

Analysis of Environmental Factors Affecting Children's Safety in Park Construction

Yishan Zheng^{1,a,*}

¹Southwest Minzu University, No. 168 Wenxing Section, Dajian Road, Shuangliu District, Chengdu City, Sichuan Province, China

a. 1732606752@qq.com

*corresponding author

Abstract: With the rapid development of urbanization, the construction of parks has gradually become a prominent topic. In addition to addressing infrastructure and facilities, the quality of park development requires consideration of safety factors, particularly those that may be easily overlooked in relation to children's safety. This paper conducts a research analysis of People's Park and Hongshi Park in Chengdu, Sichuan Province, pinpointing some issues affecting children's safety in park construction. The paper concludes with recommendations for constructing "child-friendly" parks that cater to both the psychological needs and safety requirements of children.

Keywords: Child-friendly, Safety, Park Construction, Influencing Factors

1. Introduction

Currently, with the acceleration of urban construction, cities are filled with grey, concrete, and steel structures, highlighting issues such as traffic congestion, air pollution, and dense crowds. Unlike in the past when children used to play freely in the streets and alleys, they are now restricted to city parks and green spaces only during weekends and holidays, accompanied by their parents. Most contemporary park constructions primarily aim to meet the leisure needs of adults, with little consideration for the requirements of children. Moreover, there are numerous safety hazards, such as highly commercialized and market-driven children's activity areas, limited free green spaces, and even fewer free activities. Some children's play areas are monotonous, lack completeness, and fail to offer autonomy, interest, and mystery. Safety concerns persist within parks, including mixed pedestrian and vehicular traffic, overcrowding, deep water bodies, and inadequate protective facilities, posing constant threats to the safety of children. These issues have sparked discussions on hot topics related to children's physical health, mental development, personal safety, and freedom of movement. Addressing these challenges involves changing urban development concepts, prioritizing children's interests, meeting their physiological, psychological, and behavioral needs, enhancing the child-friendliness of cities, and creating sustainable, multifunctional, and intergenerational shared spaces. These considerations become crucial for urban planners and developers.

Strengthening the construction of urban children's infrastructure does not merely involve building a system exclusively for children but creating a shared space that meets the safety needs of children while catering to the needs of other groups. This perspective serves as the starting and focal point for urban park design. Emphasizing the ecological value of urban parks, improving the service functions

of public cultural venues for children, and attaching great importance to the construction of children's public spaces are essential. There is a continuous effort to increase the construction of children's public activity spaces, enhance child safety in public spaces, actively promote the construction of regional smart children's sports park projects, adapt to the developmental needs of children, and elevate the level of moral and ethical development among minors. The analysis will further discuss the impact of environmental factors on children's safety in urban park construction, using People's Park and Hongshi Park in Chengdu, Sichuan Province, as examples.

2. Proposal of Child-Friendly Parks

The concept of a "child-friendly" park refers to a park that allows children of different age groups to play safely, freely, and independently. It aims to provide children with the opportunity to interact with nature in any area or space within the park, enabling them to play safely and freely. This approach promotes the physical and mental well-being of children, contributing to their joyful growth. It deepens children's understanding of nature and society, nurtures their love for the environment, and fosters the idea of environmental protection. The concept encourages children to perceive and comprehend their surroundings in nature and grow happily. [1] It is distinct from children's parks as it considers the physiological and psychological characteristics of children during the design and construction of urban parks. However, examining the current status of most parks in China reveals that designers often confine children's activities to designated play areas, while the remaining areas are constructed entirely based on the aesthetic and needs of adults. This practice is not conducive to children's play and may even pose safety risks [2].

3. Current Situation Analysis

In recent years, both People's Park and Hongshi Park have strengthened the construction of children's recreational facilities. During holidays, parents often bring their children to the park for outdoor relaxation and leisure. The park's facilities undoubtedly have a significant impact on children's behavior, influencing the relationship between people and the environment.

People's Park, in the past, was a beloved destination for both adults and children, especially the Children's Paradise and boating areas. These areas used to preserve traditional activities, particularly during holidays and Children's Day. On such occasions, the park would be crowded, and participation in these recreational activities required advance reservations. To ensure people's enjoyment, the park also enhanced safety facilities, especially in the children's play areas. Entertainment facilities were specially designed in terms of height and load-bearing capacity, meeting safety standards and aligning with children's behavioral habits. Adequate safety measures were in place, such as providing life jackets during boating and using relatively new boating facilities to significantly reduce the likelihood of problems.

Nowadays, there is an increasing number of entertainment projects and facilities in the city, offering people a diverse range of choices. More and more individuals are flocking to new entertainment venues. For People's Park, the majority of visitors prefer coming here for leisurely walks and exercise or participating in the matchmaking corner, transforming the target demographic from parents with children to the middle-aged and elderly. The boating center and children's playground, due to sparse foot traffic, no longer update their recreational facilities, leading to a significant weakening of safety measures and precautions. Despite occasional visits by children for play and recreation, the outdated entertainment facilities, characterized by loose components and potential deviations from the latest safety standards, may pose certain risks to children's safety.

Hongshi Park is located in the Luhü District and is a newly constructed park in recent years, surrounded by numerous residential areas. While People's Park often attracts people from various

parts of Chengdu, the user base of Hongshi Park tends to be more localized, consisting of residents from the surrounding neighborhoods and parents who visit with their children to relax on weekends. This differs slightly from People's Park. The children's playground in Hongshi Park stands out as a major feature, drawing parents and children with its innovative play methods, state-of-the-art equipment, and interactive educational activities. In addition to various recreational facilities, the children's playground is surrounded by a vast lawn where parents can bring their children for picnics and spring outings, enjoying the pleasures of family life.

Despite the innovative recreational equipment, there are still some safety hazards in this area. For instance, the children's slide is excessively high, and the supporting ladder is not dense enough, posing a risk of falling for very young children. The exit of the slide is not enclosed, and people playing near the exit may collide with those sliding down, leading to accidents. Moreover, after rain, recreational facilities, the ground, and climbing equipment become slippery, increasing the risk of children falling, thereby impacting their safety.

4. Investigation and Research

The topic of the impact of park environments on children's safety has always been a focus of attention. Despite considerations for children's safety in park facility construction, certain factors inevitably affect safety. Taking People's Park and Hongshi Park as examples, we conducted on-site visits and surveys through both offline interviews and online questionnaires to investigate and analyze the environmental factors affecting children's safety in the parks. The goal was to assess whether these parks align with the development principles of a "child-friendly park" and meet the protection criteria for children's safety.

4.1. On-site Inspection

4.1.1. Hongshi Park

Based on on-site investigations, several features in Hongshi Park are appealing. For instance, the pathway near the entrance is surrounded by unique, creatively shaped plants, including tree-shaped and trumpet-flower-shaped pruned shrubs. These elements effectively capture children's curiosity and stimulate their desire for knowledge. The playground area is crowded with many people, making it the most popular section of the park. The playground is well-equipped with facilities such as tunnels, slides, climbing structures, and trampolines, resembling a small amusement park. Warning signs and prompts are displayed on recreational facilities, indicating the appropriate age range for children and providing essential guidance. Adjacent to the play area is a large picnic area where many families gather for picnics. Children run and play joyfully on the lawn, contributing to the vibrant atmosphere.

However, safety hazards were identified during the research, particularly concerning children, indicating certain risks:

(1) Near the entrance of the park, there is a fountain with electric components, marked with a sign reading "Do not touch, electric," warning children of the danger. Despite this warning, children are naturally drawn to playing with water, and mischievous children might attempt to play with water when parents are not paying attention, posing a safety risk.

(2) The amusement area of the park is situated on a downhill slope, and the pathway transforms into irregularly shaped stone steps. Considering the potential danger for children descending the steps, cautionary signs are posted at intervals along the stairs. However, given the lively and active nature of children, there is a possibility of them tripping or bumping into the steps, and the stairs could pose a safety risk to children.

(3) The climbing area features worn-out and deteriorated grips and footholds, with some areas having minimal foothold options, which raises concerns about safety.

(4) The ground in the play area is uneven and abrasive, posing a risk of skin abrasions if children fall.

(5) Adjacent to the play area is a dining area with a hardened surface, increasing the risk of injuries if children fall.

(6) The proximity of equipment is such that it mainly considers the distance between children, neglecting the distance between children and adults. This oversight may lead to accidents, especially if adults inadvertently step on children due to poor visibility.

(7) Some amusement facilities, such as tall slides and tunnels, are only ventured by children under the supervision and encouragement of their parents. However, the size and scale of these facilities do not ensure the safety of both children and adults playing together. There is a significant safety risk as parents' bodies may inadvertently harm their own children. When sliding down the tunnel slide, one needs to ascend stairs to reach the highest sliding point. The handrails on either side of the stairs have considerable spacing, and some are even loose. Smaller children might potentially fall off, leading to severe consequences. Additionally, birds nest on the trees next to the steps, posing a potential threat to children from bird droppings.

(8) There are many water bodies and small rivers in the park, with stones laid on the water for convenience. The spacing between the stones varies, and some irregular stones increase the appeal to children. However, due to prolonged exposure to water, the stones are covered with moss, making them slippery and increasing the risk of children falling.

(9) The park provides tables and chairs for visitors to rest, mostly constructed with rough-textured, brick-red bricks that may scratch children's tender skin. Some chairs are relatively high, making it challenging for young children to sit on them alone.

(10) The park lacks a sound system, making it difficult to locate a lost child, which is not very safe for children.

4.1.2. People's Park

People's Park attracts a significant flow of visitors, with most engaging in activities such as strolling, boating with their children, or enjoying recreational facilities in the children's playground. The matchmaking corner is mostly frequented by middle-aged and elderly individuals or young people for photo opportunities. The main safety hazards identified include:

(1) Boating facilities and recreational facilities in the children's playground are relatively old, and maintenance is inadequate.

(2) There are numerous small lakes in the park, some lacking fences around them. Although the water is not deep, children playing without adult supervision may easily fall into the lakes.

(3) Most park benches are made of wood, with sharp edges and corners, posing a safety risk to children.

Through careful and detailed on-site observations, we identified elements that could pose safety hazards to children and areas that could be improved to enhance the overall user experience.

4.2. Online Questionnaire Survey

Through an online survey, we investigated aspects such as the age composition of children visiting the park, their choice of playmates, safety hazards in the park, and factors affecting children's safety. The survey revealed:

(1) The majority of respondents have experience supervising children.

(2) Many respondents are hesitant or unwilling to let children play in the park alone, primarily due to concerns about getting lost and fear of injuries during play.

(3) Over 80% of respondents have either experienced or heard of children getting injured in the park, while less than 20% are less familiar with safety hazards in the park causing harm to children.

(4) People generally believe that the main factors causing injuries to children in the park include: chaotic pedestrian and vehicular traffic, park ponds or other water bodies, safety of park play equipment, excessively hard or slippery park surfaces prone to causing falls, safety hazards such as raised surfaces, sharp edges, and gaps in the park's ground, toxic plants in the park, and activity areas without clear safety signage or usage instructions.

(5) To mitigate factors affecting children's safety in the park, most respondents believe that incorporating a "child-friendly" concept into park construction, enhancing parental supervision, and educating children about their own safety awareness through teachers and parents are essential.

5. Conclusion

In order to facilitate children's play and healthy growth in park green spaces, and around the construction of "child-friendly" parks, this study draws conclusions based on literature review, questionnaire surveys, and on-site investigations.

Starting from the importance of play, the behavioral psychology of children's play, the number of play areas, and design aspects, an analysis and summary of the current situation at the level of types, design, and planning countermeasures of children's play areas were conducted. The concept and connotation of "child-friendly" parks were proposed. [3]

Through on-site investigations, interviews, and questionnaire surveys, an analysis was conducted on the age composition of children visiting the park, their choice of playmates, frequency of park use, ways of visiting the park, seasons of park visits, preferences for types of games, preferences for sports types, preferences for activity areas, preferences for design elements, and perceived design deficiencies. It was found that children's activities in the park mainly include adventure, sports, creativity, and comprehensive activities. Children's activities exhibit six characteristics: activity dependency, age grouping, seasonality, temporality, difficulty in concentration, and self-centeredness. Based on this, it was concluded that children expect urban parks to integrate convenience, safety, naturalness, stimulating adventurousness, and diverse play areas.

Based on the "child-friendly" perspective, on-site investigations and interviews were conducted on People's Park and Hongshi Park in Chengdu, analyzing the landscape features of these parks. The study critically analyzed the current design status of water bodies, mountains, plants, roads, paving, and small facilities in the children's play areas and other areas of the parks. It was pointed out that the current design of urban parks is mainly from an adult perspective, lacking sufficient attention to children. Existing children's activity areas are highly commercialized, ignoring the respect for children's natural tendencies, and there are serious safety hazards, neglecting children's physiological characteristics, and other three practical problems. [4]

The planning and design of "child-friendly" parks are discussed based on the organized data. It is proposed that urban parks should have a balanced layout to ensure good accessibility. The paper advocates breaking the boundaries of the "children's play area" within the park and introduces the concept of a "whole-park activity field." Attention to every detail throughout the entire park is emphasized to guarantee the safety of children playing in various areas. Emphasizing the innate characteristics of children, four guiding principles for planning and design are established to ensure a highly naturalistic park environment. Specific content and requirements for the design of water features, topography, plants, boundaries, road systems, paving, and small-scale facilities within the children's play area and other park sections are detailed. [5]

Through exploration, it was recognized that the current park construction has many outstanding features, fully considering the usage situations and experiences of various groups, and paying attention to the healthy growth of children's behavior and psychology. However, there are still many

areas for improvement in park construction. Factors affecting children's safety need more attention, and the entire society should be concerned about the healthy growth of children.

6. Recommendations

Through the study of cases in People's Park and Hongshi Park, combined with literature, on-site investigations, and online questionnaire surveys, research has been conducted on the design of children's parks, leading to the formulation of several advisory recommendations.

6.1. Park construction must meet the psychological and behavioral needs of children

With the development of technology and the use of multimedia, the ways children engage in activities and educational methods have changed. Therefore, the design of children's activity areas must meet the educational needs of children, taking into account the psychological characteristics, personality traits, psychological needs, and behavioral needs of children of different age groups, and formulating targeted measures. [6]

6.2. Park construction must provide experiential educational spaces

Park design should start from meeting the physiological and psychological needs of children, cultivating children's humanistic qualities, integrating traditional culture with children's activity spaces, creating a new space that combines education with entertainment, and adding some children's play areas with participation, interactivity, and independence. These areas should possess both educational and entertaining elements, embodying both entertainment and intellectual development.

6.3. Park construction should complement, update, and improve the urban green space system.

Given the current situation of outdated functionality, aging facilities, chaotic landscapes, and safety hazards in recreational facilities, constructing high-quality "child-friendly" parks has become an inevitable trend.

6.4. Integrate the "child-friendly" concept into park construction

Teachers and parents should focus on cultivating and educating children's self-awareness of safety. Park construction personnel and government officials should pay attention to the rationality of park construction and raise awareness in society.

References

- [1] Liu, G., Zhou, C., Ouyang, L., et al. (2012). A brief analysis of the planning and design of "child-friendly" parks. *Journal of Hunan Agricultural University (Natural Sciences Edition)*, 38(S1), 61-63.
- [2] Li, S. (2021). On the planning and design of child-friendly parks. *Chinese Gardening*, 37(S1), 80-84. DOI: 10.19775/j.cla.2021.S1.0080
- [3] Yang, M., & Jia, H. (2023). Adventure-themed landscape design under the psychological and behavioral characteristics of children: A case study of Xi'an Children's Park. *Sculpture*, (04), 66-67.
- [4] Liu, H. (2023). Park landscape planning and design from the perspective of child-friendly space: A case study of Sanwan Children's Park in Fengdu County, Chongqing City. *Urban Architecture Space*, 30(04), 20-25.
- [5] Zhong, L. (2015). Research on urban green spaces based on children's safety. [Doctoral dissertation, Jiangxi Agricultural University].
- [6] Cao, Y. (2015). Research on the safety of children's outdoor play areas. [Doctoral dissertation, Tianjin University of Science and Technology].