly Design.

1. INTRODUCTION

Mild Cognitive Impairment (MCI) refers to a decline in memory or other cognitive functions that does not yet interfere with daily living activities [1]. Against the macro-background of accelerating population aging and the miniaturization of family structures in China, the number of older adults living alone continues to expand. The high prevalence of MCI in advanced age plunges this group into a dual physiological and psychological predicament [2]. Physiologically, the memory loss, spatial disorientation, and decline in executive function caused by MCI markedly weaken older adults' ability to live independently. Combined with the lack of immediate care in a solitary living situation, these deficits readily lead to safety risks such as wandering, falls, and medication errors. Psychologically, cognitive decline is often accompanied by stigma and a loss of self-efficacy. Due to the absence of family companionship and the weakening of social support networks caused by living alone, these older adults are highly susceptible to severe loneliness, anxiety, and depression. The intertwining of physiological deterioration and psychosocial isolation not only accelerates the irreversible progression from MCI to Alzheimer’s disease (AD) but also poses a severe challenge to the traditional

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aging-in-place model [3]. Therefore, resolving the dual physical and psychological plight of older adults with MCI who live alone has become a pressing public health and livelihood issue that society must urgently address.

In the face of the complex needs of older adults with MCI living alone, the design paradigms of current health and wellness products urgently need to be upgraded. Most age-friendly products currently on the market remain at the stage of "passive functional assistance" (e.g., basic vital sign monitoring, unidirectional medication reminders), focusing on compensating for physical deficits while neglecting the deeper needs of cognitive stimulation and emotional comfort [4]. Consequently, it is of great theoretical and practical significance to explore the shift of health and wellness products from "passive functional assistance" to "proactive emotional empowerment." The latter emphasizes that, while providing fundamental safety protection, products should proactively perceive the user's emotional and cognitive states through multimodal interaction and then offer personalized companionship and guidance, cognitive training, and social connection. The value of this shift lies not only in its capacity to effectively alleviate the psychological anxiety of older MCI adults living alone and slow the progression of cognitive decline through warm emotional compensation and cognitive intervention [5], but also in its breakthrough from the limitations of traditional "pathologized" age-friendly design, thereby restoring the older person's sense of dignity and self-worth. This approach offers an innovative paradigm for the future development of smart health and wellness products that integrates both "humanistic care" and "medical intervention."

2. DESIGN CATEGORIES AND FUNCTIONAL CHARACTERISTICS OF HEALTH AND WELLNESS PRODUCTS FOR OLDER ADULTS

In the face of the deepening aging trend, health and wellness products for older adults are no longer limited to merely being "life assistants" but are increasingly emphasizing the provision of emotional companionship and cognitive exercise. Surveying the current market, these products can be broadly divided into three categories: cognitive training, safety monitoring, and companionship and interaction. Each has a distinct emphasis in terms of technology application and attention to the older user's psychology.

Regarding age-related memory decline such as MCI, the core goal of cognitive training products is to delay disease progression [6]. This type of product often packages tedious rehabilitation tasks as engaging games. Through visual stimulation, logical reasoning, and memory mini-games, it guides the older adult to participate proactively, imperceptibly exercising their brain's neural networks in the course of daily interaction.

Monitoring devices form the foundation of smart health and wellness care, primarily including functions such as heart rate measurement and fall-detection alarms [7]. Their working principle is largely "silent observation with critical alerts": they routinely analyze the older adult's living habits in the background and immediately issue a reminder upon detecting any physiological or behavioral warning signs. It is noteworthy that current monitoring devices are gradually moving away from traditional "wearable" forms toward non-contact technologies such as radar and infrared sensors. This not only better protects the older user's privacy but also reduces the conspicuousness of the device, providing precise safety protection without disturbing the user.

As for the emotional interaction that older adults living alone lack the most, companionship products have come into play. Their design intention is no longer solely to achieve a specific function but to genuinely care about the older person's psychological state and relieve their boredom in daily life [8]. Today's excellent companionship products not only provide basic voice broadcasting and medication reminders but can also capture the user's emotional fluctuations through smarter affective computing technology. This kind of interaction characterized by "human touch" and "empathic ability" can significantly alleviate the older adult's loneliness and bring more enjoyment to their later years.

3. LIMITATIONS OF CURRENT HEALTH AND WELLNESS PRODUCT DESIGN FOR OLDER ADULTS

(1) The Problem of "Stigma"

Currently, the appearance of many health and wellness products for older adults still carries a strong "medical device" aesthetic. This overly conspicuous medicalized appearance invisibly labels older users as "patients in need of care." Such psychological suggestion not only intensifies the older adult's sense of stigma but also leads to rejection when they are in public settings or when there are guests at home, ultimately rendering the product a mere decoration and significantly reducing its actual usage rate. This design tendency of merely accumulating functions while ignoring psychological feelings precisely overlooks a fundamental fact: older adults also have a pursuit of aesthetics and yearn to maintain a normal living state and personal dignity when using these products.

(2) "Isolated" Design

Existing health and wellness products often confine the older user's scenario to a "standalone mode," focusing only on one-way interaction between the person and the device while neglecting that aging care is essentially a socialized activity requiring multi-party participation. Due to the lack of effective networking with family members and community clinics, the health data measured by the devices often stay on the local screen and cannot be transmitted in real-time to children or family doctors. This phenomenon of an "information silo" not only fails to alleviate the care burden on family members but, on the contrary, often increases the difficulty of subsequent rescue and treatment due to untimely alarm notifications and physicians' inability to access long-term data [9]. Ultimately, if a product severs the emotional connection between the older adult and the outside social world and fails to link the "older adult-family-community" chain, a standalone hardware device will often be powerless in the face of a genuine sudden health crisis.

(3) Deficiency in Emotional Interaction

Although today's health and wellness devices are extremely powerful in terms of monitoring precision and data computing power, the design thinking behind many products remains trapped in a set of cold "technical indicators." They tend to view the older adult as a "data-collection subject," fixating only on physiological parameters such as heart rate and step count, while severely neglecting the psychological comfort that solitary older adults crave most. Many devices on the market merely emit a one-way beeping alarm, completely lacking the ability to perceive and respond to the user's emotional changes. For older adults living alone who already lack companionship, this kind of "inhuman" mechanical communication not only fails to fill their inner loneliness; sometimes, it even causes severe frustration because the device "cannot understand speech" or is "too mechanical to operate," making the older user even more psychologically averse to these smart products [10].

4. THEORETICAL CONSTRUCTION BASED ON "ACTIVE HEALTH" AND "ENVIRONMENTAL EMPOWERMENT"

The core idea of "active health" is, simply put, to move the health defense line forward and change the passive aging-care model of "only managing illness after it occurs, only rescuing after a fall" [11]. Applying this concept to product design means endowing products with three attributes simultaneously: "prevention, rehabilitation, and autonomy." At the "prevention" level, the product should rely on daily data and AI algorithms to keenly detect subtle signs of physical or cognitive decline. At the "rehabilitation" level, tedious and rigid medical training should be cleverly packaged into small daily activities that the older adult is willing to engage in. At the "autonomy" level, assistive technology should be as "invisible" as possible, providing unobtrusive support that helps the older person maintain their self-care capacity. This shift in thinking transforms health and wellness

products from a “lifesaver” after illness into a “life companion” that helps older adults preserve their health, vitality, and slow aging.

Embodied cognition theory tells us that human thinking and memory are not solely the result of the brain operating in isolation but also require the body’s continuous interaction with the external physical environment [12]. For health and wellness products, environmental psychology offers valuable inspiration: the older adult’s brain responsiveness is closely related to the arrangement of their surrounding environment. If, during the design process, we enable a positive interaction between the products and the domestic space, the physical contact involved in operating devices and moving around the home can effectively stimulate neural activity and help slow cognitive decline. This requires designers to focus not only on the functions of the device itself but also to comprehensively consider lighting, tactile feedback, and spatial layout in the home, striving to create a barrier-free environment that is visually pleasing and comfortable to use. In this way, the physical space of the home becomes an “external support network” that assists the aging brain’s functioning.

Now, the core philosophy of age-friendly design is undergoing a fundamental shift: from the former simple approach of “compensating for what is lacking” (functional compensation) to a deeper level of “helping older adults preserve their dignity” (dignity maintenance). Past health and wellness products often bluntly compensated for older adults' physical deficits. While this addressed practical life difficulties, it also invisibly labeled them as “disabled” and deeply wounded their self-esteem as independent individuals. To redefine health and wellness, “dignity” must be placed at the forefront of design: the product should not be a cold crutch but rather an “umbrella” protecting the older person’s dignity in life. By integrating home aesthetics and embedding complex medical technology into everyday details, we can make care feel natural and unobtrusive. In essence, this design reconstruction aims to transform older adults from “passive recipients of care” back into “masters of their own lives.” Health and wellness is no longer merely about removing life obstacles, but about using subtle, imperceptible technology to enable older adults to live independently and with dignity, aided by technology.

5. DESIGN STRATEGY MODEL FOR MILD COGNITIVE IMPAIRMENT AND OLDER ADULTS LIVING ALONE

(1) Implicit Design Strategy: Empowering the “Cognitive Field” of the Home Environment

For MCI, forced, tedious training often intensifies the patient's resistance. The implicit strategy advocates embedding cognitive stimulation into the background activities of daily living, thereby de-medicalizing health and wellness behaviors. For example, a smart lighting system whose color temperature changes over time can guide the older adult’s circadian rhythm; logical cues implanted in furniture arrangement can prompt moderate walking and spatial memory recognition. Through environmental nudging, this design transforms cognitive rehabilitation tasks into subconscious home activities, enabling older adults to maintain active cognitive function through interaction with the environment without needing to deliberately cooperate with training.

(2) Emotional Interaction Strategy: Building a Digital Network of “Presence”

To address the emotional deprivation of older adults living alone, emotional interaction should go beyond simple voice responses and strive to establish a sense of family connection and social security. Design strategies include: introducing a shared digital space where the life updates of distant children (such as photos, videos, and status logs) are projected non-intrusively onto the older adult's home devices in real-time, constructing an emotional bond; and endowing the device with emotional warmth in interaction design, using tone adjustment and emotion perception algorithms to ensure that monitoring and alerting provide caring guidance rather than cold commands. This kind of emotional connection can alleviate the psychological anxiety caused by living alone and provide the older adult with a long-term sense of social security and belonging.

(3) Autonomy Preservation Strategy: IoT-Driven "Imperceptible" Monitoring

Autonomy is the cornerstone of older adults' dignity. This strategy emphasizes the principles of low interference and high sensitivity, i.e., utilizing the Internet of Things and sensor technology to achieve comprehensive health monitoring while abandoning excessive reliance on wearable devices. Through millimeter-wave radar, pressure sensors, and smart home appliances installed in the environment, the system can automatically obtain gait, sleep quality, and daily activity trajectories. This imperceptible monitoring mode minimizes direct intervention in the older adult's life and avoids the psychological burden of feeling watched, thereby granting the user maximum autonomy in daily life and a sense of spatial freedom while ensuring safety.

(4) Human-Machine Symbiosis Model: AI-Driven Personalized Health and Wellness Evolution

Under the human-machine symbiosis model, artificial intelligence is no longer a rigid program but an intelligent steward with self-evolution capabilities [13]. The design should focus on AI's learning of the older adult's behavioral preferences and cognitive change trends to generate personalized health and wellness recommendations. For example, the AI system can automatically adjust the difficulty of cognitive training, achieving dynamic task allocation by analyzing the user's historical performance, and automatically optimize the feedback mechanism based on their preferences for different intervention approaches. This symbiotic model transforms the design process from "one-time product delivery" to "continuous service evolution," ensuring that the health and wellness plan always matches the older adult's current physical and mental state, thereby forming a closed-loop cognitive health and wellness care system based on human-machine collaboration.

6. ETHICAL AND EVALUATION FRAMEWORK FOR HEALTH AND WELLNESS PRODUCT DESIGN

As IoT monitoring technology enters the home-based aging care of millions of households, health and wellness design faces an unavoidable ethical dilemma: how to find the right balance between "proactive care" and "privacy protection"? Unrestrained data collection can turn genuine care into "round-the-clock surveillance" of the older person's private life, which not only makes them feel psychologically insecure but may even breed resentment. Therefore, from an ethical standpoint, the design must uphold a fundamental bottom line-the "minimum necessary principle." That is, as long as the health and wellness objectives can be achieved, the less data collected the better; simultaneously, technologies such as data anonymization and edge computing should be adopted as much as possible to process information locally on the device rather than blindly uploading it to the cloud.

More importantly, the rights to "be informed" about and to "delete" data should be returned to the older adult and their family members. Through a simple and easy-to-understand interface, clearly inform the older adult: what data the device collects, why it is collected, and how it is used. Such respect for technological ethics should be directly turned into the product's default settings, thus steadfastly guarding the privacy boundaries that protect the older adult's dignity while leveraging the role of technology.

To scientifically guide the future design of health and wellness products, this study proposes a four-dimensional evaluation index system based on "function, safety, psychology, and environment." This system aims to break through the limitations of previous single-function evaluations, ensuring that design addresses both technical effectiveness and humanistic care. **(1) Functionality Index:** Assess the product's task completion in cognitive intervention or life assistance, measuring its learnability, ease of use, and adaptability to different degrees of cognitive decline. **(2) Safety Index:** Focus on data security, hardware failure warning mechanisms, and the speed and robustness of the system's response to sudden risks in emergency situations. **(3) Psychological Support Index:** Evaluate the product's effect on improving the older adult's emotional state, including whether it can reduce

"stigma," enhance "self-efficacy," and possess attributes of emotional resonance and companionship. **(4) Environmental Compatibility Index:** Examine the degree of integration between the product's appearance and the home space, measuring whether the design language conforms to universal design principles and the extent of its interference with existing living habits.

7. CONCLUSION

By analyzing design bottlenecks such as stigma, isolation, and emotional deficiency, this study proposes an innovative design paradigm grounded in active health, embodied cognition, and environmental empowerment, demonstrating the paradigm shift pathway from "passive functional tools" to "proactive emotional care." However, the theoretical system construction of health and wellness product design is a process of dynamic evolution. Limited by the boundaries of technology and social cognition, current research still needs to be continuously expanded in subsequent practice.

REFERENCES

[1] Petersen, R. C. (2016). Mild cognitive impairment. Continuum (Minneap Minn), 22(2), 404–418.

[2] Cao, Y., Deng, Y., & Zhang, J. (2024). Mild cognitive impairment among community-dwelling older adults living alone versus co-residing and its influencing factors. Chinese Health Service Management, 41(8), 928–932.

[3] Guan, Z. (2024). Design of multi-channel intervention training products for elderly patients with MCI [Master's thesis, Yanshan University].

[4] Cheng, Y., & Li, B. (2025). Age-friendly design of rural residential spaces in Guangdong under the background of aging. Ju She, (5), 19–21.

[5] Zeng, Y., & Zeng, L. (2023). Application status, challenges, and countermeasures of smart health and wellness metaverse from the perspective of healthy aging. Journal of Nursing, 30(14), 70–73.

[6] Zhao, X. (2020). Direct and transfer effects of multitasking process-based cognitive training on executive function in community-dwelling individuals with mild cognitive impairment [Master's thesis, Huzhou University].

[7] Li, W. (2022). Research on natural interaction design of home-based elderly assistive devices under the health and wellness model [Master's thesis, Jiangnan University].

[8] Wang, L., Liu, Z., Zhang, W., et al. (2020). Research on home product design under the accessible interactive experience needs of advanced-age users. Packaging Engineering, 41(14), 181–187.

[9] Peng, Q. (2017). Research on China's urban community home-based elderly care service model under the "Internet +" background [Master's thesis, Shaanxi Normal University].

[10] Han, J., & Zhao, H. (2024). Research on emotional design of smart home product app interfaces under the background of smart aging care. Industrial Design, (9), 97–100.

[11] Zhang, M. (2025). Research on optimization of urban built environment based on active health theory under the background of aging [Master's thesis, Shenyang Jianzhu University].

[12] Huang, H., Meng, H., Zuo, M., et al. (2018). How embodied interaction in mixed reality environments promotes scientific concept understanding. Modern Distance Education Research, (6), 28–36.

[13] Wang, Y., Li, Y., Fang, S., et al. (2026). Generative artificial intelligence empowering digital-age smart aging: Concepts, values, and pathways. Modern Distance Education, 1–11. Advance online publication.