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Age-Friendly Design of Public Spaces in Aging Residential Communities from a Micro-Renewal Perspective

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Abstract

In the context of an aging society, public spaces in aging residential communities often suffer from inadequate age-friendly features, while large-scale renovations face practical constraints. This study aims to explore how micro-renewal strategies—characterized by low-cost and incremental interventions—can optimize community public spaces to better meet the physical and psychological needs of elderly residents. Grounded in the concept of micro-renewal, the research first investigates current conditions and identifies key issues in typical aging communities. It then proposes age-friendly design strategies from three spatial dimensions: pedestrian circulation, landscape environments, and interactive spaces, based on seniors' behavioral patterns, physical limitations, and social interaction needs. The study develops a micro-renewal framework for aging community public spaces, emphasizing quality improvement through refined design rather than large-scale reconstruction. The proposed framework offers a practical implementation reference for age-friendly renovations in constrained settings and contributes to the broader discourse on urban micro-regeneration.

Keywords: urban micro-renewal, aging residential communities, age-friendly design, public space

1. Introduction

With the steady development of China's economy and the ongoing demographic transition, the issue of population aging has become increasingly prominent. According to the Seventh National Population Census, citizens aged 60 and above accounted for 18.7% of the total population, signifying a shift toward a deeply aging society. In response, the Chinese government has implemented a series of strategic plans, including the '14th Five-Year Plan for Aging Development and Elderly Care Services,' which emphasizes building a coordinated system of home-, community-, and institution-based eldercare, along with integrated medical and wellness support.

Against this policy backdrop, the community-based aging model is gaining traction due to its cost efficiency and its ability to preserve emotional connections. However, many aging urban communities still rely on traditional renovation approaches that prioritize superficial upgrades—such as building façades—over user-centered improvements. These efforts often neglect the specific physiological and psychological needs of older adults and rely on standardized renovation templates that fail to address site-specific issues. Consequently, the gap between renovation outcomes and the elderly's demand for quality environments continues to widen.With age, seniors face various physical challenges such as reduced mobility, impaired vision, and hearing decline, while also requiring social interaction and emotional support. Most aging communities are situated in dense urban cores and face spatial, regulatory, and financial constraints, rendering large-scale redevelopment neither feasible nor desirable. Such projects may also disrupt longstanding neighborhood ties and the social fabric crucial for elderly well-being.

In this context, the concept of urban micro-renewal—rooted in theories of organic urbanism—offers an alternative strategy. It emphasizes precise, small-scale interventions tailored to local conditions, adopting a 'surgical' approach that targets critical spatial problems without major demolition or relocation. Compared to conventional large-scale projects, micro-renewal enables more sustainable, human-centered, and context-sensitive transformation.This study adopts the micro-renewal lens to investigate how age-friendly improvements can be integrated into public spaces in aging communities. By focusing on behavioral patterns, mobility constraints, and social engagement needs of older residents, it proposes actionable strategies that promote safety, comfort, and inclusiveness—thereby enhancing quality of life without disrupting community stability.

2. Current Status of Public Spaces in Aging Communities

As the physical environment for residents' daily lives, communities are complex systems that encompass living spaces, neighborhood relationships, and social contexts. The World Health Organization introduced the concept of Age-Friendly Cities in 2005 and published the Global Age-Friendly Cities Guide in 2007. Within this framework, the age-friendliness of community public spaces has become a central component in building elderly-supportive neighborhoods[1].

Currently, due to inadequacies in community-based eldercare systems, public space renovations in aging neighborhoods often fall short of addressing elderly users' needs, significantly impacting their daily activities. These communities typically contain fragmented and scattered public spaces, which can be divided into two main types. The first comprises formally planned spaces that fail to align with residents' actual needs, resulting in low usage efficiency. The second consists of informal spaces created by residents themselves, which—while meeting some immediate needs—often compromise community coherence.This binary spatial structure creates several challenges: vague functional boundaries, illegal occupation of public zones, and unregulated vehicle parking, all of which pose safety risks and intensify community conflicts. Additionally, insufficient green space and low environmental quality further deteriorate the spatial experience. Notably, this fragmented space structure exacerbates the limitations of an already inadequate eldercare service network, leading to a vicious cycle in which the declining quality of public spaces restricts seniors' mobility and social participation, while the lack of services fails to compensate for these deficiencies, thus lowering the overall age-friendliness of aging communities.

2.1 Homogenization in Age-Friendly Community Renovations

In the ongoing efforts to upgrade aging communities, mainstream modular renovation approaches often fall into the trap of homogenization. While standardized and large-scale interventions can improve efficiency, they tend to overlook the unique spatial characteristics and historical memories embedded in older neighborhoods. This widespread use of template-based designs results in public spaces across different communities exhibiting similar layouts, circulation patterns, and landscape aesthetics, ultimately eroding the spatial identity of each site.Such homogeneity is particularly problematic for elderly users, whose cognitive functions may decline with age. In uniform environments, older adults can struggle with orientation and wayfinding, leading to increased psychological stress. In contrast, public spaces with distinctive spatial features and plant arrangements tailored to local culture and terrain can enhance recognition and comfort[2].

Moreover, elderly individuals often possess strong nostalgic attachments to familiar settings. Renovations that respect existing site textures and preserve local spatial narratives not only maintain physical continuity but also reinforce emotional bonds. This design philosophy—grounded in the spirit of place—strikes a balance between physical upgrades and emotional continuity, increasing older adults' acceptance and satisfaction with the renovation outcomes.

2.2 Monofunctionality of Public Space Platforms

Public spaces in aging communities serve as key venues for elderly residents' daily activities, yet their functions often remain overly singular. This is reflected in limited spatial functions, rigid usage patterns, and narrow user targeting, which fail to support the diverse needs of older adults.

Currently, most public spaces do not fully accommodate seniors' varied interests—such as socializing, exercising, and leisure—which leads to underutilization. Additionally, fragmented layouts increase the physical burden on those with limited mobility, making it harder for them to access multiple functions within a reasonable distance. Standardized facilities often overlook distinctions among elderly groups with different physical or cognitive needs. This reduces the actual value and inclusivity of the space. Optimizing age-friendly spatial systems and walking networks through detailed analysis of senior activity patterns can significantly improve accessibility[3].

Design strategies should focus on enhancing the comfort and reach of pedestrian routes, clarifying service radii, and creating multifunctional, composite spaces. These user-oriented improvements not only elevate efficiency but also improve the quality of outdoor experiences for older residents, ultimately advancing the overall public space environment.

3. Needs Analysis of the Elderly in Community Public Spaces

As the most frequent users of community public spaces, elderly residents have highly specific and multidimensional needs that must guide spatial design. Their physical limitations, emotional expectations, and behavioral patterns demand a tailored approach that transcends generic urban planning models. In age-friendly environments, it is not sufficient to merely provide access; design must actively support safety, social participation, and emotional fulfillment. Aging is not a uniform experience—different seniors face distinct challenges based on

mobility, cognitive ability, and personal history. Thus, planning must accommodate both universal accessibility and individual variability. By recognizing the elderly not as passive recipients but as active community members, designers and planners can create spaces that empower rather than restrict.

This section applies both psychological theory and environmental behavior analysis to categorize and address the primary needs of older adults. These include a strong desire for safety and security, emotional connection and belonging, and social recognition and respect. Through comprehensive needs assessment, the study lays the foundation for a context-sensitive, human-centered approach to spatial intervention in aging communities.

3.1 Psychological Needs

In traditional Chinese eldercare culture, aging at home remains the most preferred mode of later-life living. However, due to changes in family structures, urban migration, and socio-economic transformations, an increasing number of older adults experience 'empty-nest' living conditions, with diminished familial support. This results in rising levels of social isolation, emotional vulnerability, and psychological imbalance among seniors.The rapid pace of urbanization has further disrupted original community structures. Long-established social networks have weakened as original residents relocate and new populations enter, causing a breakdown in neighborhood familiarity and emotional bonding. Many elderly individuals find themselves disconnected from both place and people, leading to a sense of alienation and emotional loss.

A good social atmosphere is essential to alleviate the loneliness of the elderly. Studies have shown that loneliness and social isolation are common psychological problems faced by the elderly, and community public space can provide them with an ideal social platform to help them establish and maintain social connections, thus reducing loneliness and enhancing life satisfaction[4].

Design strategies should consider creating socially inclusive, easily accessible, and psychologically safe spaces—such as shaded plazas, conversation benches, community gardens, or flexible-use courtyards. Such interventions help reestablish a sense of belonging and identity among elderly users. When seniors are encouraged to participate, express, and connect, the community environment transforms into a supportive ecosystem that enhances both emotional health and life satisfaction. In this way, public spaces serve as therapeutic landscapes, bridging the emotional gaps created by aging and urban change.

3.2 Maslow's Hierarchy of Needs

3.2.1 Safety Needs

In daily life, the physical decline experienced by older adults—such as slower reflexes and reduced mobility—makes them more vulnerable to accidents during outdoor activities. According to Maslow's hierarchy of needs, safety is a fundamental human requirement, particularly for the elderly. Only when this basic need is satisfied can higher-level needs be meaningfully pursued. Therefore, ensuring physical safety must be a core focus in the design of community public spaces. This includes attention to surface materials, lighting, barrier-free access, and spatial clarity. Details such as anti-slip pavement, gradual ramps, and handrails can significantly reduce the risk of injury.

When older adults feel that their safety is protected, they are more likely to engage in public life, increasing their activity levels and social interaction. Beyond physical protection, a secure environment also offers psychological reassurance—helping seniors feel more confident, respected, and emotionally supported. Safety-focused design is not only a prerequisite for participation but also a form of invisible care. It signals that the community values its elderly members and is willing to invest in their well-being. By building a secure and trustworthy public environment, communities can lay the foundation for healthy aging and social inclusion.

3.2.2 Esteem Needs

As individuals enter old age, physical decline is often accompanied by societal marginalization. Elderly people are frequently viewed as a vulnerable group, but vulnerability should not equate to neglect. On the contrary, it calls for greater social care and recognition. According to Maslow's hierarchy of needs, respect is a vital psychological need—it includes both self-esteem and the recognition received from others.

In the design of community public spaces, it is essential to fully consider the specific conditions and preferences of older adults, offering diverse options for leisure, cultural, and social engagement. This not only accommodates their activity needs but also affirms their value in the community.

When society openly acknowledges the importance of elderly individuals and provides targeted support to improve their well-being, it reduces the risk of marginalization and enhances their sense of identity. Respect fosters confidence, enthusiasm, and a strong sense of purpose in life. Therefore, spatial design should not only meet

functional needs but also convey care and respect—ensuring that elderly residents feel visible, valued, and meaningfully included in community life.

4. Design Strategies for Age-Friendly Community Spaces

Age-friendly spatial design in aging communities must account for the physical and cognitive limitations of older adults. Based on their behavioral patterns and needs, this section proposes targeted improvements in three spatial categories: circulation (pathways), landscape, and interactive areas. These strategies aim to ensure not only safety and accessibility, but also psychological comfort and social integration, forming a comprehensive support system for aging-in-place.

4.1 Pedestrian Space Design

From the perspective of human physiological and cognitive aging, elderly individuals often experience reduced leg strength, slower reflexes, and declining spatial perception. These changes make long-distance or continuous walking difficult and potentially unsafe. Therefore, community pathway design must emphasize clarity, safety, and accessibility. Distinct primary and secondary routes help older adults recognize and remember directions, while barrier-free designs across all areas ensure safe and independent travel[5].

Pathways should offer diverse walking loops and be equipped with handrails or seating in complex or sloped sections, allowing users to rest based on their own conditions. Given memory decline, ground-level visual markers can enhance spatial cognition and prevent disorientation. These markers also help distinguish areas and increase environmental legibility.To avoid fatigue and risk from long, uninterrupted routes, pathways should be segmented with “pause points” that allow elderly users to stop and rest, and possibly interact with others. Circular walking trails can connect various zones, promoting interaction among users and improving spatial continuity.Additionally, traffic organization in many aging communities is problematic—private vehicles often share space with elderly pedestrians, making it difficult for those using walkers or mobility aids. To address this, time-sharing systems can be implemented, or vehicular traffic can be rerouted, ensuring safety and reducing conflict. Pathway design is thus fundamental to building age-friendly environments, directly influencing mobility, engagement, and overall quality of life for senior residents.

4.2 Landscape Space Design

Creating a rich landscape experience in the public space of the community can enable the elderly to experience the changes of the seasons in the community, improve the quality of the living environment, and promote the healthy development of the body and mind[6] . Enriching the landscape space of the residential area promotes the active participation of the elderly in social activities, and the landscape space with certain design meets the needs of the elderly for private activities. For the suitability of landscape ecology for the elderly, it is possible to enhance the sense of belonging of the elderly by adding elderly service facilities and integrating native plants into them, and at the same time to utilize horticultural therapy and introduce recreational plants to create a pleasant healing space landscape to promote the physical and mental health of the elderly. Most landscape design is too one-sided only from the visual effect, to consider landscape configuration and design from multi-level and multi-faceted, starting from the human senses, mobilizing visual, auditory, olfactory and tactile experience of the four senses, to promote the perception of space to obtain an overall sense of spatial experience, and to increase the attractiveness of the landscape space.

4.3 Interactive Space Design

Compared with other age groups, the elderly will have more behavioral activities in the community public space, and their properties can be roughly divided into two kinds of static and dynamic. Therefore, when setting up the interactive space, attention should be paid to the combination of static and dynamic. Activity area for the elderly to provide strolling, dancing, fitness and other activities, should avoid the carriageway, and maintain the distance from the residential area, to avoid the noise generated by the activities affecting the neighborhood. The static activity area can carry out more private activities, such as reading books and newspapers, etc., to effectively meet the spiritual and cultural needs of the elderly and increase the sense of community cultural atmosphere. The space focuses on making the elderly feel more secure, using natural plants, trees and other natural partitions to create a relatively private space for the elderly[6] . Spatial function planning can be set up separately in the old and young activity areas to meet the needs of different age groups for public space. Increase interactive devices to expand the function of space, encourage the elderly to participate in spatial activities, strengthen the connection with the space, socialize with others in the interactive process, and improve the sense of social identity and community belonging.

5. Conclusion

This study investigates the age-friendly transformation of public spaces in aging urban communities through the lens of micro-renewal. It establishes a theoretical framework that integrates the spatial, behavioral, and psychological needs of elderly residents with targeted interventions in three domains: circulation systems, landscape environments, and interactive spaces. These design strategies emphasize incremental, low-disruption upgrades that enhance quality of life without compromising existing social fabric. The findings demonstrate that micro-renewal approaches—characterized by small-scale, community-sensitive improvements—can effectively respond to the constraints faced by older urban neighborhoods, including limited funding, spatial rigidity, and complex resident dynamics. By prioritizing human-centered design, the proposed framework addresses both physical safety and emotional well-being, thereby improving the usability, comfort, and inclusivity of public spaces. Moreover, the research reveals the broader implications of spatial renewal beyond functional optimization. Public spaces, when thoughtfully adapted, can serve as critical social infrastructure that fosters interaction, reduces isolation, and supports aging in place. The value of this approach lies not only in enhancing the built environment but also in reinforcing a sense of belonging and dignity among older adults.

In conclusion, this study offers practical and adaptable solutions for aging-oriented community renewal, contributing to both urban design practice and theoretical discourse. It calls for future research to further explore interdisciplinary methods—such as participatory design and smart technology integration—to sustain and scale age-friendly micro-renewal efforts.

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