

DESIGN OF INTERACTIVE CHILDREN'S ACTIVITY SPACE IN URBAN RESIDENTIAL AREAS IN CHINA.

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Abstract

With the acceleration of urbanization, the design of children's activity spaces in residential areas of Chinese cities is increasingly valued. This article aims to explore how to design interactive children's activity spaces to meet the needs of children at different stages of growth and promote their physical and mental health development. However, there are currently many problems in the design of children's activity spaces in many urban residential areas. This article proposes design principles, strategies, and specific implementation methods for interactive children's activity spaces in urban residential areas. Based on existing academic research and practical cases, the current situation and challenges of children's activity spaces are analyzed, and a series of design principles and suggestions are proposed to meet the needs of modern urban residential area residents. The research results are as follows:

- (1) Interactive design promotes children's development, and interactive activity spaces for children can significantly enhance their social, cognitive, and physical development;
- (2) Partition design meets the needs of different age groups, ensuring the applicability and safety of activity spaces;
- (3) Flexible design improves space utilization and enhances the diversity and sustainability of activity spaces.

Keywords: children's activity space, interactive design, landscape design, children's development

Introduction

The urbanization process in China has developed rapidly in the past few decades, with increasing urban population density, posing enormous challenges to the planning and construction of residential areas. With the rise of high-rise buildings, children's outdoor activity space is gradually decreasing, which limits their physical activity and social interaction opportunities. Interactive children's activity space design, as an emerging solution, is committed to creating diverse activity spaces in limited urban spaces to meet the physical and mental development needs of children.

Research objective:

- (1) Analyze the current situation and problems of children's activity space design in urban residential areas in China, understand the current situation of children's activity space in urban residential areas, and identify its shortcomings in interactivity, safety, and diversity.
- (2) Explore design strategies to improve the interactivity and safety of children's activity spaces, and propose design principles for interactive children's activity spaces suitable for urban residential areas in China.
- (3) Propose design improvement suggestions based on actual cases, providing practical references for future urban planning and landscape design.

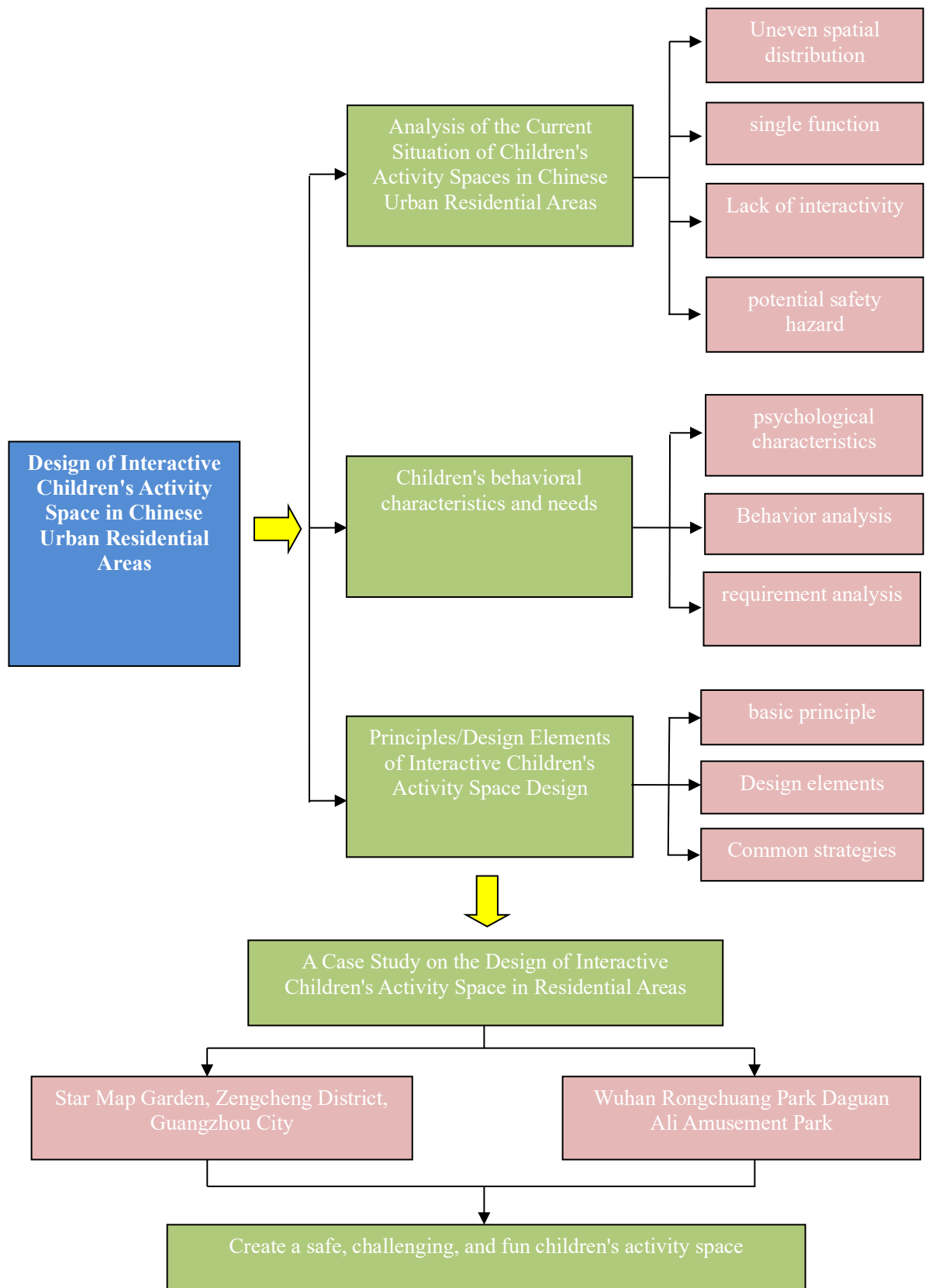
Methodology

This study comprehensively analyzes the current status and challenges of designing interactive children's activity spaces in residential areas of Chinese cities. Through multi-dimensional data collection and in-depth analysis of typical cases, this article aims to propose practical and feasible design strategies to enhance children's outdoor activity experience.

Data collection is mainly conducted through questionnaire surveys and field research. The questionnaire survey design includes questions such as usage frequency, satisfaction, and facility requirements. In addition, field research recorded the layout and facility distribution of children's activity spaces in typical residential areas through on-site observation and measurement. Research has found that over 80% of activity spaces have problems with single design and low utilization rates.

The case study selected representative successful cases in China. Through literature analysis, this article provides a detailed analysis of the design concepts, functional layouts, and facility characteristics of these cases. The case study in Haidian District, Beijing shows that by adding interactive devices and fun designs, the utilization rate of children's activity space has increased by 40%. Copenhagen Super Children's Park has significantly enhanced the sense of belonging and satisfaction of community residents by incorporating local cultural elements and innovative facility design. These successful cases provide valuable design references and practical experience for this study.

The main conceptual framework of this study adopts the following mind map:



1. Research Methods

- (1) Collecting data and group discussions from an overview of the importance of interactive design and children's psychological development.
- (2) Analyze the data through the following content:
 - a) The intrinsic relationship between interactive design and children's psychological development.
 - b) The application of interactive design elements in children's activity spaces, evaluating their degree of integration and effectiveness.
 - c) The adaptability and uniqueness of interactive design in different urban environments.
- (3) Analyze the connotation and value of interactive design.
- (4) Analyzing the integration of interactive design and children's activity space.
- (5) Analyze cases to reveal the application effects and challenges of interactive design.
- (6) Conclusion and Prospect.

2. Analysis of the Current Situation of Children's Activity Spaces in Chinese Urban Residential Areas

2.1 Uneven spatial distribution: Some residential areas lack dedicated space for children's activities or are located in remote areas, making it inconvenient to use.

2.2 Single function: Most activity spaces are dominated by simple amusement facilities, lacking diverse activity content and richly layered space design.

2.3 Lack of Interactivity: Existing spaces often overlook interaction and collaboration among children, lacking elements that promote social skills and creativity.

2.4 Safety hazards: Some facilities are aging and poorly maintained, posing safety hazards; At the same time, there is insufficient consideration for adult monitoring areas in spatial design.

3. Analysis of Children's Behavioral Characteristics and Needs

3.1 Psychological characteristics of children

Children have unique psychological characteristics at different age stages.

Children in infancy (0-3 years old) mainly perceive the world through their senses and enjoy exploring the environment through actions such as touch and grip. At this stage, children rely on their senses and actions to understand things.

Children in early childhood (3-6 years old) begin to develop basic activity abilities, enjoy imitating the behavior of adults and peers, and learn and develop social skills through social activities.

Children in the preschool period (6-12 years old) gradually develop the ability to think independently and solve problems. They are more interested in challenging and creative activities, and at this stage, they enjoy satisfying their curiosity and sense of achievement through exploration and innovation.

3.2 Characteristics of Children's Behavior

Children exhibit significant behavioral characteristics during their growth process. They have strong imitation and learning abilities, and can learn new skills and behaviors by observing and imitating adults and peers around them. Children enjoy interacting with their peers, building social relationships and developing social skills through interaction and cooperation. In terms of activity preferences, children are enthusiastic about diverse forms of activities and enjoy challenging and stimulating activities such as running, jumping, climbing, and slides. These activities not only contribute to their physical development, but also stimulate their adventurous spirit and desire for exploration. In addition, children's activities are self-centered, and they often use specific activities as clues to observe and think about problems with themselves as

the center. This self-centered thinking mode is a natural stage of their cognitive development. Through these diverse activities and interactions, children can continuously accumulate experience, enhance their cognitive abilities and social skills, and promote comprehensive development.

3.3 Requirement Analysis

Based on the psychological and behavioral characteristics of children, designing interactive children's activity spaces should meet the following needs:

Safety: Ensuring the safety of children during activities is the top priority.

Fun: Provide diverse activities and facilities to stimulate children's interest.

Interactivity: Promote interaction between children, peers, and the environment, and enhance social skills.

Educational: Integrating educational elements into design, combining education with entertainment.

Adaptability: Consider the needs of children of different age groups and design activity spaces with adaptability.

4. Principles and design elements of interactive children's activity space design

4.1 Design principles.

4.1.1 Safety principle: Ensure that all facilities and materials comply with safety standards, set clear boundaries and monitoring areas, and facilitate adult supervision.

4.1.2 Interactive principle: Design diverse game facilities and interactive devices to encourage cooperation and communication among children, and promote the development of social skills.

4.1.3 Principle of Fun: Create a space environment that is rich in fun and exploration by combining children's interests, hobbies, and psychological characteristics.

4.1.4 Sustainable development principle: Adopt environmentally friendly materials, integrate natural elements, and achieve harmonious coexistence between space and environment.

4.1.5 Multi functional composite space design: Breaking the traditional layout pattern of single function, organically combining functional areas such as gaming, learning, and rest to form a composite activity space. For example, setting up a sandy area adjacent to a graffiti wall not only satisfies children's hydrophilic nature, but also stimulates creativity.

4.1.6 Innovation of Interactive Game Facilities: Introduce intelligent interactive facilities such as motion sensing game areas, AR experience areas, etc., allowing children to experience the charm of technology while playing, while enhancing physical coordination and reaction abilities.

4.2 Design Strategy

4.2.1 Site selection and layout

When planning children's activity spaces, it is advisable to choose areas with convenient transportation, moderate foot traffic, sufficient sunlight, and relatively quiet surroundings. The layout of the venue should be reasonably divided into different functional areas, such as rest areas, quiet game areas, physical exercise areas, secret exploration areas, etc., to meet the needs of children of different ages.

4.2.2 Terrain Utilization

Terrain is a key factor determining the basic form of a site. We should fully utilize the advantages of terrain, such as slopes, depressions, and high points, to design challenging and interesting activity facilities. For example, designing slopes as slides, using depressions to store water for fish farming, or setting up sand pits.

4.2.3 Plant Landscape Creation

Plants are an essential element in children's activity spaces. Non toxic and non aggressive plants should be selected for ecological and visual design to increase interest. At the same time, by creating plant landscapes, children are provided with opportunities to observe and learn about nature.

4.2.4 Game Facility Design

Game facilities are the core elements of children's activity spaces. We should design game facilities with distinctive features and diverse functions, paying attention to the selection and matching of colors to stimulate children's interest and imagination. At the same time, gaming facilities should be sturdy and durable, with a smooth surface and anti-corrosion treatment to ensure the safety of children.

4.2.5 Integration of Science Popularization Education

Integrating popular science education elements into design to enhance children's cognitive abilities and scientific literacy through entertaining and educational methods. For example, setting up ecological science popularization areas to allow children to understand natural knowledge through observation and learning. Utilize game facilities for enlightenment education in mathematics, physics, and other knowledge.

5. Theoretical basis for designing interactive children's activity spaces in residential areas

The theoretical basis for designing interactive children's activity spaces in residential areas mainly covers relevant theories in the fields of environmental psychology, child developmental psychology, and landscape design. These theories collectively guide how to construct a safe, fun, and conducive activity space for children's physical and mental development.

5.1 Environmental Psychology: The theory in this field emphasizes the impact of the environment on human behavior and psychological states, with a particular focus on how design can promote positive social interaction and create a comfortable environmental atmosphere. In children's activity spaces, theories of environmental psychology help designers understand how to attract children to participate in activities and feel happy and safe through spatial layout, color, lighting, and other elements.

5.2 Child Developmental Psychology: This theory studies the cognitive, social, emotional, and physical developmental characteristics of children at different age groups. According to this theory, when designing children's activity spaces, it is necessary to consider the needs of children at various developmental stages, such as imitation and social needs in early childhood, exploration and challenge needs in early school age, etc. Design should encourage children to learn, explore, and socialize in games, promoting their comprehensive development.

5.3 Landscape Design Theory: Landscape design theory focuses on the aesthetics, functionality, and sustainability of space, emphasizing the positive impact of the natural environment on children's development. Introducing natural elements such as plants, water features, and sand can not only enhance the aesthetics of activity spaces, but also provide children with opportunities to explore nature and improve their perception and cognitive abilities. Meanwhile, reasonable spatial zoning and layout of activity facilities can effectively meet the activity needs of children of different age groups, enhance interactivity and participation.

5.4 Social Interaction Theory: This theory emphasizes the importance of social relationships and interaction in children's development, believing that children learn social skills and rules through interaction with others. Based on this, the design of interactive children's activity spaces should focus on promoting cooperation and communication among

children, such as setting up group game areas, interactive devices, etc., encouraging communication and cooperation among children, and enhancing their social skills.

6. A Case Study on the Design of Interactive Children's Activity Space in Residential Areas

6.1 Star Map Garden, Zengcheng District, Guangzhou City (Figure1)

Star Map Garden in Zengcheng District, Guangzhou is a modern urban residential area that emphasizes interactive design of children's activity spaces. The children's space in this residential area meets the needs of children of different ages through the concept of all age interaction, including sand pits suitable for young children, climbing facilities, and high-altitude climbing frames for older children. In addition, innovative water feature interactive areas have been introduced to stimulate children's interest in exploring nature through artificial streams and water curtain walls. In the design, Star Map Garden fully utilizes the natural features of the site, preserves some of the original vegetation, and introduces diverse green landscapes such as flower beds, shrubs, and lawns, providing children with rich sensory experiences and shaded activity areas. In terms of materials, non slip and durable rubber flooring and environmentally friendly plastics are used to ensure the safety of children. The design also incorporates educational elements, such as setting up outdoor classrooms and interactive learning signage to help children learn while playing. There is a parent-child reading area near the community center to promote family interaction. The overall design combines interactivity, safety, and education, providing an excellent reference case for urban residential areas. Through the integration of natural landscapes and modern facilities, it creates a vibrant and interactive community environment

6.2 Wuhan Rongchuang Park Dagan Ali Amusement Park (Figure2)

Wuhan Rongchuang Park Dagan Ali Amusement Park is a children's activity space themed around the cartoon character "Ali", integrating entertainment and educational functions, providing rich interactive experiences for urban residential areas and tourists. The design of the amusement park revolves around a "fairy tale world" and attracts children of different ages through multiple themed areas. Each themed area features brightly colored cartoon decorations and interactive facilities, such as Ali Adventure Area, Magic Forest Area, and Dream Castle Area, encouraging children to unleash their nature, exercise their physical fitness, and team spirit through games. The Ali Adventure Zone is equipped with climbing facilities, slides, and mazes, aiming to stimulate children's curiosity and courage through adventure and exploration; The Magic Forest area uses lighting and sound effects to create a mysterious atmosphere, allowing children to experience wonderful adventures in a fantasy world. In terms of material selection, the amusement park adopts environmentally friendly materials and safety design, such as anti slip flooring and no sharp corner facilities, to ensure the safety of children during activities. There is also an educational interactive area in the amusement park, which cultivates children's creativity and imagination through hands-on production and role-playing. In addition, Ali Amusement Park places special emphasis on family interaction and has a parent-child activity area to encourage parents and children to participate together and enhance parent-child relationships. The application of Ali theme makes the amusement park not only an entertainment space, but also carries the function of cultural dissemination, attracting family tourists through the charm of cartoon characters. Wuhan Rongchuang Park Dagan Ali Amusement Park has successfully integrated fairy tale themes, interactive experiences, and educational functions, becoming an important activity venue for children and families in the city. It also provides innovative reference cases for the design of interactive children's activity spaces in urban residential areas.



Figure1, Public artwork "Awakening"
Image source: from the author Pictures



Figure2, Public artwork "Awakening"
Image source: Baidu

Conclusion

This article proposes interactive activity space design principles and strategies suitable for children of different age groups through the study of children's activity spaces in urban residential areas in China. Research has shown that interactive design plays an important role in the physical and mental development of children, effectively promoting their comprehensive improvement in social, cognitive, and physical abilities.

Firstly, interactive design should become the core concept of children's activity space design. In design, interactive facilities such as cooperative games, social platforms, and multi sensory experiences can be introduced to stimulate children's desire for exploration and creativity, while promoting cooperation and communication among children. This interactive design not only meets children's entertainment needs, but also invisibly promotes their socialization process.

Secondly, zoning design is an effective method to meet the needs of children of different age groups. Children have different psychological and physiological characteristics at different stages of growth, so the design of activity spaces should take these differences into consideration. Through scientifically reasonable spatial zoning, designers can provide suitable activity facilities and environments for children of different ages, ensuring the safety and practicality of the activity space.

Finally, the integration of cultural and natural elements is crucial for enhancing the attractiveness and educational function of activity spaces. Incorporating local cultural symbols and natural landscapes into the design not only enhances the aesthetic value of the space, but also provides diverse educational opportunities for children to learn and experience the charm of culture and nature in games.

Looking ahead, with the acceleration of China's urbanization process, the design of children's activity spaces in urban residential areas will face more challenges and opportunities. Future designs should pay more attention to interactivity, diversity, and localization, fully considering the psychological and physiological needs of children, and creating children's activity spaces that are both entertaining and educational. Meanwhile, driven by policy support and resident participation, the design of children's activity spaces in urban residential areas in China will gradually mature, providing children with a better growth environment and promoting sustainable social development.

References

- Fan,M.R.&Hu,Y.H. (2020). Construction of a path for cultivating children's sharing behavior based on picture book reading *Journal of Hubei Normal University (Philosophy and Social Sciences Edition)* (03), 116-120.
- Huang,Y. (2012). Analyzing the safety design of children's products based on their behavioral characteristics *Technology promotes development* (s1), 75-76.
- Ji,W.D.,Qiao,Y.P.,Yuan,Z.H.&Ge,W. (2019). Research on the Design of Kindergarten Activity Space Based on Children's Behavioral Characteristics: A Case Study of Century Zhonghua City Community Kindergarten in Huaiyin District, Jinan *Chinese and Foreign Architecture* (11), 118-120.
- Jiao,H.Y.&Cao Lei. (2016). The Influence of Children's Psychology on the Transformation and Renewal of Traditional Kindergartens: A Case Study of Nanjing Century Star Kindergarten *Green Technology* (19), 48-50.
- Liu ,Y.W.&Liu,M.G. (2019). Characteristics and Implications of Children's Observation Record Evaluation in Classic Curriculum Models Abroad *Fujian Education* (37), 34-36.
- Lu,Y.H. (2011). Research on Children's Activity Space Design in Residential Area Environmental Design (Master's Thesis, Northwest A&F University) <https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CMFD2012&filename=1011403863.nh>
- Peng,X.Y. (2019). Analysis of the Environment and Science Popularization Exhibition Design of Children's Behavior Science Museum *Art and Technology* (10), 245.
- Sun,L.& Tang,Z.J. (2010). Research on the Design of Scene Toys and the Development of Good Behavior in Children *Packaging Engineering* (14), 32-34+46.
- Xu, Y.M. (2024). Research on the Design of Child Friendly Community Public Spaces under the Concept of Natural Education Design (12), 42-45.