THE IMPACT OF LANDSCAPE SPATIAL CONFIGURATION AND CPTED ON USER SATISFACTION IN URBAN PARKS OF LANZHOU CITY, CHINA

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THE IMPACT OF LANDSCAPE SPATIAL CONFIGURATION AND CPTED ON USER SATISFACTION IN URBAN PARKS OF LANZHOU CITY, CHINA

by

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The best thing in all this world that can befall a man is to be born lucky. I was fortunate to meet my supervisor, Dr. Massoomeh Hedayati Marzbali, on this challenging PhD journey. Her guidance and dedication of time inspired me to gain the confidence to achieve my goals in this degree. Thanks to her for making me understand that seeing much, suffering much, and studying much are the three pillars of learning. This journey would never have ended without her hard work, guidance, support, and robust advice. My warmest feelings are addressed to my beloved parents, Mr. Hou Youlin and Ms. Zhang Li, and I thank them for their unlimited support and understanding. I cannot say how grateful I am to my dear friends, those who have been there for me during the most challenging time of my PhD career. This unforgettable learning journey was not only about how to get a PhD but also taught me that patience and perseverance have a magical effect before which difficulties disappear and obstacles vanish.

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LIST OF ABBREVIATIONS

SPSS	Statistical Package for Social Science
SD	Standard Deviation
VIF	Variance Inflation Factor
EFA	Exploratory Factor Analysis
PLS-SEM	Partial Least Squares-Structural Equation Modeling
CR	Composite Reliability
AVE	Average Variance Extracted
f^2	Effect Sizes
HTMT	Heterotrait Monotrait Ratio
$Q2$	Predictive Relevance
R2	Coefficient of Determination
VAF	Variance Accounted for
SES	Socioeconomic Status

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IMPAK LANDSKAP KONFIGURASI RUANG DAN CPTED TERHADAP KEPUASAN PENGGUNA DI TAMAN BANDAR BANDARAYA LANZHOU, CHINA

ABSTRAK

Dalam konteks penyelidikan semasa, walaupun penyelidikan tertumpu terutamanya pada kesan positif taman bandar terhadap aktiviti fizikal dan kesihatan mental pengguna dan peranan konfigurasi spatial landskap dan reka bentuk persekitaran dalam meningkatkan keselamatan dan kepuasan yang dirasakan, masih terdapat jurang yang jelas. Pertama, kajian sedia ada kebanyakannya tertumpu pada persekitaran bandar di negara Barat, seperti Eropah dan Amerika Utara, di mana konteks budaya, sosial dan alam sekitar berbeza dengan ketara daripada di bandar Asia. Bias geografi ini mengehadkan kebolehgeneralisasian penemuan ke wilayah seperti China, di mana pembandaran pesat dan struktur sosioekonomi yang unik memberikan cabaran yang berbeza untuk reka bentuk dan pengurusan taman bandar. Pertama, kebanyakan kajian tertumpu terutamanya pada persekitaran bandar di Barat, dan kurang diketahui tentang situasi di Asia, terutamanya di China. Kedua, prinsip pencegahan jenayah melalui reka bentuk alam sekitar (CPTED) dapat meningkatkan keselamatan ruang awam. Mengintegrasikan prinsip ini dengan reka bentuk landskap khusus dan keperluan pengguna taman bandar untuk menyesuaikan diri dengan keperluan struktur sosial masih perlu diterokai. Akhir sekali, penyelidikan semasa tertumpu terutamanya pada data kuantitatif, dengan kurang analisis mendalam kualitatif pengalaman subjektif pengguna dan persepsi keselamatan. Oleh itu, kajian ini mencadangkan kerangka konsep baru berdasarkan Teori Kognitif Persekitaran, Teori CPTED, Teori Hierarki Keperluan Maslow, dan Teori Stratifikasi Sosial.

Matlamat utama adalah untuk memahami secara menyeluruh dan mengoptimumkan reka bentuk konfigurasi spatial landskap taman bandar berdasarkan bentuk strategik prinsip CPTED untuk meningkatkan keselamatan dan kepuasan yang dirasakan pengguna dan menggalakkan pembangunan mampan taman bandar di kawasan perbandaran pesat seperti Lanzhou. Berdasarkan pendekatan kaedah campuran penjelasan berurutan, persampelan rawak mudah 1210 peserta telah diambil, dan fasa kuantitatif kajian telah disahkan. Selepas itu, persampelan bertujuan sebanyak 27 peserta telah diambil untuk melengkapkan fasa kualitatif kajian. Pertama, PLS-SEM mengesahkan kewujudan hubungan positif antara konfigurasi spatial landskap, CPTED, keselamatan dan kepuasan yang dirasakan di taman bandar. Selepas itu, peranan pengantara keperluan pengguna diperiksa, dan ditunjukkan bahawa taman yang memenuhi keperluan pengguna secara berkesan dari segi kualiti alam sekitar, kemudahan dan peluang rekreasi dikaitkan dengan tahap keselamatan dan kepuasan yang lebih tinggi. Kedua, status sosioekonomi (SES) telah muncul sebagai penyederhana yang ketara, mempengaruhi konfigurasi spatial landskap dan kesan CPTED terhadap keselamatan dan kepuasan yang dirasakan. Akhir sekali, Keputusan kualitatif menunjukkan bahawa taman bandar di utara China perlu mempertimbangkan faktor bermusim dan kepelbagaian tumbuh-tumbuhan untuk mengimbangi masalah tumbuh-tumbuhan tunggal pada musim sejuk. Kedua, reka bentuk taman bandar juga perlu mempertimbangkan keperluan pengguna status sosioekonomi yang berbeza, yang boleh membantu pereka bentuk membina taman bandar di wilayah sosioekonomi yang berbeza. Kajian ini menyumbang kepada pemahaman yang lebih mendalam tentang dinamika pelbagai aspek pengalaman taman bandar. Ia membantu memaklumkan intervensi berasaskan bukti masa hadapan untuk mewujudkan persekitaran taman bandar yang inklusif, selamat dan menyeronokkan untuk

pengguna. Ia sejajar dengan banyak Matlamat Pembangunan Lestari (SDG) Pertubuhan Bangsa-Bangsa Bersatu dan selaras dengan visi pembangunan mampan China.

THE IMPACT OF LANDSCAPE SPATIAL CONFIGURATION AND CPTED ON USER SATISFACTION IN URBAN PARKS OF LANZHOU CITY, CHINA

ABSTRACT

In the current research context, although research mainly focuses on the positive effects of urban parks on users' physical activity and mental health and the role of landscape spatial configuration and environmental design in improving perceived safety and user satisfaction, there are still obvious gaps. First, existing studies predominantly focus on urban environments in Western countries, such as Europe and North America, where cultural, social, and environmental contexts significantly differ from those in Asian cities. This geographic bias limits the generalisability of findings to regions like China, where rapid urbanisation and unique socioeconomic structures present distinct challenges for urban park design and management. Second, crime prevention through environmental design (CPTED) principles can improve the safety of public spaces. Integrating these principles with the specific landscape design and user needs of urban parks to adapt to the needs of social structures still needs to be explored. Finally, current research primarily focuses on quantitative data, with limited qualitative in-depth analysis of users' subjective experience and perceived safety. Therefore, this study proposes a new integrated conceptual framework based on Environmental Cognitive Theory, CPTED Theory, Maslow's Needs Hierarchy Theory, and Social Stratification Theory. The main aim is to comprehensively understand and optimise urban parks' landscape spatial configuration design based on CPTED principles to improve users' perceived safety and satisfaction and promote the sustainable development of urban parks in rapid

urbanisation areas such as Lanzhou. Based on a sequential explanatory mixed-method approach, a stratified random sampling of 1210 participants from four urban parks in Lanzhou was recruited, and the quantitative phase of the study was validated. After that, a purposive sampling of 27 participants was recruited to complete the qualitative phase of the study. First, PLS-SEM verified the existence of a positive relationship between landscape spatial configuration, CPTED, perceived safety and user satisfaction in urban parks. Subsequently, the mediating role of users' needs is examined, and it is shown that parks that effectively meet users' needs in terms of environmental quality, facilities, and recreational opportunities are associated with higher levels of safety and user satisfaction. Second, socioeconomic status (SES) has emerged as a significant moderator, influencing landscape spatial configuration and the impact of CPTED on perceived safety and user satisfaction. Finally, the qualitative results show that urban parks in northern China need to consider seasonal factors and vegetation diversity to compensate for the problem of monotonous vegetation in winter. Moreover, urban park design also needs to consider the needs of users of different socioeconomic statuses, which can help designers build urban parks in different socioeconomic regions. This study contributes to a deeper understanding of the multifaceted dynamics of the urban park experience. It helps inform future evidence-based interventions to create inclusive, safe and enjoyable urban park environments for users. It aligns with many of the United Nations' Sustainable Development Goals (SDGs) and resonates with China’s vision of sustainable development.

CHAPTER 1

INTRODUCTION

1.1 Research Background

The accelerating process of urbanisation has attracted worldwide attention. In today's accelerating urbanisation process, many environmental challenges have also arisen. The coronavirus disease 2019 (COVID-19) spread rapidly and quickly became a global pandemic (Lu et al., 2020). It has dealt a catastrophic blow to the health and safety of citizens and the social and economic operation. At the same time, COVID-19 has led to an increase in antisocial behaviour, which has contributed to the increase in crime rates (Hajna & Cummins, 2023). This makes humans reflect that although the rapid development of cities has dramatically improved lives, it has also created many problems. These ecological problems will directly negatively affect the quality of life of humans. Discussing a healthy and safe ecological balance in a rapidly urbanising system is challenging. Inadequate environmental policies and social and economic issues lead to unsustainable construction, illegal land occupation, and damage to environmental protection efforts, resulting in the loss of green space (Serpil Önder & Ahmet Tuğrul Polat, 2012). At the same time, intensive urbanisation, unplanned development, wrong site selection, catastrophic epidemics, and growing urban populations occur together. In short, cities seem to become unsuitable environments for human life (Karakaya Aytin & Korkut, 2015).

Recognising these challenges, international frameworks such as the Sustainable Development Goals (SDGs), particularly Goal 11, emphasize the need to create inclusive, safe, resilient, and sustainable cities. This goal specifically highlights the importance of increasing access to green spaces and improving urban quality of life. Similarly, the New Urban Agenda (NUA) promotes integrated urban planning that

balances urban growth with ecological sustainability, fostering a harmonious relationship between people and nature. Additionally, the World Health Organization (WHO) Healthy Cities Program underscores the critical role of urban parks in improving public health, enhancing social interaction, and fostering mental well-being. These frameworks align closely with this study's focus on urban parks and their potential to address contemporary urban challenges.

Therefore, the World Health Organization (WHO) has recommended building healthier cities (Tsouros, 2015). The World Health Organization (WHO) aims to inform city planners that urban space planning has become a hot topic. Since 2015, the Ministry of Environmental Protection and the Ministry of Ecology and Environment of China has successively issued two documents, the Measures for Public Participation in Environmental Protection and the Measures for Public Participation in Environmental Impact Assessment, emphasising the public's right to know and participate. They enable Chinese citizens to participate in monitoring and protecting the environment and promote the active participation of citizens in environmental protection work (Gao & Liao, 2019). These national-level initiatives complement the international frameworks and emphasise the importance of green spaces in promoting urban sustainability, public participation, and improved quality of life. Second, safety and security issues have always been a primary human need in human history (P. Cozens, 2007, 2008), as urban parks have become increasingly open and more closely connected to urban spaces. On the one hand, unsafe incidents are increasing (Henriques & Brilha, 2017). On the other hand, COVID-19 has also created fears of the pandemic for citizens (Isabella et al., 2022), and it is necessary to pay attention to the user's perceived safety of the environment.

However, cities that coexist with their natural and physical environments are undergoing rapid change with the changing needs of society and powerful technological interventions (H. Yilmaz & Özer, 1997). As urbanisation further poses a particular threat to urban green spaces, it seems that national and individual levels recognise the challenge - how to design green spaces as a place where people and nature are in harmony, maximising the use of land resources and benefiting the user. China and other local governments are also starting to pay attention to this challenge. Lanzhou, China, has been paying attention to environmental issues since 2000. As an industrial city, Lanzhou is the second largest city in Northwest China and has been experiencing severe air pollution. The funny thing is that the breakdown of air quality has even made Lanzhou challenging to observe on satellite maps. However, Lanzhou has become a Chinese Garden City since 2017. All Lanzhou people must see the significant changes in Lanzhou's environment during this period. Over the years, the Lanzhou Municipal Government has deeply understood the central government's determination to build an eco-city, vigorously improve the living environment, and focus on solving environmental governance problems. These efforts align with the objectives of the New Urban Agenda (NUA) and SDGs, showcasing Lanzhou as a case of integrating green space development with urban sustainability strategies.

Parks are an essential indicator of the quality of life in a city. In this regard, Loukaitou-Sideris (1995a) pointed out that urban parks are valuable assets for users because they can meet users' social needs for entertainment and leisure. Therefore, urban park space design can be based on users' needs, and planners can design according to users' needs to improve users' satisfaction (R. Zeng et al., 2024) and perceived safety (Kermani et al., 2022). With the construction and use of urban parks, contradictions and problems have emerged, particularly the contradiction between the

park's design concept and its practical implementation (Kazemi et al., 2022). This issue often arises when the initial design concept prioritizes aesthetics or theoretical ideals over functionality, resulting in spaces that fail to align with actual user behaviours and needs. For instance, insufficient seating, poorly planned pathways, or inaccessible facilities can undermine the usability of a park, despite an appealing design concept. This highlights the importance of integrating user-centred approaches into both the conceptual and practical stages of park design (Wever et al., 2008). Other issues include the low participation of users and the contradiction between restrictions and users' needs during COVID-19 (Davico et al., 2021). In the early stage of design, most designers rely on their own experience and personal hobbies, but they do not consider the real needs of users (Xia, 2008).

The investigation of most domestic urban parks found that it is far from enough to feel the landscape design when constructing urban parks. Landscape design emphasises the integration of natural and built environments to create spaces that not only fulfill functional needs but also evoke emotional and Physiological connections. By designing the environment of the urban park, users can better appreciate the balance between aesthetics, functionality, and sustainability, which enhances their sense of belonging and satisfaction (Quagraine et al., 2024). The main service objects of urban parks are urban users. Providing an adequate and humanised space for urban users is the most important guarantee for the success of park design (Liu, 2016). As one of the public infrastructures in urban construction, urban parks play a role in relieving pressure (Grahn & Stigsdotter, 2003), promoting happiness, and improving the health of the whole people (Sanesi et al., 2006). Green spaces are also fundamental to the World Health Organization's (WHO) Healthy Cities Program, which highlights their role in reducing stress, promoting physical activity, and improving mental health.

Green spaces attract countless users in today's fast-paced cities, especially urban parks. Nowadays, people pay more attention to the quality of life, especially after the COVID-19 pandemic, and urban parks emphasise the satisfaction of users' various activities and spiritual needs. To this end, it is necessary to investigate and evaluate the use of urban parks, gain insight into users' needs, and discover possible problems in parks regarding environment, design, use, and management. However, the definition of urban parks is not the same in all countries, so according to the Ministry of Housing and Urban-Rural Development of the People's Republic of China issued the "Urban Green Space Classification Standard (CJJ/T85-2017)" document, urban parks are divided into four categories: comprehensive parks, community parks, theme parks, and amusement parks. Their functions are outlined according to their classification (Table 1.1). Following the provisions of the above-mentioned documents, a comprehensive park that best meets the objectives and criteria of the study is selected. First, this kind of park is larger in scale and better built. Secondly, it has attracted a lot of users. Therefore, comprehensive parks are sufficient to provide reliable and valid data support in research.

Table 1.1 Classification and conceptual definition of urban parks in China

Classify	**Conceptual Definition**	**Number of People Served (Ten Thousand)**	**Scale of Construction (hm2)**	**Service Radius (m)**
Comprehensive Parks	The park is rich in content, suitable for carrying out various outdoor activities, with a perfect recreation and supporting management services.	>50	≥50	>3,000
		20 – 50	20 – 50	2,000 – 3,000
		10 – 20	10 – 20	1,200 – 2,000
Community Parks	The land is independent, with basic recreational and	5 – 10	5 – 10	800 – 1,000

	service facilities, and is mainly a park for residents within the community to carry out daily leisure activities nearby.	1.2 – 2.5	1 – 5	500
Theme Parks	A park with a specific content form and corresponding recreational and service facilities.	–	–	–
Amusement Parks	In addition to the above parks, the land is independent, the scale is small, and the shape is diverse, convenient for residents to enter nearby, and it has certain recreational functions.	0.5 – 1.2	0.4 – 1	300

Although urban parks are designed for the recreational purpose of users, also may attract a small number of criminals to engage in harmful activities (Knutsson, 1997). Data prove that violent crime cases in China's urban green spaces are rising yearly (Du, 2016). Crime and social conflict are severe problems in most urban parks (Schroeder, 1989). Some areas and conditions provided by urban parks, such as poor visibility, insufficient lighting, garbage, etc., can promote the formation of crime, and a small number of illegal users, such as vagrants and homeless people, can also cause park users to refuse to use. Fear of crime makes park users reluctant to use areas they perceive as unsafe and, as a result, prefer to use safer parks (S. Maruthaveeran & van den Bosh, 2015).

While urban parks continue to be constructed and optimised, safety will remain an important social issue. Environmental safety perception is considered one of the most important factors affecting urban parks' perceived quality and attractiveness (Mehta, 2014; Wolch et al., 2014a). During the COVID-19 outbreak, the perception

and behavioural activity characteristics of park users when engaging in park visits will undoubtedly be different from those of the past. Even users have developed a fear of COVID-19 (Xie et al., 2020). The physical environment design of urban parks promotes users' satisfaction and perception of environmental safety. As a forward-looking part of the overall design, landscape environmental design should consider user safety. If this element is ignored in the design, it will not only seriously affect the user's experience but may even threaten the user's perceived safety. When considering the return on investment in an ecological sense and the effect of conservation and utilisation, user experience should give priority (Liu et al., 2020; Timalsina, 2021).

Perceived safety is affected by a variety of factors. Currently, most of the research on perceived safety in the academic community is from the perspective of criminal defence. The American scholar Jeffery first proposed Crime Prevention Through Environmental Design (CPTED) (Jeffery, 1971). This theory is now essential in criminology and is widely used in urban design practice. Research on perceived security is often from a socio-criminological perspective, with little integration with landscape elements. As the essential component of environmental design, landscape elements need to consider the user's perceived safety. Improving the user's sense of security through a suitable combination of landscape elements is crucial. Secondly, people's fear of Covid-19 during the pandemic has become another factor in perceived safety (Xie et al., 2023) because the impact of the pandemic has led to a change in users' needs, from the fear of crime in the past to the fear of COVID-19.

As mentioned earlier, the physical elements (such as CPTED and landscape spatial configuration) in urban parks affect urban park users' perceived safety and user satisfaction. Perceived safety also affects users' satisfaction. Therefore, this study first shows how physical elements (such as CPTED and landscape spatial configuration)

affect users' perceived safety and satisfaction through users' needs. This approach provides a comprehensive understanding of making urban parks safer to improve users' satisfaction. Finally, from the perspective of users' needs, the possible problems of the current urban parks are found, and the optimisation and improvement strategies as a framework for the landscape space configuration and environmental safety design of urban parks are proposed.

1.2 Problem Statement

Urban park landscape spatial configuration provides recreational opportunities, enhances social interaction, and promotes environmental sustainability (S. Zhang et al., 2024). An urban park that can bring perceived safety and user satisfaction can encourage users' frequent use of the park. It effectively increases the utilisation rate of parks and enhances the value and utilisation efficiency of public space. Secondly, urban parks with high perceived safety and user satisfaction are more likely to attract families, friends and neighbours to gather, promote social interaction and community cohesion, and enhance residents' sense of belonging (Dobson & Harris, 2019). Through scientific design and management, urban parks can become safe, enjoyable, and attractive public spaces that provide users with a better quality of life (H. Wang et al., 2019). Connectivity within the urban park landscape spatial configuration is another critical aspect. This involves designing the layout to facilitate seamless connections between the park and its surroundings, including adjacent urban areas and infrastructure, thereby enhancing accessibility, usability, and overall functionality (Al-Kodmany, 2024). Additionally, effective connectivity enhances the accessibility, usability, and overall functionality of urban parks. The proximity of urban parks encourages the integration of parks with commercial and cultural districts, and creating

parks near mixed-use areas with shops, restaurants and service facilities around them can create a highly attractive urban park (Qin et al., 2024). Lastly, the study points out that urban park landscape spatial configuration can affect the risk of COVID-19 transmission and the well-being of urban residents. Crowded urban parks may exacerbate users' fear of COVID-19. Therefore, well-maintained urban parks with a quality landscape spatial configuration can calm users and reduce pandemic-related anxiety (Padeiro et al., 2022).

However, with the rapid development of urbanisation, how to improve the safety and satisfaction of users through effective landscape design and configuration has become an urgent problem to be solved. Existing studies have shown that the CPTED theory has been fully validated in crime prevention and urban safety (Lim et al., 2020). Nonetheless, there is a need to enrich further the CPTED principles and the safety assessment of urban parks (H. Li et al., 2024). The study mainly focuses on increasing the safety of the urban park environment from the dimensions of landscape spatial configuration, such as environmental quality and road connectivity (Huang et al., 2023). With the popularisation and application of CPTED principles, the six critical elements of CPTED: territoriality, nature surveillance, access control, activity support, imagery and maintenance, and target hardening more effectively guide the effectiveness of safety design in urban parks (Mak & Jim, 2022). In addition, landscape spatial configuration plays a crucial role in integrating urban safety design through CPTED principles, providing a viable design strategy for creating safer urban landscapes in the future (Ahmad et al., 2024). Therefore, optimising urban park landscape spatial configuration combined with the CPTED strategy can enhance perceived safety and improve user satisfaction.

Maslow's hierarchy of needs theory states that safety is one of people's basic needs (Y. Gu, 2024). Urban park design must prioritise this need to ensure continued use and satisfaction of users (Jing Zhao, 2024). For example, accidents such as drowning, falling, and disease transmission in urban parks pose a threat to users' physical health (Kruize et al., 2019). The frequent occurrence of violent crimes exacerbates people's perceived unsafety (Bogar & Beyer, 2016) and people's fear of COVID-19 in public environments after the outbreak of COVID-19 (Ugolini et al., 2020), all affect users' perceived safety and satisfaction. However, it is one-sided and insufficient to optimise the urban park environment to improve perceived safety and satisfaction by only considering the safety needs of urban park users (Rozman Cafuta, 2021). This is because the study has pointed out that Maslow's hierarchy of needs theory must be fully considered when designing and optimising urban environments based on CPTED principles, especially considering the diversity of user needs and high-level needs, which can promote a highly satisfying and livable urban environment (Mihinjac & Saville, 2019). Therefore, incorporating the diverse needs and socioeconomic status of users into the design of urban parks not only helps to improve satisfaction and safety but also promotes social equity and ecological and environmental benefits (Y. Xiao et al., 2017).

However, there is an imbalance in the design and users' diverse needs of urban parks (X. Xiao et al., 2024). The best way to reduce this imbalance is to meet the diverse needs of users of public space (J. Li et al., 2022). Human-centred design also aims to prioritise user needs (Alfredo et al., 2024). In addition, study has shown that the diverse needs of users are significantly influenced by socioeconomic status (R. Zhang et al., 2021). Understanding different socioeconomic statuses is essential for developing urban park designs adapted to various user groups. However, current

research needs empirical research to explore the root causes and mechanisms of socioeconomic status inequality based on the theory of social stratification and how to address environmental design to narrow this inequality. Therefore, it is essential to pay attention to the differences in needs of users of different socioeconomic statuses, as this will not only effectively increase the use of urban parks but also improve satisfaction and promote social equity. It also contributes to the sustainable operation of urban parks.

In summary, the unreasonable design of urban parks will lead to a lack of sense of security and satisfaction, leading to a decline in the use rate of parks so that these public resources cannot play their due social and environmental benefits. In addition, failure to meet diverse needs and differences in socioeconomic status can exacerbate social inequalities and affect social cohesion and stability. Therefore, it is significant to study and solve these problems to improve the overall benefits of urban parks and achieve sustainable development.

Lanzhou, as one of the representative cities undergoing rapid urbanisation in China, provides a unique context for this study. The city has made significant progress in improving environmental quality, as reflected in its designation as a "Chinese Garden City" in 2017. Despite these achievements, challenges remain, including an imbalance between park supply and user needs (Y. Chen et al., 2023), low perceived safety (Y. Xu et al., 2023), and low user satisfaction (X. Li et al., 2023; Lili et al., 2022). These issues highlight the urgent need to develop park design strategies aligned with CPTED principles to enhance user experience and promote sustainable urban development.

As one of the representative cities of rapid urbanisation, Lanzhou faces problems such as an imbalance between supply and needs, low perceived safety and

low satisfaction of users in the design and configuration of urban parks, and there is a lack of design strategies based on the principles of CPTED in Lanzhou urban parks. This study focuses on urban parks in Lanzhou, China. It explores the relationship between landscape spatial allocation, user needs, perceived safety and satisfaction in urban parks in Lanzhou through environmental cognition theory, combined with CPTED theory, Maslow's hierarchy of needs theory and social stratification theory. Through questionnaire surveys and semi-structured interviews, the needs and feedback of users with different socioeconomic statuses are collected and analysed to provide a scientific basis and practical suggestions for the design and renovation of urban parks, hoping to improve the perceived safety and satisfaction of users, promote social equity, and achieve a sustainable urban park environment. This study not only addresses local challenges in Lanzhou but also provides insights and strategies applicable to other rapidly urbanising areas, contributing to the global push for sustainable urban living.

1.3 Research Gaps

After reviewing the literature on urban park satisfaction and perceived safety, this study identified four significant gaps, as shown in Figure 1.1. A comprehensive understanding of user demand preferences in urban parks necessitates analysing the landscape spatial configuration characteristics within the study area (S. Zhang & Zhou, 2018). Differences in the landscape spatial configuration may affect individual demand preferences, leading to user satisfaction variations. Therefore, the landscape spatial configuration characteristics in different areas result in diverse needs and varying satisfaction levels among individuals (Shi et al., 2021). However, current research does not fully explore how these configurations interact with user perceptions,

leaving a critical gap in understanding this relationship. Further research is needed to bridge this knowledge gap.

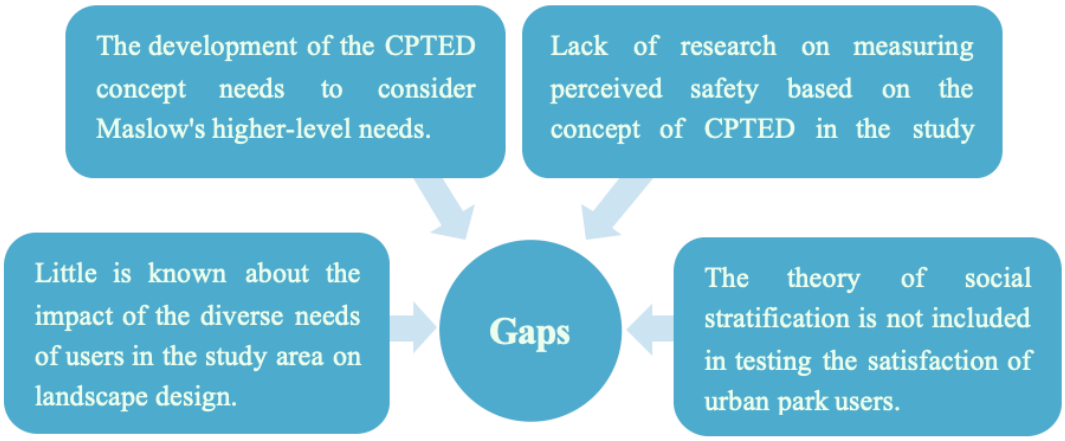

Figure 1.1 Summary of gaps in the literature

Mihinjac & Saville (2019) highlighted the importance of considering Maslow's hierarchy of needs within the context of CPTED, emphasising the integration of higher-level needs into safety design. Specifically, they argue that addressing users' Physiological and emotional needs, such as belongingness, esteem, and self-actualisation, is essential for urban park environments that foster a sense of safety and satisfaction. Several studies have also underscored the significance of Maslow's hierarchy of needs in CPTED (Abdullah et al., 2021). Human satisfaction is a complex equation influenced by various factors, and Maslow's hierarchy of needs illustrates the hierarchical nature of these needs. This hierarchy encompasses basic physiological needs such as food and shelter for self-preservation, and progresses to higher-level cognitive and psychosocial needs like social connections and a sense of belonging. Today's research across multiple disciplines has greatly expanded upon Maslow's higher-level needs (Lowe et al., 2016). Closing this gap would significantly contribute to more holistic and effective urban park design and safety strategies

Figure 1.2, Mihinjac & Saville (2019) illustrated the correspondence between different community levels and types of needs and highlighted the ineffectiveness of relying solely on crime opportunities in the physical environment to reduce crime and enhance safety. This model underscores the opportunity for humans to realise higher-order needs within Maslow's hierarchy, aligning with the objectives of CPTED to create safe urban spaces that not only reduce crime but also maximise individual potential (Saville & Mihinjac, 2022). Therefore, this research seeks to advance the second generation of CPTED by incorporating Maslow's high-level needs into the design framework to enhance satisfaction and perceived safety among urban park users, thereby contributing to innovative strategies for urban park design and safety management.

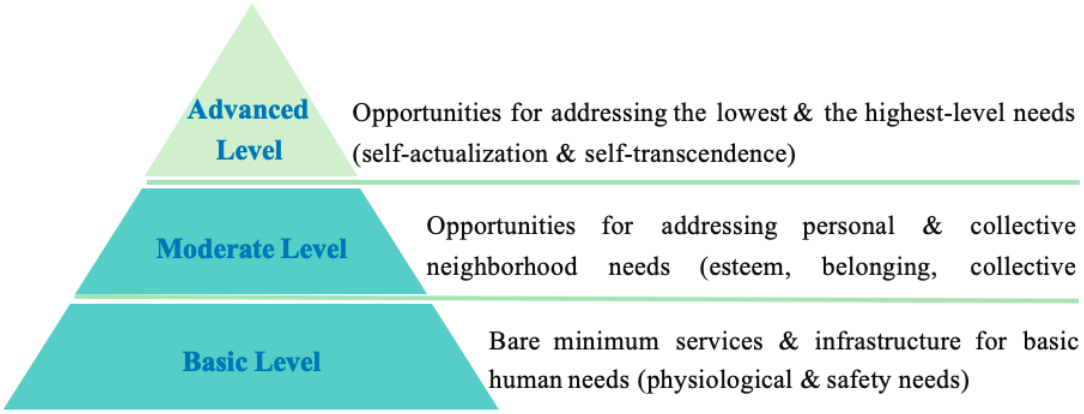

Figure 1.2 Liveability hierarchy
Source: (Mihinjac & Saville, 2019)

Additionally, environmental quality influences the perceived safety of users (Heshmati & Charehjoo, 2018). As a cornerstone of ecological design, CPTED principles are essential for creating environments that enhance both safety and satisfaction (Karimzadeh et al., 2019). Research shows that CPTED, as an essential strategy to improve the design of urban parks, not only enhances the safety of the environment but also affects the satisfaction of geopark visitors through its six principles (G. Chen et al., 2021). Access to Chinese geoparks requires a fee,

contrasting with free access to urban parks, which can contribute to higher crime rates. Thus, enhancing perceived safety through CPTED principles is a critical component in improving user satisfaction in urban parks, particularly in cities like Lanzhou. Lanzhou, as a major urban center in Northwest China, faces unique challenges such as rapid urbanization, significant socioeconomic disparities, and an increasing population density, which exacerbate concerns about crime and public safety in urban parks. Additionally, the city's distinct geographical and cultural characteristics require tailored strategies to address the diverse needs of its residents. These factors highlight the urgent need for further research and strategic interventions to create safer and more inclusive urban park environments that enhance user satisfaction and foster a sense of community.

Finally, according to the literature, previous studies on urban parks have examined occupation, income, and educational attainment, showing that socioeconomic statuses lead to differences in users' satisfaction and perceived safety (Liang et al., 2022; Wang et al., 2022). social stratification is a controversial yet pervasive concept in modern society (Jonkers & Fu, 2022). Combining Weber's and Bourdieu's criteria, which emphasise the multidimensional nature of social stratification, this study primarily uses socioeconomic status (SES) as an indicator of social stratification, including income, education, and occupation. Bourdieu's theory highlights that social stratification is not solely based on economic capital but also on cultural capital (e.g., education, knowledge) and social capital (e.g., networks of relationships) (O'Donoghue, 2013). These forms of capital influence individuals' behaviours, preferences, and access to resources, which are critical in understanding user diversity in urban park contexts. Understanding the different needs of people from various socioeconomic statuses can guide designers and park managers in creating

urban parks that better serve all community members, thereby improving user satisfaction and perceived safety (Kong et al., 2022). This research divides social classes according to the combined value of these three aspects. Understanding the factors behind physical factors like social stratification can better guide the construction of urban parks in different economic zones, ensuring they meet the diverse needs of all users.

1.4 Research Questions

This study is motivated by the question: "How can landscape spatial configuration and CPTED analysis enhance the perceived safety and satisfaction of urban park users?" Based on environmental cognition theory and supported by CPTED, Maslow's hierarchy of needs and social stratification theories, this study integrates CPTED, landscape spatial configuration, users' needs, perceived safety, and user satisfaction into the development of conceptual framework. This study provides new insights into the factors that may affect users' satisfaction and perceived safety in urban parks in Lanzhou. Therefore, the following key research questions are designed for further study:

1. What are the relationships among landscape spatial configuration, CPTED, users' needs, perceived safety, and user satisfaction in urban parks of Lanzhou, China?

2. Do users' needs mediate the relationship between landscape spatial configuration, CPTED, perceived safety, and user satisfaction in urban parks?

3. Does socioeconomic status of urban park users moderate the relationship between landscape spatial configuration, CPTED, users' needs, perceived safety, and user satisfaction?

4. How can social factors and physical attributes (landscape spatial configuration and CPTED) of urban parks be prioritised to enhance user satisfaction and perceived safety in urban parks?

1.5 Research Aim and Objectives

This study will establish a framework for comprehensively understanding and optimising urban parks' landscape spatial configuration design in the form of some strategies based on CPTED principles to improve users' perceived safety and satisfaction and promote the sustainable development of urban parks in Lanzhou and other rapidly urbanising areas. The study aims to address the following research objectives:

1. To examine the direct and indirect relationships among landscape spatial configuration, CPTED, users' needs, perceived safety, and users' satisfaction in Lanzhou urban parks, China.

2. To assess the mediating role of users' needs in the relationships between landscape spatial configuration, CPTED, perceived safety, and satisfaction.

3. To investigate the moderating role of socioeconomic status of urban park users on the relationships between landscape spatial configuration, CPTED, users' needs, perceived safety, and user satisfaction in the study area.

4. To suggest strategies for urban parks based on social factors and physical attributes (landscape spatial configuration and CPTED) to enhance user satisfaction and perceived safety.

This study makes a new contribution to the body of knowledge by addressing the above research objectives. This study will use Smart-PLS to test the path model of CPTED, landscape spatial configuration, satisfaction, perceived safety, and users'

needs as mediating variables in Lanzhou urban parks in China and explore the direct or indirect relationship between variables. In addition, an optimisation scheme that matches the spatial structure of Lanzhou urban parks in China will be proposed, which provides a specific reference for the construction and optimisation of the landscape spatial configuration and CPTED of Lanzhou urban parks in the future and is also of great significance improve the perceived safety and user satisfaction in the urban park of Lanzhou.

1.6 Scope and Limitations of the Study

By clarifying the study's scope and limitations, the findings' applicability and reliability can be better understood, ensuring that the results can be applied appropriately in the design and optimisation of urban parks and that practical implementation challenges are considered. This study focused on the comprehensive urban parks in Lanzhou City and selected four comprehensive parks: Baitashan Park, Wuquanshan Park, Yintan Wetland Park, and Xigu Park. These parks are famous tourist attractions in Lanzhou City, with good amusement facilities and developed infrastructure, which can be used for sightseeing, rest, entertainment, sports, scientific research and other activities. Secondly, they offer several free services to tourists. The selection of these parks ensures the study's representativeness.

However, this study does have some limitations. First of all, most of the previous studies used ArcGIS or depth maps to measure the landscape spatial configuration dimension. However, China's geographic data is confidential, especially for public facilities or government jurisdictions, which are strictly controlled and cannot be made public. Therefore, it is not easy to use software to analyze the spatial dimension of the landscape. To address this issue, study employed a questionnaire

survey method to gather data on landscape spatial configuration indirectly through users' perceptions and experiences, ensuring the confidentiality and security of sensitive information while still achieving the research objectives. Secondly, the urban parks in Lanzhou City were selected as the study site for this study, which may not be representative of the situation in other cities. Although Lanzhou is somewhat representative, different cities' cultural, economic, and social environments may lead to different study results. At the same time, this study's data collection and analysis were conducted over a specific period, so the impact of time changes on users' needs and emotions could not be considered. For example, seasonal changes and special events (holidays or pandemics) may affect the park's usage model and user experience. Finally, the sample size does not represent the needs and experiences of all user groups. This is especially true of the needs of certain marginalised groups (people with disabilities or older persons).

1.7 The Significance of the Study

Since the establishment of urban parks, designers and park managers have focused on users' needs and preferences to enhance user satisfaction and design better park landscapes (Talal & Santelmann, 2020). First, this study contributes to the growth of the environmental cognitive theory knowledge system. Environmental cognitive theory includes three aspects: environment, individual, and behaviour. Environmental characteristics and individual differences influence a person's cognitive components, affecting their satisfaction (Larsen & Diener, 1987). Urban park satisfaction results from individuals engaging in leisure activities within the park's spatial environment (Kabisch et al., 2021; Perry et al., 2021). Perceived safety is an individual's response to the environment (Tennakoon & Taras, 2012). Users generally choose urban parks

that they consider safe to participate in recreational activities, so the environment and individuals can promote the perceived safety of urban park users (Mak & Jim, 2022). Research also shows that safety in any context is crucial to users' satisfaction (Lee et al., 2021; van den Berg et al., 2020). The distinction between safety and perceived safety needs clarification, but both impact urban park users' satisfaction.

Therefore, designing safe and diverse parks that meet different users' needs and improve well-being is a challenge for every urbanised country. Based on environmental cognitive theory, CPTED, and Maslow's hierarchy of needs, this study proposes that landscape spatial configuration and users' needs in urban parks may affect perceived safety and, thus, users' satisfaction. By examining these two independent variables, this study expands knowledge about the factors influencing users' satisfaction in urban parks and their relationship with perceived safety. Additionally, this study suggests that users' needs mediate the relationship between urban park landscape spatial configuration, CPTED, perceived safety, and users' satisfaction. This work will further elucidate whether the effects between independent and dependent variables are direct or indirect.

Second, the perceived safety in this study will be examined based on the dimensions of the CPTED concept. In addition to crime prevention, applying CPTED strategies also helps promote perceived safety, which is essential for establishing a safe environment.(Shariati & Guerette, 2019). Relevant research indicates that the safety and security dimensions of first-generation CPTED align with the lower levels of Maslow's hierarchy of needs, while the dimensions of second-generation CPTED correspond to the physiological needs and social belonging in Maslow's hierarchy. Newman (1972)and Moffatt (1983) identified six dimensions of CPTED: territoriality, surveillance (formal and informal), access control, activity support,

image/maintenance, and target hardening. In China, CPTED-related research began later, and both theoretical research and practical applications lag behind. Therefore, applying the CPTED strategy in constructing and transforming urban parks in China can promote CPTED practice in the country.

Third, this study incorporate social stratification theory to examine whether users' satisfaction, needs, and perceived safety when using parks differ based on socioeconomic status (SES). Understanding these differences can guide park construction to consider the SES of surrounding communities, including users' income, occupation, and education levels, and design parks accordingly to improve satisfaction and perceived safety. By applying SES as a variable, this study aims to control and enhance users' satisfaction and perceived safety.

Finally, this study's importance lies in constructing a relational model that links landscape spatial configuration, CPTED, perceived safety, user satisfaction with urban parks in Lanzhou, China, and users' needs as mediating variables. The proposed model utilises multidimensional measures of these constructs through structural equation modelling. Few previous studies have employed this approach, making the study more reliable in measuring the subject. After completing the quantitative phase, this research will use semi-structured interviews to explore the main reasons for high and low users' satisfaction and perceived safety. By combining interview data with quantitative analysis, the study will gain a comprehensive understanding of user expectations and experiences. The results will contribute to developing a knowledge base that aids the government, designers, and park managers in understanding the actual needs of urban park users. This understanding will enhance the landscape configuration characteristics of urban parks and help optimise their physical attributes (landscape spatial configuration and CPTED) to improve users' satisfaction and safety. The

significance of this study can be summarised in enhancing theoretical understanding, practical application, addressing socio-economic disparities, and comprehensive analysis as discussed below:

1. This study contributes to the growth of environmental cognitive system knowledge by examining the environmental characteristics of urban park landscape spatial configuration and CPTED, along with the personal attributes of users' needs, which directly or indirectly affect users' satisfaction and perceived safety in urban parks.

2. This study also emphasises the importance of socio-economic status (income, occupation, education) in the relationships between urban parks' landscape spatial configuration, CPTED, users' needs, perceived safety, and users' satisfaction.

3. Based on the theory of social stratification, this study employs qualitative analysis to emphasise the needs and perceived safety of different users under social stratification. This approach helps designers and park managers understand the actual needs of urban park users and leverage the landscape configuration characteristics to create high safety and satisfaction in urban parks. Additionally, it enables the understanding of the socioeconomic status of urban park users to build or optimise parks according to their needs.

4. Finally, this study will complement the quantitative analysis by conducting interviews to further clarify and confirm the results related to users' needs, perceived safety, and satisfaction. This will assist park planners and management in building and optimising the physical attributes (landscape spatial configuration and CPTED) of urban parks, thereby improving users' satisfaction and safety, which has practical significance.

1.8 Research Methodology

This study selected four representative comprehensive urban parks in Lanzhou (Baitashan Park, Wuquanshan Park, Yintan Wetland Park and Xigu Park). A sequential explanatory mixed method was used to answer the research questions. Firstly, the data on respondents' social characteristics, landscape spatial configuration, CPTED, user needs, perceived safety, and user satisfaction were obtained through questionnaire surveys. The questionnaire was conducted among urban park users selected by a stratified random sampling method. These urban parks were chosen for the study because they have become modern society's first choice for leisure and entertainment. These parks have a wide variety of users. Collecting and analysing these users' perceived safety and satisfaction is more conducive to the design and renovation of urban parks according to the CPTED principles, and the study results are more general. Once the official questionnaire has been issued, the collected questionnaire data was entered into the SPSS software to process the missing data and weed out invalid questionnaires. Finally, Smart PLS was used to establish a model of the relationship between all variables, the mediating role of user needs and the moderating role of socioeconomic status.

In the qualitative data collection phase, further interpretation and supplementation of the quantitative results are necessary. To gain deeper insights into the perspectives of park users, semi-structured interviews were conducted. The interviewees were selected through purposive sampling, including participants from the questionnaire survey and users who voluntarily participated in the qualitative phase. The selection criteria focused on ensuring representation across different socioeconomic statuses. The interview content includes differences in CPTED, landscape space configuration, user needs, perceived safety and user satisfaction. The

collected data is transcribed using Nvivo 12.0, and thematic analysis encodes the interview content and ultimately forms themes and subthemes. This part of the study aims to illustrate the quantitative results further and provide a reference for planners and governments to construct and optimise the spatial layout of urban parks in Lanzhou.

The study design of this study is descriptive, exploratory, and interpretive. Combining quantitative and qualitative methods can provide a wide range of quantitative data support and profoundly understand users' real feelings and needs. This will provide a valuable reference for the Lanzhou Forestry Bureau and the Lanzhou Urban and Rural Planning Bureau in the construction and renovation of parks and help different economic regions to build urban parks suitable for other social levels, to reduce the financial expenditure of the financial department and avoid waste of resources and unnecessary financial outlays.

1.9 Operational Definitions of Terms Used in this Study

This chapter provides actionable definitions by focusing on the exact meaning of the terms used in this study. Some terms used in the study require precise definitions. This chapter gives definitions of landscape spatial configuration, users' needs, perceived safety, and users' satisfaction.

Landscape Spatial configuration: Landscape spatial configuration of urban parks may include issues that cover various aspects such as land use, topography, vegetation, and human interaction. Zheng (2021)developed a questionnaire on landscape spatial configuration composed of 4 dimensions: landscape quality, accessibility, connectivity, and proximity. This study focuses on the four dimensions