

Key Points in Planning and Design of Residential Communities Based on All-age Communities

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Abstract. Based on the trend of ageing in China and the social background that more and more families have inter-generational parenting, researchers have found that the original community planning and design can hardly meet the needs of people of all ages, especially the old and young, so the concept of all-age communities has been proposed. However, the concept of all-age community is a new and big concept, and there is still a lack of unified perception. Using three residential communities in Guangzhou as objects, this paper investigates the physical and mental characteristics, behavioral characteristics, behavioral needs, spatial location and design of existing communities for the elderly and children through literature research, field surveys, interviews and behavioral observation to explore design strategies for all-age communities, which are important for improving the quality of life of the elderly and children and meeting the needs of people of different ages. It is important to explore the design strategies of all-age communities to improve the quality of life of the elderly and children and to meet the needs of different age groups.

Keywords: Neural Network, Prediction Model, Big Data.

1. Introduction

Since China entered an ageing society in 1999, the phenomenon of population ageing has continued to increase. According to the communique of the 7th National Population Census in 2021, the population aged 60 and above reached 264.02 million, accounting for 18.70% of the total population; compared to 2010, the proportion of people aged 60 and above rose by 5.44% [1]. In 2050, China's ageing will reach its peak, with the population aged 65 and above accounting for 27.9% of the total population in China [2]. On the other hand, in August 2021, a meeting of the Standing Committee of the National People's Congress voted on a decision to amend the Law on Population and Family Planning. The amended Law on Population and Family Planning stipulates that the state advocates marriage and childbirth at an appropriate age, preferential births and that a couple can have three children.

The proportion of second and third births in the total birth population is increasing year on year, and most families in China are now structured in the "421" and "422" forms [3]. Because the children's parents need to work, and because the health of middle-aged and older people in cities continues to improve, and because most grandparents are physically and temporally capable of raising third-generation children, more and more families are choosing grandparents to be involved in the care of their children as they grow up. According to a 2014 survey by the China Centre for the Aging, 60-70 per cent of children aged 0-2 years are mainly cared for by their grandparents, with 30 per cent of children being completely cared for by their grandparents. Even after the age of three, about 40 per cent of children are raised directly by their grandparents when they attend kindergarten [4]. It is clear that the phenomenon of "inter-generational parenting" is becoming more and more common and has become the main mode of child care for families in China. There are new demands on the planning, design and construction of residential community childcare facilities for the elderly.

This paper was conducted through literature research method, fieldwork, interview and behavioral observation (timed and fixed). It mainly focuses on low and middle-aged elderly people (60-80 years old), senior elderly people (over 80 years old) and preschool children (1-6 years old) and school-aged children (7-12 years old), analyzing their physical and mental characteristics, activity characteristics and behavioral needs, summarizing the needs of the old and young groups for community functions, and proposing design strategies for shared public spaces for the old and young in the community.

2. Method

International research on the topic of inter-generational interaction between the elderly and the young has been conducted from various perspectives, including psychological [5], behavioral [6], sociological [7] and pedagogical , it has been proven that inter-generational interaction between the elderly and children can enhance mutual understanding and recognition through emotional expression, knowledge transfer and discussion of cultural values, which can have a positive impact on bridging the inter-generational gap and promoting the psychological health of the elderly and young people. Inter-generational interaction can also develop positive and optimistic attitudes towards life through activities and care of the elderly and young people together. Inter-generational interactions can also contribute to the physical health of the elderly and young people through the formation of positive attitudes towards life through activities and care for each other. Based on the positive effects of inter-generational companionship on the health of young and old, the concept of "age-friendliness" proposed by the World Health Organization (WHO) and "child-friendliness" proposed by the United Nations Children's Fund (UNICEF) has been developed. "The concept of 'age-and child-friendly' has evolved from the WHO's 'age-friendly' concept and UNICEF's 'child-friendly' concept to advocate that cities should provide age-friendly public spaces that support inter-generational companionship and inter-generational mutual support, in order to promote urban equity and enhance the health and well-being of the elderly and the young.

The author chose 7:00-21:00 every day for one week, with each two hours as a time period, to observe the behavior of the old and young in three residential communities in Guangzhou, interviewing the needs and intuitive feelings of the old and young groups towards the community space, and recording their behavior and location in each time period to clarify the characteristics of their behavior types and the relationship between their behavior and the space [8]. The characteristics and needs of older people and children are summarized in Table 1. Two kinds of persons have similarity and difference in the above five aspects, as seen in Table 2.

Table 1 Characteristics and needs of older people and children

Older people	Physiological characteristics	Easily fatigued, unable to exercise vigorously, decreased self-care ability, decreased resistance, decreased adaptability.
	Psychological characteristics	Decreased memory, prone to negative emotions, sensitive, desire for affection, need to realize values, likely to have common interests with peers, seeking a natural environment, health conscious cautious.
	Behavioral characteristics	Needs to rest, mostly static activate, slow movement, most take on child-rearing roles, likes flowers, birds, trees and other natural environments, more ways to exercise, gathering of peers, geographical, temporal, socially active.
	Type of activity	Chess, fitness, chatting, reading, painting, planting.
	Space needs	Fitness facilities, safety and security, good accessibility, engagement, interaction, rest facilities, natural space, gathering and communication.
Children	Physiological characteristics	easily fatigued, poor coordination, poor self-care ability, temperature sensitivity, low adaptability, smaller in size than adults.

	Psychological characteristics	Thinking skills Immature, emotional, sensitive, dependence on parents, good at imitating and learning, likes to interact with peers, referring natural elements, likes to explore adventure, play.
	Behavioral characteristics	Needs parental supervision, dynamic activities, multiple play styles, highly malleable, strong learning ability, active and dynamic, needs care, aptitude for imitation, likes sand, flowers, birds, trees and other natural environments, gathering of the same age, temporal, uncertainty.
	Type of activity	Games, reading, painting, planting, exercise, chatting.
	Space needs	Play facilities, engagement, gathering and communication, natural space, sports facilities, good accessibility, safety and security, rest facilities.

Table 2 Similarities and differences in the above five respects

	Similarities	Differences
Physiological characteristics	Easily fatigued, poor coordination, poor self-care ability, low immunity, low adaptability.	Different sizes.
Psychological characteristics	Poor cognitive skills, emotional, sensitive, desire for affection, complementary and dependent on each other, needs peers, preferring nature.	Older people like to be settled emotional, children like fun and changeable.
Behavioral characteristics	Variety of activities, interacted with each other, aggregation at the same age, close to nature gathering activities, get involved in the experience.	Static activities for older people, dynamic activities for children, different roles, older people tend to teach, children tend to learn.
Type of activity	Reading, drawing, gardening, exercise, chat.	Older people prefer light to moderate exercise, children enjoy creative play, more intense sports.
Space needs	Facility security, interaction, engagement, natural fun, gathering and communication, easy access, safety and security, rest facilities.	Fitness facilities for older people, children like play facilities.

3. Results

3.1 Out-door activities for the elderly

Outdoor activities for the elderly are characterized by time of day, locality, social interaction and gathering at the same age. The main activity times are between 9:00 and 11:00, 15:00 and 17:00, and 19:00 and 21:00, and the activity space is mainly indoors and outdoors. The most frequent activities

of the elderly are walking, sunbathing, sitting, chatting, chess, reading and other activities that do not require a good level of physical fitness, i.e., static activities of all kinds. The most frequent activities for the middle and lower age groups are, in order of frequency, communication, recreation and leisure activities, with recreation and leisure activities being mainly light to moderate activities and leisure activities being mainly hobbies.

3.2 Out-door activities for the children

Children's outdoor activities are characterized by the time of day and the gathering of their peers. Preschool children are active between 9:00 and 11:00, 16:00 and 19:00, and 20:00 and 21:00. They are active, enjoy creative play, and are dependent on their parents for their activities and are often supervised by older people, so their activity times are consistent with those of older people. School-age children's activity times are mainly between 16:00 and 19:00 and between 20:00 and 21:00, with a variety of behavioral types, the highest proportion of which are educational and physical activities. Educational activities are aimed at learning in advance and developing hobbies and interests, mostly in indoor recreational learning spaces. Physical activities are mainly sports, including but not limited to running, cycling, scooters, badminton, basketball, swimming, etc.

3.3 The current situation of community activity spaces

For indoor activity spaces, most are designed separately and built separately to serve only the elderly or children's side. For outdoor activity spaces, as many communities generally lack separate activity spaces designed for children, there is a basic overlap of activity spaces for the elderly and children, with flat and open spaces being the most frequently chosen by the elderly and children. Older people's activities tend to take place near various facilities, such as fitness facilities and rest facilities, while children are concentrated near play facilities or in the middle of spacious areas.

A statistical study of the factors affecting outdoor activities for the elderly and children and their needs for facilities shows that safety, weather, landscape and accessibility are the main factors affecting outdoor activities for the elderly and children. Due to Guangzhou's hot and rainy climate and the long summer months with more mosquitoes and insects, the elderly and young people are more sensitive to temperature changes and less resilient to hot weather, so they have a high demand for shade, seating and insect repellent facilities. They also have a high demand for public toilets as they spend more time outdoors in a single visit.

4. Discussion

Based on the above analysis of the current situation and needs of the elderly and young people, the design strategy of shared public spaces for the elderly and young people in urban residential communities is proposed. Based on whether the space can be shared between the elderly and the young and the degree of overlap between the activities carried out in the space, the space planning and design is divided into the following four categories: community commercial space, indoor recreational and learning space, outdoor activity space and public support space.

4.1 Community commercial space

For commercial service facilities, the basic requirement of residents for their community is to have their needs met in the most convenient way possible. Here is a need to meet the convenience needs of residents [9]. The commercial space contains a range of necessary activities for older people such as dining, shopping and accessing money, and is also one of the most frequent places for necessary activities in the community for other age groups. In an all-age community, the accessibility of such commercial spaces for older people is the bottom line of the design requirements, and by locating such spaces mainly at the edge of the community, it is possible to meet the needs of all groups of people for such spaces.

4.2 Indoor recreational learning space

4.2.1 Reading room

This is a place for static activities such as reading books and newspapers for all ages in the community, and requires a high degree of quietness. It was also found that the majority of respondents responded that the sound of storytelling and children running around would cause disturbance to other people. This paper recommends that the reading room be divided into four sections: a childrens area, an adult area, a transition area and a reading area. The childrens and adult areas are both quiet reading spaces, with a difference in seating height between them, and are arranged in parallel to facilitate parental supervision of children. The reading area allows for sound for children who need to be accompanied by their elders, and the transition area separates the sound area from the silent area to reduce noise.

4.2.2 Culture room

The culture room can be connected to the reading room and the outdoor space. The Culture Room is usually used for activities such as calligraphy, painting, crafts, lectures, etc. The atmosphere of use is variable and can be quiet or lively, making it suitable for the transition between the reading room and the outdoor space.

4.2.3 Multi-purpose room

The multi-purpose hall is not suitable for use in close proximity to quiet facilities. Singing is a popular leisure activity for older members of the community. However, singing can be noisy and unless the room is well insulated, it is recommended to keep a distance from quiet facilities.

4.2.4 Chess room

Chess is also a common recreational activity for middle-aged and elderly people, but it may involve gambling, etc., which can have a negative impact on the development of young people, so it is recommended that the chess room be separate from the childrens facilities and kept at a distance from the childrens activity space [10].

4.3 Outdoor space

The elderly and children spend most of their day in the community and have a high demand for outdoor public space and neighbourhood interaction. The outdoor space is close to nature and has a wide variety of activities, so we need to plan and design it to meet the needs of both the elderly and the children.

4.3.1 Additional activity facilities for the elderly and children

Most of the existing fitness facilities are designed for adults [11]. As the size and material of fitness facilities can easily pose safety hazards for children, it is advisable to add fitness equipment and play facilities that can be used by children to the design of community outdoor spaces, in addition to increasing the number of fitness facilities suitable for the elderly. The facilities can be designed to be functionally diverse, compounding the needs of the respective functions of the old and young groups and integrating multiple ways of sharing between the elderly and the elderly, children and children, and the elderly and children. For example, rest and play functions can be combined in the same facility to facilitate children's play activities around the elderly, bringing them closer to each other and meeting the needs of the elderly to supervise and care for them at all times. Another example is the combination of fitness and play functions, where play facilities such as seesaws and swings for childrens activities are designed in combination with fitness facilities for the elderly, or placed close to each other, which can better achieve supervision and joint activities for the elderly and children. Free and varied play spaces can also be created through micro-terrain, water systems, the creation of gardens and vegetable gardens, etc. to promote childrens closeness to and understanding of nature.

4.3.2 Additional ancillary facilities

To facilitate the elderly to accompany children in joint activities, adequate seating, gazebos, handrails, drinking facilities, mosquito repellent equipment, lighting facilities, public toilets, rubbish bins, and relatively private spaces for mothers and babies are required.

4.3.3 Additional safety features and attention to detail

The layout of the space should take full account of the safety norms for childrens facilities (safety safeties, restraints, safety fences, warning signs, etc.) and take into account the needs of older people for accessible facilities (barrier-free access, stairs, toilets, seating, Braille, etc.) [12]. For example, relatively flat ramps (ramps are preferable to ordinary steps) are provided where there are large changes in height, and signage facilities are needed at locations where there are changes in height to avoid hazards. Another example is the design of sites and places such as road junctions to take into account wheelchair and baby pushchair access, to provide barrier-free design, to ensure continuity of walking paths, and to choose floor coverings made of non-slip and anti-glare materials to ensure the safety of activities for young and old. The style, size and placement of furniture should ensure safety and reflect humanism. In the choice of environmentally friendly or soft materials for facilities, accidental injuries should be avoided.

4.4 Public support spaces

These spaces, which include mainly open space and transport spaces, are themselves fully integrated spaces and are essential to promote interaction between young and old and to enliven the atmosphere of the space.

4.4.1 Resting space

The elderly and young people have a greater need for resting facilities in the space. As the elderly and children are easily fatigued, seating facilities should be located around the plaza and in the buffer spaces of the static and dynamic zones, so that the elderly and children can rest after their activities. The resting facilities mainly consist of resting seats and a place to store clothes. The lounge seating can be lined up with backrests and armrests and is made of wood. Shade by trees or pavilion planters next to the lounge seating facilitates the division of space and the definition of areas. The space should be paved with non-slip materials, preferably rubber or flat, solid stone.

4.4.2 Transportation space

The design of the transport space can be combined with an exhibition space to display works and to give interest to the act of transport and rest. It can also be combined with resting spaces and outdoor spaces where people can rest and talk.

Finally, it is recommended that additional personnel and facilities for security surveillance be installed within the scope of the above-mentioned activity spaces [13]. The purpose of the surveillance is to prevent and reduce the occurrence of crime. This includes arranging patrols by patrolling officers from community organizations and the deployment of electronic surveillance equipment.

5. Conclusion

Based on the analysis of the current situation of the activities of the old and young groups, this paper proposes to set up shared spaces for the old and young in the planning and design of urban residential communities. It focuses on the planning, design and optimization of commercial spaces, indoor recreational and learning spaces, outdoor activity spaces and public support spaces in the community. The above planning and design points provide more options for interaction and activities for the old and young groups, improve age-appropriate and child-friendly measures, and are the basis for ensuring the construction of all-age communities, while combining comfort and fun to design more safe and interesting spaces for inter-generational community interaction. As senior and child-friendly communities are being built, it is inevitable that young and old will share community common spaces,

truly achieving vibrant, all-age communities where everyone can live and work happily. The limited sample size in this paper, coupled with China's vast territory and large population, does not fully take into account the differences in climate, customs, culture and geography that may affect the need for all-age communities in different cities and regions, which may not be identical. Further refinement and research could be done in the future on the above relevant variables to facilitate further research on this topic.

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