

Research on the "Elderly-Friendly + Child-Friendly" Multifunctional Design of Pocket Parks in Urban Aged Residential Areas

Chenxi Wang

Shenzhen General Institute of Architectural Design and Research Co., Ltd., Hefei Branch, Hefei, Anhui, 230000, China

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Abstract: With the development of urban renewal toward deepening, while gradually prominent population aging and low birth rate trend, This paper takes Urban Aged Residential Area as study object, it is faced with problems of poor public space situation, backward facilities and single functions. Pocket parks serve as unique, highly efficient public spaces and are becoming increasingly important for the regeneration of urban centres. The subject of this research is the multifunctional design of pocket parks in urban aged residential areas and emphasizes the concept called "Elderly-Friendly +Child-Friendly". Based on retrospective analysis of the development status and difficulties, theoretical demonstration of the concept for multifunctional design, and a combination of representative domestic case studies, this study proposes basic strategies in four aspects: Age-Friendly Spatial Layout Design Dimension; Intergenerational Integration Functional Configuration Dimension; Perceptual Experience Landscape Design Dimension and Universal Accessibility Ensuring Safety. The research shows that the "Elderly-Friendly + Child-Friendly" multifunctional design may not only improve spatial quality of aged communities but also encourage generations to interact and energizing vitality in communities, which is of great significance for urban development.

1. Introduction

With the further deepening of the urbanization process, listening more to residents' voices and taking action in house refurbishing and neighborhood renewal becomes necessary to better upgrade cities with higher quality and promote people's well-being. Due to their small scale, adaptability and proximity to daily life, pocket parks have been found as a solution of the public space dilemma in these settings. Yet many pocket park designs, similarly to gray parks, have a "one-size-fits-all" standardized approach that does not recognize differing needs among user groups of all ages—most notably the elderly and children. With deep demographic changes there comes a challenge in creating pocket park designs to reconcile, in the same small urban space, leisure and wellbeing for seniors with play and growth for children so we may create public places where people of all generations choose to congregate.

2. Development Status and Challenges of Pocket Parks in Urban Aged Residential Areas

Despite this enormous lure into urban aged residential areas, they face many practical challenges in developing pocket parks. The most illustrative challenge is that of a deep-seeded tension between finite space capacities and unprecedented spatial function diversification. This tension appears not only in terms of how much space there is, like Amsterdam getting narrower for cars as the population grows and more people want to cycle, but also with regard to a fundamental question of efficiently meeting different age groups needs, when many age groups have divergent needs within that same space.

2.1 Contradiction between Limited Spatial Resources and Diverse Functional Demands

In the 1980s and 1990s, aged urban residential areas (Example of a case study Aged Urban Area

with low greening rates. Aged urban residential area with generally high building density, low public space supply and poor greening rate due to outdated planning concepts and construction standards not useful for the current needs of urban living ^[1]. Average per capita public activity space in many Chinese aged communities is less than 2 square meters, which totally fails current standard. However, in this case constructing pocket parks comes down to strung up a precarious method for "performing elaborate rituals in tiny spaces" (in other words; maximizing function within limited confines). Designers must meet the space requirements of residents in every age group with maximum limited area that also satisfies multiple other functional designs like environmental beautification, ecological improvement and social interaction. Seniors need comfortable lounges and exercise facilities they can access, and pedestrian-friendly places. Kids need places to play, various types of activity equipment and natural exploration areas. While middle-aged and younger adults look for spaces with a mix of fitness, social interaction and parent-and-child activities. This diversity and differentiation of functional needs collide with those banal spatio-temporal congealments, that render functional zoning models ineffective.

2.2 Imbalance between Monotonous Facility Configuration and Diverse User Groups

One of the most fascinating trends within existing pocket park renovations in an aging community is attentiveness to form over function. The Facility configuration is relatively uniform and shallow. For instance, standardized fitness equipment, almost identical benches and basic crayon-like slides for kids are all common installations. Even though these represent a certain level of minimum requirements, they more so do not take into account the variations in physiological traits and psychological requirements, as well as user behaviour profiles across different groups. Most facilities for the elderly do not get designs based on their specific needs like ideal handrail height, seat depth and activity intensity. Fun factor, challenge and age group differentiation that particularly badly affect children's facilities. However, importantly for the design of contemporary facilities, current configurations largely tend to be segregated—separating elderly and child activity zones without any wayspace or spaces that could promote intergenerational communicativeity.

3. Theoretical Basis of "Elderly-Friendly + Child-Friendly" Multifunctional Design

The multifunctional design of "Elderly-friendly + Child-Friendly" is not just random but based on a solid theoretical foundation. In contrast, the Age-Friendly City concept provides not only a theoretical support as well as valuable orientation for this design practice but is also an important scientific realization at the micro scale in optimizing spatial integration across age groups.

3.1 Spatial Practice of the Age-Friendly City Concept

The Age-Friendly City approach discusses that urban areas must be listened for generations by and for all ages, from babies to the elderly population with an inclusive, fair and sustainable way of living ^[2]. Emerging from the WHO and UNICEF (through the Age-Friendly Cities and Child-Friendly Cities initiatives respectively), this idea has - in practice- developed into a more overarching Age-Friendly approach. Age-Friendly Age-Friendly in pocket park design is the dismantling of intergenerational segregation and provision of equitable, inclusive public open spaces. As a micro-scale manifestation of this design principle, the "Elderly-Friendly + Child-Friendly" multifunctional design is not simply about separating the elderly area and children's area. It organizes spatially clever scenarios of grandparent-grandchild enjoyment and intergenerational interaction, facilitates organic functional integration, and includes universally designed facilities. This idea acknowledges that the elderly and children differ in their physical capabilities and mental function but not so much when it comes to emotional needs or social drives.

3.2 Spatial Demand Analysis from an Environmental-Behavior Perspective

Studies on Environmental-Behavior confirm that humanbehavior patterns are influenced by spatial environments and there is age-based variation in behaviors exhibited during space utilization. The elderly activity in public places tend to be static (resting, viewing, chatting) therefore they

would benefit greatly from comfortable seating areas, shade and proper visibility. Because social need is so intense and because people of all ages want their environments to be familiar with their neighbors talking to one another, places that create a sense of belongingness and security are needed. Children mainly exhibit dynamic exploration—cognizing their surroundings, developing skills and acquiring social skill through play. They need stimulating, exciting play equipment, a variety of places to do things and clear access to nature. Importantly, they are often accompanied by caregivers, so multi-use rest areas near the play elements (Supervision + Rest).

4. Design Strategies for "Elderly-Friendly + Child-Friendly" Multifunctional Pocket Parks

Drawing on the above theoretical interpretations and functional demands, this research puts forward a systematic design route integrating four aspects, with multi-levels and multi-angles to achieve functional integration as well quality improvement. The Age-Friendly spatial layout is the Primary strategy that sets up the base for organizing spatial configuration.

4.1 Age-Friendly Spatial Layout Design

A mixed-use approach is supported by the Age-Friendly spatial layout, which emphasizes creating places to conduct diverse types of activities for aged people and their different age groups on a limited site in flexible compositional organizations^[3]. Instead of collecting all functional zones, it gives up traditional functional zoning for a "core-periphery" spatial structure. The notable placement of functions is centred to represent those with high sharing potential, while group specific functions are positioned peripheral to the central node. Clever circulation design manages separating dynamic/static zones and visual permeability. Also, a time-sharing strategy allows the same space to be used for different groups at different times (eg morning exercise seniors in the same location as a children play area in the afternoon)Effectively enabling temporal complementarity. Moreover, designing multi-functional 'transitional gray spaces' (i.e., pergolas, pavilions) act as sheltered rest areas for the elderly in addition to fun where children can play hide-and-seek with positive co-benefits.

The case is Shanghai Lexingtong Green (Lexington Green) renovation. The spatial backbone of the project is an 80-meter long "People's Joy Corridor" in which a large-span lightweight structure is applied to enhance visual permeability and create unimpeded flow inside and outside the corridor. The under-corridor space intelligently accommodates public resting areas, co-reading spaces and such green space management rooms to cater for the wide-ranging ambitions of the local needs i.e. communal recreational or local community concerns. Focusing on the "Source of Joy" community stage — shared fitness studios and children's play spaces spill into parkland. The 400-meter circular slow-run path naturally connects the spaces outside, underneath and inside of the corridor, presenting a multi-age friendly spatial pattern for exercise across all ages and activity levels.

4.2 Intergenerational Integration in Functional Configuration Design

The intergenerationally integrated functional configuration concerned with constructing the shared facilities and activity scenarios for different age groups interacting with one another. It maximizes spatial efficiency by means of overlapping, transforming and complementary functions. Shared Priority, Dedicated Supplement: This strategy focuses on building facilities that can support multi-generational usage at the same time. At the same time, the installation of "Grandparent-Grandchild Fun" play equipment such as a mild climbing structure, swing seats and interactive fitness machines encourages senior citizens to participate in children's play, allowing bonding through companionship. Second, to use smart and technological methods (such as interactive projection, musical floor, sensor light), to create new and fun experiential scenes, triggering intergenerational participation in the common joy of "old people happiness + young improve" mutually beneficial situation.

Shenzhen Shenwan Neighborhood Park is a good example of the consideration of multiple functional needs. In this project, it is used that wind-powered rainwater garden system pumping up stored rainwater into an aqueduct bridge to create a network of self-circulating water features. The

dynamic waterscape not only provides an ecological educational aspect, inspiring children to be curious and explore the world around them, but also visually pleasing scenery for elderly people. A 320-meter slow running path traverses groves of golden trumpet tree and miscanthus grass communities constructed from permeable concrete supplying a common interface between community walkers, joggers, elderly strollers, children cyclists and younger fitness runners. Although the skate park is mainly focused on youth, its fair-faced concrete textures and flowing curved forms also form an attractive vantage point for the elderly or an intriguing play backdrop for children delivering functional diversity and sharing.

4.3 Perceptual Experience in Landscape Design

Perceptually-driven landscape design encourages the stimulation of multiple senses to create diverse and rich spatial experiences for people ranging from toddlers to seniors that fosters a sense of emotional resonance and place identity. This method takes deep consideration of the perceiving characteristics of elderly and children. Old adults can take a hit with impaired vision/hearing, but the emotional resonance to environment is more thematically complicated: they love things that are familiar. As children are very sensitive to color, sound and touch, they tend to be attracted to new fun environment elements. So in the case of plant selection, we choose plants that can provide seasonal interest (flowering, foliage, form) and are scented flowers and interesting fruit-bearing—we have flowering in spring, shade in summer, color in autumn and even structure for frost during winter—a poem for old people and natural education for children.

Shanghai Yongjia Road Pocket Plaza (Yongjia Road Pocket Square) A unique landscape design. Design elements resonate with the historic memory of the old city and create familiarity and belonging for older residents—during construction, permeable paving bricks were even used in red similar to those on existing pavements. Using light-colored timber in beams, soffits, and seating systems contributes to the warm tactile quality that invites children to climb and touch safely. Weathering steel walls exhibit rust-red patina, functioning as "time textbooks" to the education users. In particular, steel columns are painted with bright green fluorocarbon paint—a lively color that embodies the spirit of a jumping frog, indulging children and bringing vitality to the space while allowing seniors to be rejuvenated by sensing the taste of life.

4.4 Universal Accessibility Design Ensuring Safety

Designing for universal accessibility is the basic guarantee of pocket parks which really are Age Friendly. It wants us to reflect in a painstaking way on the mobility restrictions within which older people operate and on the safety necessities of children so as to break down obstacles and reduce dangers. Examples include:

Aged: Gentle ramps instead of steps; continuous handrail systems; sufficient lighting for wheelchair/walker barrier-free entry; seat designs that allow easy sitting and standing (height, backrest angle, armrests); non-slip, durable ground materials to prevent slips in wet weather.

Play Equipment meets safety standards Soft ground surfaces (to cushion falls) Rounded corners/edges Injury free 5 Railings around activity zones with sightlines available for caretaker

One of which is embodied in the concept of retrospective renovation and its application on the renewal project Shanghai Changli Garden (Changli Yuan). A zigzagging path acts as a spatial skeleton for the project. All paths include barrier-free ramp design with slopes lower than 1:20 to allow smooth travel by wheelchair and stroller. A portico runs along the same way with alternating in and out movements. The spacing and height of pillars offers judiciously calculated shading/sheltering to people without physically obstructing movement too, while also giving rest stops for the elderly. For example, children's play area is provided with coloured rubber surfacing that has high shock absorption property for controlling injuries due to falls. The lighting uses timed zoning control, which ensures both safety for undertakings in the evening and creates an inviting environment.

5. Conclusion

The innovative and social governance concept of the "Elderly-Friendly + Child-Friendly" multifunctional spatial pattern in urban aged residential areas elaborately constructed through "Age-Friendly" in spatial layout, Intergenerational Integration in functional configuration, Perceptual Experience in landscape design and Universal Accessibility ensuring safety. This is an important exploration with respect to demographic transitions and community quality-of-life improvement. In the future, urban renewal progresses and the synthesis design of pocket states will grow theoretically more profound, technologically ingenious and institutionally elaborate. We expect to see more design habits adapting local circumstances and executing fine policies with every city of pocket park as a "Pocket of Happiness" sharing new vitality within sustainable urban development through better life contents shared by people.

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