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Research progress on the impact of community outdoor space on intergenerational activities from the perspective of health promotion

FENG Bo-Wen *

Hebei University of Technology
15022565716@163.com

LIU Hong-ling

MDPI (Tianjin) Technology Service Co., LTD
catboy1123@163.com

LIU Rong-ling .

2020104@hebut.edu.cn; Tel.: 13920969458

* Correspondence: 2020104@hebut.edu.cn ; Tel.: 13920969458

ABSTRACT: Community outdoor spaces are the main places for intergenerational activities and social interactions between older adults and children. In order to understand the elements of spatial environment that attract activities of different age groups and explore the methods of building community outdoor spaces that promote intergenerational activities. This study screened 536 papers published from 2009 to 2023 using WOS and CNKI as the source. Using CiteSpace, this study analysed the dynamics of domestic and international research on community outdoor spaces and intergenerational activities over the past 15 years in terms of volume of publications, institutional collaboration and keyword clustering. The health benefits of intergenerational activity are reviewed in terms of physical activity, emotional cognition and social interaction, and the elements of community outdoor space that influence intergenerational activity are described. It is hoped that the summary of strategies for optimising community outdoor spaces will serve as a reference for subsequent research.

KEYWORDS: intergenerational activities; health promotion; Community outdoor space; review

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1. Introduction

As life expectancy increases and fertility rates decline, population aging and low birth rates have become major social challenges in China and other countries. China's National Health Commission predicts that by 2035, the country will enter a stage of deep aging, with people aged 60 years and above accounting for over 30% of the population[2]. In the context of negative population growth, meeting the physical and mental needs of both the elderly and their children is a significant challenge.

Elderly people and children have similar needs and complementary behaviors in terms of activity, pace, and space. Their companionship provides opportunities for interaction and communication across the generations. Community outdoor spaces are important venues for daily activities and social connections in both groups. These spaces link the families and communities. Research has shown that built environment elements in communities can influence the behavior and lifestyles of the elderly and children[2].

According to Urie Bronfenbrenner's ecological model, human development is influenced by interactions between people and their environments[3]. This model highlights the impacts of environmental factors and their interactions with personal factors. This study provides theoretical support for the selection of the environmental factors related to intergenerational activities. This study focuses on intergenerational activities between the elderly and children. It summarizes the health benefits of these activities and the environmental elements that support them, aiming to create a better community atmosphere for intergenerational interaction.

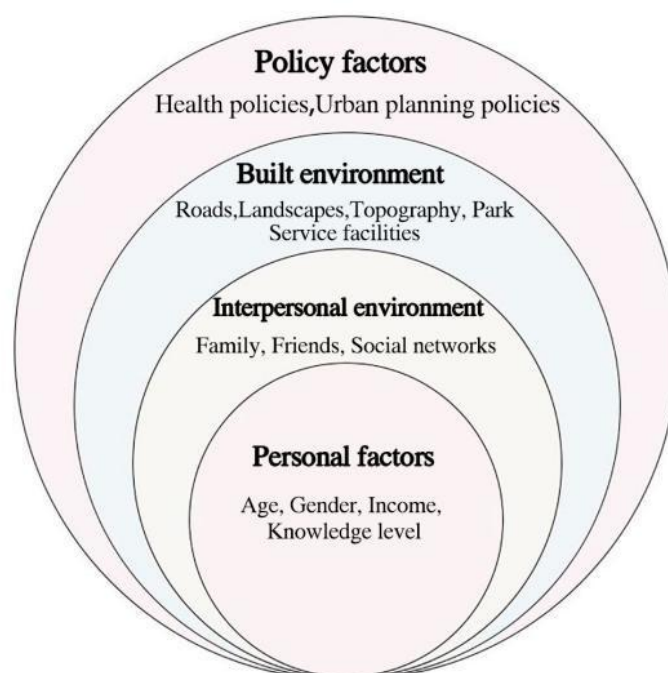


Figure 1. The Socio-Ecological Model (Image source: Adapted from referenced literature).

1.1. Literature Review

1.1.1. Data Sources and Research Methods

This study conducted a systematic literature search using the Web of Science (WOS) Core Collection and CNKI databases. For English literature, the search topics included: ("intergenerational activities" OR "intergenerational participation") AND ("community outdoor space" OR "community built environment") AND ("physical health" OR "well-being" OR "physical activity"), focusing on architecture and urban studies. The search covered 2009-2023, yielding 922 articles, of which 337 were selected after manual screening. For Chinese literature, the search topics were (Intergenerational activities OR Intergenerational participation) AND (Community outdoor spaces OR Community built environment) AND (Physical health OR Physical activity), with the same time frame. This resulted in 248 articles, of which 199 were selected after excluding irrelevant content. Using CiteSpace and Excel, this paper analyzes publication volumes, institutional collaborations, co-citation clusters, and keyword bursts to summarize research trends on community outdoor spaces and intergenerational activities over the past 15 years.

1.1.2. Analysis of Publication Volume and Institutional Collaboration

Figure 2 shows a visual analysis of the search results from the WOS Core Collection and CNKI databases over the past 15 years. The number of articles on community outdoor spaces and intergenerational activities has generally increased both internationally and domestically. Foreign research has shown steady growth, while domestic research has progressed in three phases: few publications from 2009 to 2014; steady growth from 2015 to 2018 with minor fluctuations; and a sharp increase from 2019 to 2022, peaking at 93 articles in 2022. This indicates that research interest in this topic has risen significantly over the past 15 years, with an increasing proportion of Chinese literature.

In terms of institutional cooperation, key institutions publishing English-language research on community outdoor spaces and intergenerational activities include the University of California (USA), University of London (UK), University of Melbourne (Australia), Texas A&M University (USA), and The Hong Kong Polytechnic University (Hong Kong). Notably, the University of California collaborates with 58 institutions, including Emory University. For Chinese literature, leading institutions are Tongji University, Harbin Institute of Technology, Suzhou University of Science and Technology, Dalian University of Technology, and Tianjin University. These form two major cooperative networks centered around Tongji University and Harbin Institute of Technology.

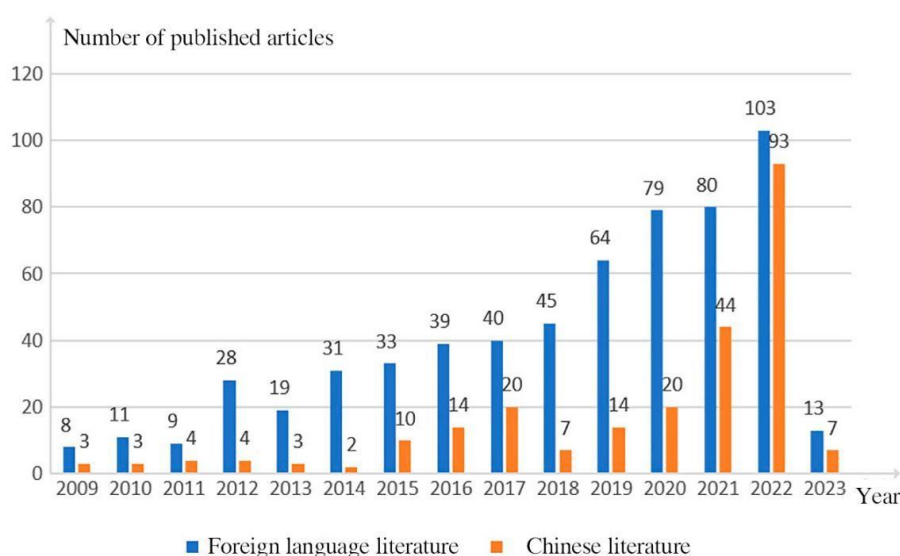


Figure 2. Distribution of Publication Time and Quantity (Image source: Created by the author)

1.1.3. Keyword clustering and keyword emergence analysis

Keyword clustering groups related keywords into thematic categories, while emerging keywords reflect the rapidly changing research trends [4]. Through keyword clustering (Figure 3) and keyword burst analysis (Figure 4) of the Chinese and English literature on community outdoor spaces and intergenerational activities obtained from WOS and CNKI using CiteSpace, it can be known that foreign related research focuses on aspects such as physical well-being, assistive devices, physical activity, and subjective well-being. For example, studies explore the impact of intergenerational activities on mental health and social interactions[5], as well as the design of intergenerational parks to promote physical activity[6]. Domestic research mainly revolves around built environment, aging, intergenerational interaction, outdoor space, and children, with topics like senior-friendly and child-friendly city planning[7-9], and the relationship between built environments and elderly physical activity[10-12].

In the keyword emergence, we can observe that as of 2023, the latest research trends abroad on intergenerational activities and health are focused on resilience and anxiety research. Keywords have shifted from individuals (women, obesity, behavior) and social conditions (mortality, inequality, quality of life) to health-related aspects (prevention, self-rated health, anxiety). In China, the keywords of the past fifteen years of research have been relatively concentrated, centering around outdoor public spaces in urban communities, outdoor activities, and age-friendly environments. The latest hotspots are public health, aging in old residential areas, and intergenerational sharing. Future research themes should be developed from these aspects.

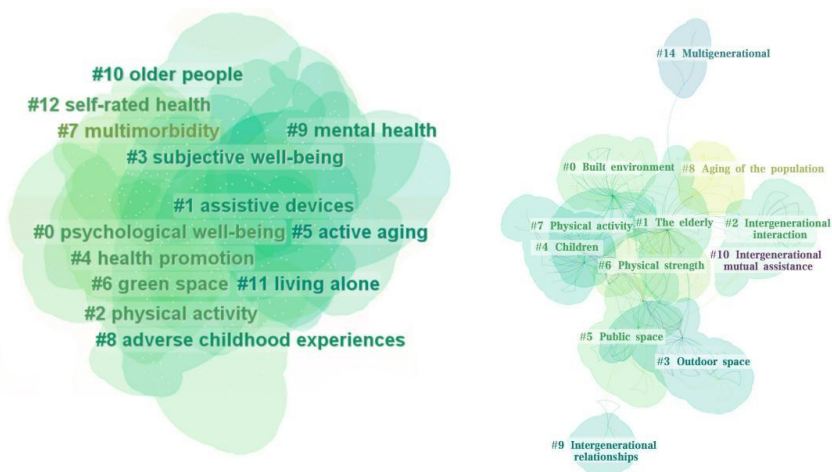


Figure 3. Keyword Clustering of WOS and CNKI (Image source: Self-drawn by the author)

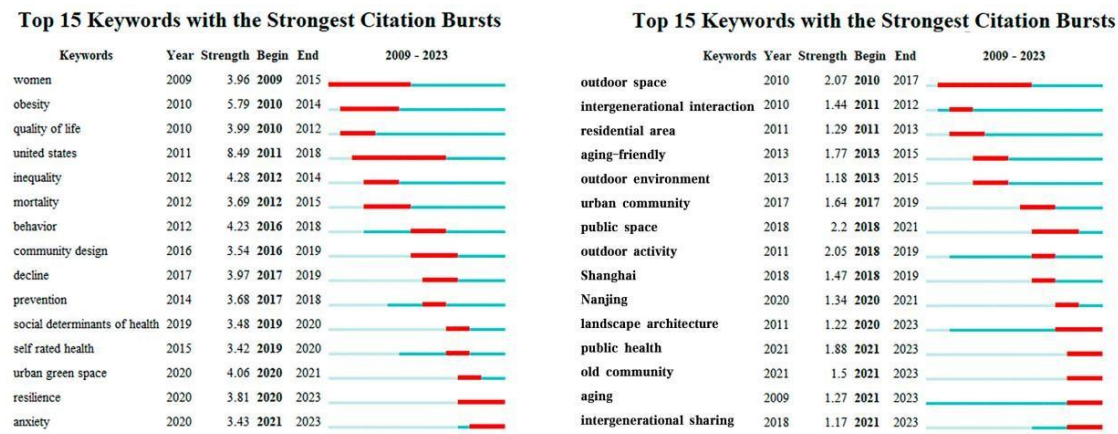


Figure 4. Emergent Keywords in WOS and CNKI (Image source: Self-drawn by the author)

2. Analysis of Research Trends

2.1. Health Benefits of Intergenerational Activities

Common intergenerational activities, such as reading[13-14], playing games[15-16], singing, and gardening[17], involve the elderly and children. These activities can be grouped into three themes: the elderly caring for children, children assisting or visiting the elderly, and collaborative activities between generations. By participating together, they foster companionship and communication. Figure 5 highlights the health benefits of these activities in physical activity, emotional cognition, and social interaction.

2.1.1. Physical Activity

Regular physical activity is a key component for healthy aging, maintaining functional independence, and improving quality of life and emotional health among the elderly. Foreign scholars have found a significant positive correlation between participation in intergenerational activities and the physical activity and functional performance of the elderly, such as grip strength and walking speed[18-19]. Kicklighter and Whitley conducted a family-based nutrition and physical activity intervention with five grandparents raising grandchildren and found that caring for grandchildren helped improve the grandparents' walking activity and nutritional health[20]. Children participating in intergenerational projects have greatly improved their motor skill proficiency, while the elderly have benefited from improved mental health and increased mobility in daily life[5]. A study in Taiwan shows that grandparents who care for their grandchildren can boost physical activity levels for both generations through regular interaction[21]. This intergenerational engagement increases aerobic exercise, benefiting the health of both elderly and children. Insufficient physical activity can lead to obesity and overweight issues in both groups[22-23].

2.1.2. Emotional cognition

As people age and their physical strength declines, the social circle and social connections of the elderly gradually shrink, and family ties become a more important part of their lives. Meanwhile, children are in a crucial period of psychological development and emotional establishment, and they need more guidance and support from their elders. Numerous controlled experiments abroad have found that participating in intergenerational activities can enhance children's proficiency in motor skills and also boost the self-worth of the elderly[24]. A study in South Korea on intergenerational gardening activities showed that such activities can improve the mutual perception between young children and the elderly[16]. Xu Tiefei's research on rural elderly migrants involved in intergenerational care found that while there are negative feelings (such as migration obstacles, role conflicts, and physical discomfort) among rural elderly migrants caring for their grandchildren, they also exhibit a strong sense of achievement and value[25]. Therefore, families and society should promptly address the negative feelings of the elderly, explore their positive aspects from the perspective of positive psychology, and promote their physical and mental health.

2.1.3. Social Interaction

Intergenerational activities can boost social interaction and participation for both the elderly and the young. A pilot project in an Italian nursing home, Let's Re-Generate, found that crafts and personal story sharing help teens overcome age-related stereotypes and improve elderly social engagement[26]. Sakurai et al.'s seven-year follow-up on an intergenerational picture book reading program showed long-term benefits, enhancing elderly cognitive function, physical health, and communication with younger generations[27]. Jia Cangcang et al. found that daily care has a stronger positive impact on elderly health than emotional support alone[28]. Thus, intergenerational activities foster social connections and enhance the well-being of the elderly.

Crowd	Physical activity	Emotional cognition	Social interaction
The elderly	• Increase walking and aerobic exercise • Enhance the mobility of daily activities • Improve physical function levels • Enjoy sports activities	• Enhance self-esteem and motivation • Boost self-worth and a sense of Achievement • Gain positive emotions • Reduce feelings of isolation • Enhance the ability to cope with physical and mental illnesses	• Reintegrate into family and community life • Share experiences with audiences who appreciate their achievements • Establish friendships with children or young people • Learn social skills and use new technologies • The dissemination of traditions, cultures and languages
Children	• Increase walking and aerobic activities • Improve proficiency in motor skills • Reduce the possibility of obesity or being overweight	• Better regulate emotions • Increase confidence, become more optimistic • Reduce feelings of loneliness and isolation • Enhance empathy skills	• Enhance children's communication skills • Improve children's perception of the elderly • Increase learning about history and traditional culture • Replace bad habits such as long-term screen time with leisure activities

Figure 5. Summary of the Health Benefits of Intergenerational Activities(Image Source: Author's own illustration)

2.2. Community Outdoor Space Elements Influencing Intergenerational Activities

This article summarizes existing literature on how community outdoor spaces influence intergenerational activities, categorizing the spatial elements into two main types: physical and perceived environment elements. The physical environment includes spatial layout, roads, greenery, and public facilities. The perceived environment refers to the elderly and children's subjective feelings about the space, such as its accessibility, safety, and natural aesthetics.

2.2.1. Physical Environment Elements

1. Spatial Layout

Intergenerational activity spaces should accommodate both interaction and intimacy for the elderly and children. These spaces should include semi-private areas within community outdoor spaces[29], allowing users to enjoy both intergenerational activities and private, tranquil moments[30]. Classic models abroad include Germany's "Multigenerational House" and Japan's "Toyama Type" facilities[31]. Domestic research recommends placing these spaces in areas where the elderly and children naturally gather, such as community green spaces, street corners, school routes, and group green areas[32]. Shu Ping found that small, directed, semi-private shared spaces with open seating promote intergenerational interaction. Based on the psychological and behavioral needs of the elderly and children, she identified two types of outdoor spaces: "one-to-one" and "many-to-many"[33].

2. Walking Paths

Leisure walking is a common intergenerational activity. A cross-sectional study in Austin, Texas, found that community streets, sidewalks, and street connectivity are key factors for elderly participation in intergenerational interaction and walking[34]. Sidewalk length, width, intersection density, and the availability of benches positively correlate with higher participation. Benches along roadsides encourage more leisure walking among the elderly[35]. A survey in Queensland, Australia, showed that well-maintained, non-slip sidewalks and barrier-free road systems support users of all ages and enhance intergenerational activities[6].

3. Landscaping

The natural environment promotes the development of children's visual, tactile, auditory, and olfactory senses. A well-designed outdoor landscape encourages intergenerational activities between the elderly and children. In communities, these activities often occur in front-of-building green spaces, community squares, and central parks. A survey in Shenzhen found that trees, water features, lighting, and accessible lawns are key elements that attract people to open spaces[37]. Sinan Zhong's research shows that a large tree canopy, nearby water bodies (such as lakes, rivers, and ponds), and parks close to water increase the likelihood of intergenerational interaction[32].

4. Public Facilities

The quality of community public facilities directly affects the satisfaction and activity levels of the elderly and children[38-39]. Key factors include the density of service facilities like washbasins, toilets, and seating, the coverage of lighting systems, and the clarity of guiding signs, all of which promote intergenerational interaction. Song Jusheng's research shows that integrating facility types with activity spaces guides outdoor activities for the elderly[40]. Adding fitness, functional, and shelter facilities attracts more elderly participation[41]. Combining auxiliary facilities with activity areas creates directional activity spaces. Public facilities with integrated functions, natural materials, and clear layouts enhance intergenerational activities[28].

2.2.2. Physical Environment Elements

1. Accessibility

Several studies have confirmed a significant correlation between community walkability and accessibility and the social interaction and intergenerational participation of the elderly[42-43]. The elderly and children face challenges with independent travel, making scattered community facilities less attractive for their participation. Li Xinyang's survey shows that the elderly and young prefer activities close to home, often gathering in front porches[44]. Tan Shaohua's research indicates that low road network density, numerous dead-end roads, and poor street connectivity limit community walking activities[45].

2. Safety

According to Maslow's "Hierarchy of Needs", physiological and safety needs are the most fundamental requirements for people. When engaging in outdoor activities, safety is also one of the top priorities for the elderly. Domestic research shows that the elderly and children often gather around the building lobbies, where the surrounding residents can visually supervise the environment, making the place relatively safe. Other studies indicate that safety hazards in activity spaces are also factors that affect intergenerational activities among the elderly and children. For instance, there might be people playing ball games or skateboarding, plants with sharp leaves and poisonous thorns, and uneven ground with numerous steps. Residents who feel unsafe in their communities tend to reduce outdoor activities and social interactions, which can lead to poorer health conditions[46]. In contrast, when residents have frequent communication with their neighbors and a strong sense of neighborhood attachment, they are more likely to receive solid emotional support and it is more conducive to the recovery of their physical and mental health[47].

3. Natural Aesthetics

Community green spaces, including parks and gardens with natural vegetation, improve residents' mental health by reducing stress and depression. Domestic surveys show that the elderly and children prefer activity areas with ample sunlight, dense greenery, and shade. Liu Xiaofang's research indicates that park landscape elements significantly influence people's willingness to visit and their activities in parks. The interaction between perceived landscape elements and perception types creates an environment that meets various needs of the elderly for outdoor activities[48]. Landscape comfort enhances the elderly's engagement and enjoyment of outdoor activities. Chen Xiaowei's study highlights that the elderly's participation in landscapes is driven by environmental attractiveness, such as enjoying beautiful scenery and accessing natural elements like water bodies, grasslands, and flowers[49].

2.3. Community Outdoor Space Elements Influencing Intergenerational Activities

Based on the activity characteristics of intergenerational activities, this paper summarizes three optimization strategies for community outdoor activity spaces (Figure 6) based on existing literature.

2.3.1. Create Spaces with Rich Experiences for Intergenerational Activities

The layout of the intergenerational activity site should promote shared activities while providing private spaces for those who prefer quietness. Multi-functional facilities, such as rest areas that double as climbing toys, can efficiently meet the diverse

needs of both elderly and children. The use of varied colors, textures, and shapes in paving and facilities creates multi-sensory experiences for residents of all ages.

2.3.2. Focus on Detailed Design of Service Facilities

Encourage universal design to enhance accessibility in activity spaces. Improve the community's slow-moving system with flat, comfortable walkways for easier travel and interaction for the elderly and children. Install various seating types: enclosed seats for elderly socializing and open seats for supervising children. Provide storage spaces to free the hands of caregivers, facilitating comforting and accompanying activities. Distribute fitness and game facilities widely to prevent overcrowding and improve usage efficiency.

2.3.3. Create a Natural, Pleasant Environment for Intergenerational Activities

Natural elements like sand, wood, stones, and water should be integrated into community intergenerational activity spaces to enhance sensory appeal. Plant selection should consider seasonal changes and visual comfort for all ages while avoiding plants with thorns or allergy risks. Natural greenery should provide shade, divide spaces, and balance enclosure and openness. Community gardens and vegetable plots also promote intergenerational activities by allowing the elderly and children to garden together, beautifying the environment and fostering a love for nature.

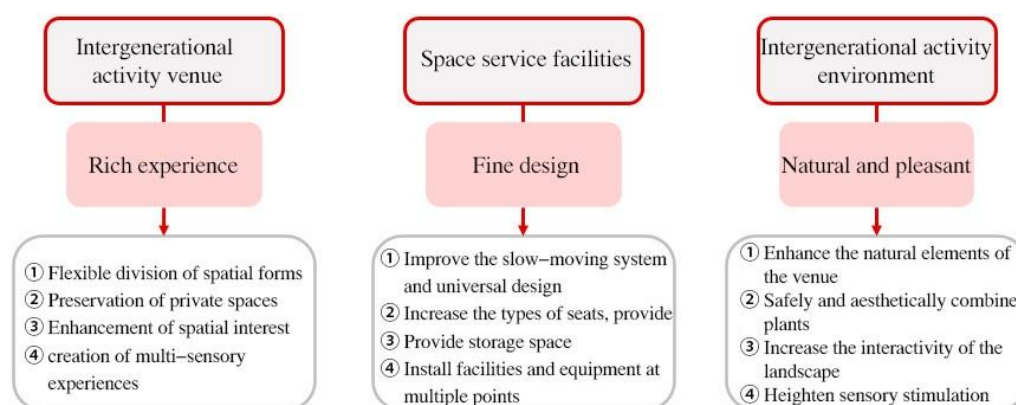


Figure 6. Summary of Intergenerational Activity Characteristics and Site Optimization Strategies(Image Source: Self-drawn by the author)

3. Conclusion and Insights

This article reviews the health benefits and influencing factors of intergenerational activities in community outdoor spaces over the past 15 years using CiteSpace. It visually presents publication trends, disciplinary distribution, countries, research institutions, keyword analysis, research directions, and current status. The number of related studies has increased annually, forming a multi-disciplinary intersection including architecture, psychology, environmental landscape, and geriatrics. Foreign institutions collaborate closely, while domestic cooperation needs improvement.

The article summarizes the wide-ranging health benefits of intergenerational activities for the elderly and children, such as improved physical health, emotional cognition, and social interaction. Key elements promoting these activities include physical and perceived environment features in community outdoor spaces. Most studies have evaluated the health outcomes of intergenerational projects with varying scales (from tens to hundreds of participants) and follow-up periods (from one month to nearly ten years). Research locations often include primary schools, nursing homes, and community centers. Assessment tools used include video analysis, field notes, focus groups, and scales. Despite differences in study design, intergenerational activities

consistently show positive short- and long-term health impacts, reducing age discrimination and social isolation, increasing physical activity, and enhancing self-esteem and social connections.

Current research on intergenerational activities primarily focuses on developed countries like Europe and America, typically in indoor settings. Future studies should extend to regions with diverse social, cultural, and economic backgrounds and explore the health benefits of outdoor intergenerational activities. Foreign research emphasizes interactions between non-family members, while Chinese studies often focus on family-based interactions between grandparents and grandchildren. To optimize foreign evaluation methods for local contexts, research and experiments need to be adapted to fit domestic community conditions. Reviewing international and domestic research on how community outdoor environments promote intergenerational activities enhances our understanding of physical and perceived environmental elements. Future research should confirm the impact of these elements and their interactions on intergenerational activities and conduct more empirical studies to identify effective environmental interventions.

Age-friendly and child-friendly designs have long been key themes in global urban planning and community renovation. Outdoor spaces that support intergenerational activities leverage the similarities and complementarities between the elderly and children, encouraging social interaction across age groups, improving health outcomes, reducing social isolation among the elderly, and promoting active aging. In China, where rapid population aging and low fertility rates are prevalent, creating community outdoor spaces for intergenerational activities provides a social environment outside the family, fostering intergenerational communication and enhancing community cohesion and inclusiveness.

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