

# Transformation Design of Old Parks Based on Behavior Psychology: A Case Study of Hefei Xiaoyaojin Park

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**Abstract** City park undertakes the function of urban core green island. Hefei Xiaoyaojin Park provides a leisure and entertainment place for Hefei citizens. Although it has been continuously transformed and upgraded, there are still many places to be improved. Through behavior observation and questionnaire, the usage and satisfaction evaluation of tourists in Xiaoyaojin Park were obtained, and the transformation design of Xiaoyaojin Park was analyzed from the perspective of behavior psychology by analyzing the behavior of tourists in different zones of Xiaoyaojin. Based on the premise of exploring the behavior of tourists in different spaces, a city park environment that meets the needs of tourists can be created by promoting the cultural context of the Three Kingdoms, improving the plant landscape and infrastructure of the site, optimizing the spatial function, and exploring the park design and transformation strategy that is more in line with the needs of people, in order to provide new ideas for the future landscape transformation of Xiaoyaojin park, and offer reference suggestions for the future transformation design of old city parks.

**Keywords** Behavior psychology, Old park, City park, Environmental optimization

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As a major content of city construction, city park is an important part of urban ecosystem and urban landscape, which meets the leisure needs of urban residents and provides places for rest, sightseeing, exercise, communication and various collective cultural activities<sup>[1]</sup>. With the development of social economy and the improvement of people's demand for quality of life, urban park landscape has made great progress. However, with the development of the times, city park still undertakes the function of urban core green island, but there are various problems such as shrinking landscape and outdated facilities. The role of city parks is no longer merely to meet the needs of sightseeing and rest, but to gradually focus on people's environmental psychology and behavior perception<sup>[2]</sup>. Xiaoyaojin Park is strategically located and is one of the most important cultural and urban landmarks in Hefei. It carries the growing memory of Hefei citizens and is one of the most familiar parks among the locals. However, with the continuous development of the times, Xiaoyaojin Park to a certain extent has some problems such as less prominent cultural theme, imperfect supporting facilities, and landscape degradation, which can not meet the needs of citizens. Therefore, Xiaoyaojin Park was transformed by adjusting the layout structure, updating the site functions, optimizing the landscape details, and taking into account the overall park<sup>[3]</sup>. Combined with the culture of the

Three Kingdoms, green landscape was reshaped to meet the psychological needs of tourists and awaken the vitality of Xiaoyaojin Park.

## 1 Overview of Xiaoyaojin Park

Xiaoyaojin Park is located in Luyang District of Hefei City, just a road away from Huaihe Road Pedestrian Street in Hefei, covering an area of 31.3 hm<sup>2</sup>, including 11.2 hm<sup>2</sup> of water area. The park was constructed in 1950 (Fig.1), but suffered from floods in 1954. It was rebuilt in 1955 and expanded the west park (Fig.2). After years of careful repair and management, Xiaoyaojin Park has become a comprehensive urban free open park. The park is fan-shaped, and is divided into two parts by water system: east park and west park. As the site of the ancient battlefield of the Three Kingdoms, the park preserves the tomb of Zhang Liao, Zhang Liao cenotaph, Feiqi Bridge and other relics. It is one of the three major scenic spots in Hefei and one of the ten scenes in Hefei, as well as the scenic spot with the longest opening time and the longest history in Hefei<sup>[4]</sup>.

## 2 Behavior psychology

Behavior psychology, also called behaviorism, is founded by the American psychologist John Watson. Some basic theories of behavior psychology are derived from psychology and anthropology, focusing on the relationship and interaction of human behavior and psychological

feelings with space and environment.

In behavior psychology, people's outdoor activities can be divided into three types: spontaneous activities, necessary activities and social activities. Most tourists' activities in parks are spontaneous and social<sup>[5]</sup>. Therefore, the behavior characteristics of tourists can be summed up in three aspects: spontaneous, group, regular. With the help of research and the combination of tourists' psychological behavior, tourists' behavior activities in the park can be divided into 6 types (Table 1).

## 3 Survey and analysis

Through field observation and questionnaire survey on the behavior types and characteristics of tourists in Xiaoyaojin Park, more than 200 questionnaires were issued in Xiaoyaojin Park, 181 of which were valid (male 73, female 98). Combined with the investigation of the park, we analyzed each functional space and tourists' related activities, and had a basic understanding of the use of each space by tourists.

It can be found from the questionnaire that there were more female tourists than male tourists in the park, accounting for about 58% and 42%, respectively (Fig.3). The statistics on the age of tourists showed that middle-aged and elderly people over 50 years old were the main users of Xiaoyaojin Park, accounting for 27% of the total, and recreational people aged 8–30 years

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were also a large group in the park, accounting for 23% of the total. Tourists under 18 years old, 31–40 years old and 41–50 years old accounted for 4%, 19% and 17% of the total, respectively (Fig.4).

The content of field observation is described in Table 2: ① observing the characteristics of various users in park activity space; ② observing and recording the relationship between different behaviors of tourists and various spaces<sup>[6]</sup>; ③ the activity space favored by tourists and the space neglected by tourists.

Questionnaire survey demonstrated that among 181 valid questionnaires, 24% of the tourists entered the park for morning and evening exercise (Fig.5), and most of them were middle-aged and elderly people. Another 30% of the tourists entered the park for the purpose of viewing, basically covering all ages; 16% of the tourists had recreational activities in the park, mainly composed of the elderly and young children; 15% of the tourists went for a walk in the park, while 9% came just to rest and 6% to get together or communicate.

Xiaoyaojin Park was transformed and upgraded according to the structural system of “one cultural main axis, two dynamic and static areas, two walking rings, six functional zones, and multiple scenic spots” (Fig.6): the main cultural axis of the Three Kingdoms with the theme of “the battle of Xiaoyaojin”; connecting two circular health trails with the dynamic area in the east and the static area in the west of the park; concatenating the six functional areas of entrance cultural exhibition area, young children’s activity area, youth activity area, ecological leisure

area, cultural experience tourist area and theme tourist area, as well as Quzhuang, Xiaoyao Pavilion, Xiaoyao Villa, History and Culture Museum of the Three Kingdoms and other important landscape nodes in the park<sup>[7]</sup>.

### 3.1 Zone A–Xiaoyao Gujin

The south gate of Xiaoyaojin Park is close to Shouchun Road, the main traffic road of Hefei City, so most of the tourists enter through the south gate of the park. After entering the park, the entrance guide space is spacious, which can meet the distribution needs of a large number of recreationists, and a tree array square is set up to facilitate tourists to rest (Fig.7). As there are not enough car parking spaces at the entrance in busy areas, it is very inconvenient for tourists to park (Fig.8). In addition, the three-bay archway has a strong identity, intensifying the cultural characteristics of the entrance of the square and strengthening the identification of the entrance, so that urban residents and nonlocal tourists can easily identify the area as a city park. However, the only drawback is the lack of facilities with cultural elements of the Three Kingdoms at the entrance, which can not satisfy people’s sense of regional cultural needs.

### 3.2 Zone B–Daxiang Xisheng

In order to retain the city memory to the maximum extent, the elephant slide bearing the childhood memory of many Hefei citizens has been re-reinforced and restored. With the elephant slide as the center, the swing and seesaw are retained, and an “elephant paradise” is built as an activity area for young children (Fig.9). However, due to single and small number of amusement facilities for young children,

they have to queue for a long time. After the renovation, the park has added facilities such as lounge racks, tree pool seats and toilets to provide more services for tourists (Fig.10). According to the behavioral characteristics of people watching and being watched in space, it is necessary to set up some landscape sketches and facilities that can block, lean and rest not far from the activity venue, so as to meet the behavioral needs of people watching nearby, the psychological needs of activists eager to be watched and the physiological needs of rest<sup>[8]</sup>. On one side of the “elephant paradise” there is a large opening space, and the tree pool on the activity space can be used as a seat, while the big tree can provide shade. Rich boundary changes have produced a popular boundary effect. The open field of vision makes the resting people become “viewers”, and the active tourists in the space become “performers”. This layout and design can meet the needs of people to watch and be watched.

### 3.3 Zone C–Weizhen Jiangdong

The city park with a long history and culture retains a large number of real historical relics and historical features, and contains many non-renewable cultural information resources<sup>[9]</sup>. A historical experience tour axis can be formed by fully excavating the historical origin and cultural connotation of Xiaoyaojin, figure statue, relief wall, antique warship and bronze ding on the avenue of the park (Fig.11). This area limits the viewing route of tourists through linear spatial form, and the planting of tall trees on both sides of the road enhances the feeling of depth. The statue of Zhang Liao has some commemorative

**Table 1 Main types of tourists’ behavior and activities**

Activity type	User	Activity time	Activity content	Activity site	Activity purpose
Morning and night exercise	The elderly	Morning and evening	Exercise, square dance	Relatively open activity space	Taking exercise, getting regular activity
Appreciation	Tourists of all ages	Whole day	Relaxing, enjoying the view	Garden, lawn, water side	Eager to embrace nature and relax
Strolling	Surrounding residents, tourists	Morning and evening	Strolling, admiring the scenery	Along the main road of the park	Relaxing, enjoying the scenery and exercising
Get-together or communication	Surrounding residents, tourists, students	Morning and afternoon	Chat, picnic	Grassland, resting platform, seat	Enhancing people-to-people exchanges
Entertainment	People of all ages	Morning and evening	Playing chess, amusement park, playing with water	Amusement park, water surface, square	Adding joy to life, brightening the mood
Recreation	People of all ages	Whole day	Rest and relaxation	Roadside seat, rest node	Stopping and relaxing when feeling tired after continuous walking

**Table 2 Field observation method**

Observation method	Observation pattern	Observation content
Direct observation	Fixed point observation	Visual measurement—observation of behavior by the naked eyes
		Measurement—spatial distribution of tourists
		Photography—capturing the actions of tourists with a camera
Indirect observation	Mobile observation	Moving around tourists and recording their actions or tracks on the premise of not affecting their activities <sup>[6]</sup>
	Footprint observation	Observing the footprints of tourists on the ground
	People counting	Recording the number of people passing through at the entrance and exit
	Survey visits	Conducting interviews and understanding actions by asking questions

significance. The renovation of the park has raised and replaced the pedestal of the statue of Zhang Liao, which makes the statue volume become larger and is suitable for tourists to watch and take photos from a distance (Fig.12).

**3.4 Zone D—Jiutian Lansheng**

Amusement places in the park are important places for tourists to carry out all kinds of outdoor recreational activities. Tourists carry out corresponding outdoor activities through amusement facilities in order to achieve health and fitness and relieve psychological pressure. The amusement projects are distributed in large area and dispersed, but this is no open space for children to play and interact freely. Game items are basically paid experience items, mainly large-scale entertainment facilities, with simple game content (Fig.13). Due to the construction and management costs of project facilities, tourists need to pay for the experience, which to some extent limits the play of some tourists, especially

children (Fig.14).

**3.5 Zone E—Gehu Qiuyue**

Xiaoyao Pavilion, 22 m tall, is the best viewing platform in the park, which can overlook the whole view of the park (Fig.15). Too large a space will create a feeling of emptiness, whereas too small a space will produce a feeling of repression. Standing on the pavilion, you can have a panoramic view of the beautiful scenery of Xiaoyao Lake and the whole park, and the empty space will make tourists feel comfortable.

Xiaoyao Lake accounts for about 80% of the total area of the park and is the main sightseeing and resting area of tourists. In order to meet the needs of tourists' hydrophilic behavior, the roads and revetments beside the water need to be designed comprehensively to facilitate tourists to interact with the water in the space. The boundary area is often a place where people like to move around. The water revetment of the park is treated as a winding

shape, and the near level platform and water walking path are planned, so that tourists can get close to the water and interact with it. In addition to boats, the park did not make use of rich water resources to set up a variety of water amusement facilities, planning fishing, interactive fountains and other water entertainment space (Fig.16).

**3.6 Zone F—Meixie Tucui**

On the basis of keeping the original style unchanged, the west park strengthens the construction of plum garden, peony garden, azalea garden and cherry blossom road landscape in the transformation, and planted other flowering plants, making it the best ecological tourist area in Xiaoyaojin Park (Fig.17). Planting various ornamental plants can attract tourists' attention in the space, and can also give people a kinds of mental relaxation (Fig.18).

**3.7 Zone G—Weiwu Zongji**

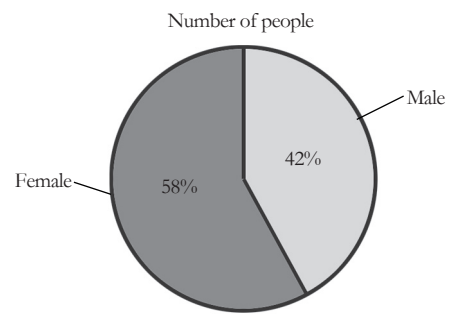
Wuwu Zongji (the remnant of Wei and Wu dynasties) is one of the eight newly built sights



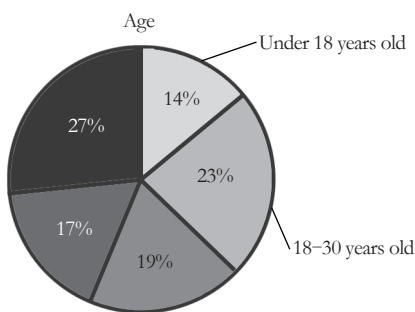
**Fig.1 Photograph of Xiaoyaojin in the 1950s**



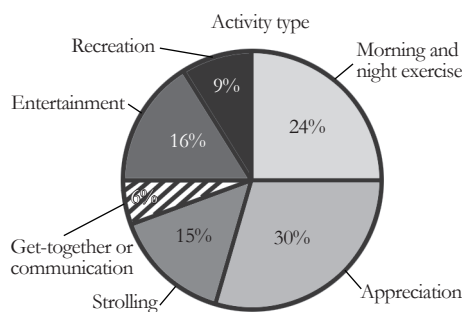
**Fig.2 Photograph of Xiaoyaojin in 1959**



**Fig.3 Sex structure of tourists**



**Fig.4 Age structure of tourists**



**Fig.5 Activity type**



**Fig.6 Park zoning**



**Fig.7 South gate of Xiaoyaojin Park**

Status quo	Site function	Existing problems
1. Xiaoyao Gujin is separated from Huaihe Road pedestrian street by Shouchun Road, with a 1,140 m <sup>2</sup> square	1. Organizing evacuation of crowds	1. Excessive pedestrian flow, parking difficulty
2. There are tree-array squares on both sides, which can provide people with a short rest and communication	2. Underground parking	2. Simple plant arrangement
3. The south gate is the main entrance and exit, displaying the cultural image of the park with landscape elements such as three-bay archway, ground paving and plants	3. Rest and communication, display of the Three Kingdoms culture	3. Unobvious cultural theme of the Three Kingdoms

**Fig.8 Analysis of zone A**

in the park, where Zhang Liao Cemetery, Jian'an Cultural Center, and Hefei Three Kingdoms Historical and Cultural Center gather together (Fig.19). This area is the main display area of the history of the Three Kingdoms in the park.

By holding cultural activities and reproducing ancient battlefield, the connection between the park and the ancient battlefield of the Three Kingdoms is strengthened, giving people a sense of cultural beauty and the massness of the

history, and improving tourists' understanding and cognition of local history and culture.

By renovating roads and other infrastructure, the park has added more areas for citizens to take photos and do activities. There is a relation-



Fig.9 Elephant slide

Status quo
1. The elephant slide is re-reinforced and restored, and the swing and seesaw are retained to become an activity area for young children
2. The large amusement facilities area is relocated and restored into a boutique green space

Fig.10 Analysis of zone B

Site function
1. Children's play area
2. Recreation area
3. Public toilet

Existing problems
1. Too small number of amusement facilities, queuing for a long time
2. Non-uniform style, poor connection between sites
3. Relatively monotonous plant group

Status quo
1. Figure statue, relief wall, antique warship and bronze ding are connected into a tour axis
2. A new replica of ancient Eastern Wu warship is built

Site function
1. Theme display of the culture of the Three Kingdoms
2. Propaganda of the culture of the Three Kingdoms

Existing problems
1. The cultural theme does not highlight the cultural elements related to the Three Kingdoms, and the science popularization education in history and culture is insufficient
2. There is less interaction between facilities and tourists, with poor sense of experience



Fig.11 Analysis of zone C

Fig.12 Statue of Zhang Liao



Fig.13 Ferris wheel

Status quo
Youth activity area with theme entertainment, amusement experience, and water tour functions

Fig.14 Analysis of zone D

Site function
1. Entertainment, recreation
2. Water activities

Existing problems
1. Entertainment projects are overcharged
2. Cartoon boat does not fit the cultural theme

Status quo
1. There are Xiaoyao Pavilion, Xiaoyao Lake, Xiaoyao Villa, Dujin Bridge and Quzhuang in the area
2. There are three islands in the lake, snail island, Xiaoyao island, and nameless island
3. Xiaoyao Pavillion is 22 m tall and can overlook the whole view of the park

Fig. 16 Analysis of zone E

Site function
1. Sightseeing
2. Viewing lake scenery
3. Publicity and display of history and culture

Existing problems
1. The internal elevator of Xiaoyao Pavilion has a sense of incompatibility with the overall park culture
2. There is a lack of hydrophilic platform and hydrophilic facilities
3. The fountain show time is not fixed



Fig.15 Xiaoyao Pavilion

Status quo
1. The construction of plum garden, peony garden, azalea garden and cherry blossom road landscape is strengthened
2. Flowering plants such as plum blossom, Chinese flowering apple and azalea are planted

Fig.17 Analysis of zone F

Site function
1. Viewing landscape
2. Plant science popularization
3. Leisure tour

Existing problems
1. There are less plant varieties, and some plants have a short ornamental period
2. There is a lack of signage, and plants have insufficient function of science popularization
3. The location is out of the way

ship between the spatial scale and the enclosing space felt by tourists and people's psychological activities. The pavilion on the mound, surrounded by dense plants, provides a quiet area for people to have private space, and ensures the privacy of space environment to a large extent (Fig.20), which not only satisfies people's needs for rest and communication, but also allows people to get satisfaction psychologically.

### 3.8 Zone H—Cangyou Shibei

Cangyou Shibei scenic spot is composed of Cangyou garden and tropical rainforest pavilion. Cangyou garden is composed of different courtyards with unique landscape. However, due to its location in the northwest corner of the park, tourists will miss it when visiting, and the park's guidance and publicity is obviously inadequate (Fig.21). It has poor correlation with Luzhou culture and local architecture, and tourists do not have a strong sense of cultural identity. There are a large number of tropical plants in the tropical rainforest pavilion, and artificial rainfall is set in the park to enhance the sensory experience of rainforest. Although there are signs, there is no professional explanation of plants (Fig.22). When tourists are alone in the park space, they have low interaction with the space environment.

## 4 Suggestion and redesign

### 4.1 Preserving cultural context

The redesign can start from the following aspects: preserving the cultural context, retaining the important scenes and buildings in the park, inheriting the ancient battlefield of Xiaoyaojin and the cultural connotation of the Three Kingdoms, increasing the landscape nodes of related historical stories, strengthening the cultural publicity around the scenic spots, setting up publicity bars, electronic display screens, intelligent interactive assistants, etc. Related cultural theme activities can be held regularly to display the cultural theme of the Three Kingdoms of the park, and Xiaoyaojin cultural and creative products can be added to improve the cultural publicity. Cultural elements

can be refined, and iconic elements of the Three Kingdoms period can be integrated into the infrastructure, to enhance the overall cultural atmosphere of the park and meet the diversified cultural needs of tourists. The park can be planned reasonably on the basis of the existing historical and cultural landscapes such as statue of Zhang Liao and cenotaph by learning from excellent historical theme parks at home and abroad, to let tourists have a deeper understanding of local history and culture and promote the regional history and culture of Hefei City, making historical sites more meaningful than just symbolic embellishments.

### 4.2 Enriching plant design

There are many types of vegetation in the park, but the plant groups are monotonous, and some plots lack vegetation. The combination of planting and design should be considered to highlight the seasonal changes of plants, and the ideas of designers should take into account the behavior and use of tourists, and bring visual beauty to tourists. In terms of olfactory sensation, the fragrant park has been built, focusing on the scenic spots such as peony garden, azalea garden, plum blossom mountain and Cangyou garden. The plant collocation and spatial layout in the park have been adjusted, to strengthen the theme of plant landscape in the boutique garden, and the plant landscape carefully created will bring people a relaxed and pleasant smell and visual experience.

### 4.3 Improving infrastructure

The park should improve the infrastructure for people's livelihood, such as setting up direct water dispensers to provide room temperature drinking water and hot drinking water in shops, public toilets and tourist centers with large traffic flow, and adding baggage depository and intelligent storage cabinets near the park service station, to enhance the convenience and happiness of tourists. The park should pay attention to humanized design, and increase barrier-free facilities, such as blind paths, handrails, railings, and barrier-free gentle slopes at the

steps. Moreover, the park should optimize the design of leisure activities and the materials used, and meet the comfort needs of tourists while ensuring basic usage requirements. The seating facilities in the park can be combined with the chessboard, and the chessboard table can be set up to provide a good place for the elderly nearby to play chess and leisure, thus increasing the richness of tourists' experience in the park.

### 4.4 Improving water landscape

The existing facilities with the strongest hydrophilicity in the park are pleasure boats, which are charged items. According to the feedback of users, it is not reasonably priced, which greatly reduces the intention of tourists to play. The pleasure boats are too cartoonish, and thatched boats in "borrowing arrows with thatched boats" can be learned to create a unique culture of the Three Kingdoms. In addition, it is very necessary to add more interactive hydrophilic facilities. Considering the actual needs of users, the park can enrich the forms of revetment, and add a variety of hydrophilic feature facilities by combining with the existing advantages. The lake should be cleaned regularly to maintain good water quality, thus improving the environmental quality of the park and creating a delightful lake view.

### 4.5 Optimizing spatial function

Considering that the surrounding residents come to the park for leisure and exercise, some free recreation and sports facilities can be appropriately added in the leisure area of the park. For children and teenagers, in addition to the existing seesaws, swings, slides, etc., the number of these amusement facilities can be added to avoid too many children waiting in line. Skating rinks and skateboards suitable for different age groups can be added to meet the space needs of tourists of different ages. In addition, the park can set up internet-famous sites to attract young people and increase the vitality of the park. The newly introduced material conditions are no longer simple amusement equipments, but facilities and services



Fig.18 Plum garden

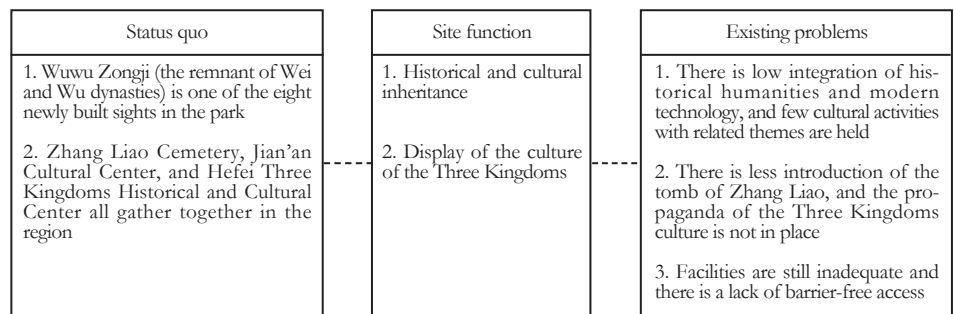


Fig.19 Analysis of zone G



Fig.20 Tomb of Zhang Liao



Fig.21 Cangyou garden

Status quo	Site function	Existing problems
1. Cangyou Shibei scenic spot is composed of Cangyou garden and tropical rainforest pavilion 2. The green brick pavement which is easy to grow moss is upgraded to non-slip marble pavement 3. Artificial rainfall is set in the park to enhance the sensory experience of rainforest	1. Plant science popularization 2. Leisure tour	1. The opening hours of the park are uncertain, and the seating shape is relatively simple. 2. The effect of plant collocation is not good, and there is a lack of professional explanation for plants

Fig.22 Analysis of zone H

suitable for the requirements of modern life, making the park truly a carrier of material experience<sup>[10]</sup>. Suitable proportion of open communication space and more private and quiet personal space can be created to meet the play and social needs of tourists.

## 5 Conclusions

The renovation and renewal of old city parks is not just demolition and reconstruction, but a continuous and dynamic renewal process. The transformation of Xiaoyaojin Park should create its own characteristic culture, inherit the cultural context of the Three Kingdoms, and

adjust the unreasonable spatial pattern on the basis of preserving the urban memory of Hefei citizens, so as to meet the needs of leisure, entertainment and fitness activities of citizens of different ages. By paying more attention to the psychological needs, subjective feelings and space experience of tourists, a people-oriented city park that meets the psychological needs of the public can be created, so as to revitalize the old park.

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