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Status quo, hotspot and trend analysis of urban green space research based on Cite Space

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Abstract

As one of the important components of ecosystem services, urban green space can affect the physical activity of the public, especially the exposure level, accessibility and landscape composition of green space are positively correlated with the health behavior activities of residents. Urban green space has the function of improving residents' mental health, physical condition, social adaptation and moral health. In this paper, we analyzed the clustering of thematic word network, high-frequency and central thematic words and thematic words on the basis of 149 literature data of CNKI website from 2009 to 2024, and summarized the research categories of the main urban green space and their main perspectives. In the future research, we should strengthen the interdisciplinary research, especially with the humanities and social sciences, pay attention to the interaction of urban green space, social economy and public health, explore the multiple mechanisms and modes of the value realization of urban green space, and help the harmony and unity of man, nature and society [1]

Keywords: cite space; city; green space; visual analysis

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Foreword

The World Health Organization (WHO) further improved the concept of health in 1989, pointing out that health should be a good state of physical, psychological, social adaptation and moral aspects. With the progress of modernization, many urban residents can not enjoy the real environmental protection, which leads to many negative effects harmful to the health of residents. In order to make our living environment can better promote our healthy development, we should attach great importance to and maintain the greening and sustainable development of the city. Urban Green Space is a vibrant place composed of a variety of plants and animals, including parks, streets, squares, nature reserves, etc. The rapid expansion of modern cities and the increasing building density often lead to the reduction of green space by [2]. Urban green space not only provides places for residents' leisure and entertainment, so that residents can directly obtain health benefits both physically and mentally, but also has the functions of improving the urban environment and improving the ecological quality. The construction of urban green space can bring multiple benefits, from the residents in the social interaction and social adaptability, to the interaction with nature, to through the cultural ecosystem services indirectly promote health behavior, can be from the sum of natural elements in urban space, the ecosystem function relationship and its use of beneficial effects. This paper aims to deeply explore the development trend of urban green space through visual analysis, and comprehensively sort out its publishing institutions, major journals and representative literature from different perspectives, in order to provide valuable reference for the research of urban green space in China.

Study Methods and Data

Source of data

With the development of society, the study of urban green space has become more and more common, covering various academic journals, conference papers and graduation papers. In order to better explore the development trend of urban green space, we collected the documents related to urban green space of Peking University, CSCD and CSSCI in the CNKI database. A total of 149 articles were retrieved, which were used as the analysis samples of foreign literature data in this study.

Study Methods

Through the use of Cite space software, this research and development has adopted a variety of effective technical means, to deeply explore the current situation of urban green development in China from 2009 to 2024, and to show the contents of 149 core journals in the form of scientific knowledge graph. Through the analysis of Pathfinder (path finding network algorithm), we can deeply understand the importance of urban green space, and use Excel, word frequency analysis and historical comparison method to accurately evaluate the publication of this field, so as to better understand the current research status and predict the future development.

Study results and analysis

Annual publication volume of urban green space research

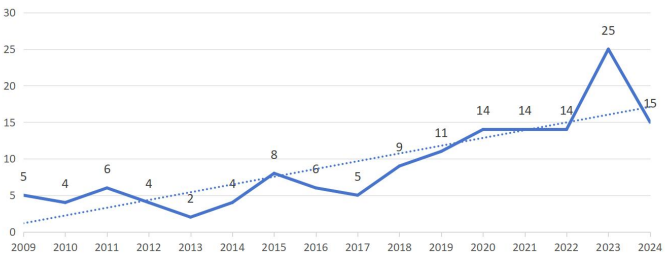

Figure 1 Volume chart of CNKI in the past 15 years

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Figure 1 shows the change of the annual publication volume of urban green space research according to Figure 1. From 2009 to 2024, a total of 149 research articles on urban green space have been published, and this development trend can clearly reflect the development process of urban green space research. In 2009, the development and research of urban green space in China has just started. In 2016, the research on green space in China has entered the development stage, and the number of documents has increased year by year. Since 2020, China's exploration of urban green space has shown a steady development trend.

Core author analysis

According to Price theory, an author with a high paper output can be identified as the core author, of which, N=0.749 (η max) 1 / 2, indicating that the number of published papers reaches at least N. The minimum number of articles is 6, and the integer 2 is taken as the minimum number of articles for the author. According to Table 2,25 authors were identified as candidates for a total of 61 articles. On average, each author published 2.44 articles, and although their proportion was only 22.12% of the total authors, their publications accounted for 40.93% of the total articles. The contributions of these scholars show their importance in the field of scientific research. Table 2 shows the core authors of the Chinese literature, among which Ye Lin scholar published six articles, followed by Zhang Biao, Xing Zhong, Li Na and Xie Highland, all of whom had more than three articles. There are 21 articles in total, accounting for about 14.09% of the total amount of Chinese literature published.

Table 1 Statistics of the authors of CNKI

Post volume	author
6 Articles	Ye Lin
5 Articles	Zhang Biao
4 Articles	Xing Zhong
3 Articles	Li Na, Xie Highlands
2 Articles	He Jinliao, Wang Shuo, Wang Siyuan, Liu Min, Chen Kanglin, Zhang Zishu, Yan Wentao, Yang He, Yang He, Xie Bo, Wu Xuefei, Liu Hui, He Shuchuan, Liu Chunlan, Zhou Liang, Liu Jingyuan, Chen Xiao, Yue Xiaoyu, Gong Jianzhou, Qin Fei, Tan Xuyuan

Keyword co-occurrence network analysis

From 2009 to 2024, several of the most common and important topics are: green Spaces, landscape architecture, mental health, and sports, which reflect the importance that academia attaches to urban environmental protection over the past 15 years [3]. The frequency of such keywords is so remarkable that they not only represent the current social focus, but also demonstrate their profound influence in academia.

Figure 2 Analysis of the co-occurrence network of keywords in urban green space

Through the number likelihood algorithm (LLR) clustering the keywords in the urban green space, we found that there is a strong correlation between the keywords under each cluster, and the Modularity Q value is greater than 0.3, indicating that the clustering structure is more clear, while the MeanSilhouette S value is greater than 0.7, indicating that the clustering results are more reliable. After this study, we found that Q=0.6451> 0.3, indicating that the keyword structure of this cluster is very significant and can be used as a strong argument. In addition, S=0.938> 0.7, indicating that the effect of this cluster is very reliable, which also indicates that the research direction, focus and main content of the literature in each cluster are similar, so it can be used for cluster analysis (Figure 6). After in-depth analysis, we find that "urban park", "landscape architecture", "landscape pattern", "mental health", "physical activity", "accessibility", "Long chi Park", "regional monitoring", "conceptual framework", "Beijing", "green space system", "sports city" and "livable" are a very important indicators. By clustering the 13 keywords, we can better understand the topic distribution [4] of urban green space spatial research in China. This information helps scholars to better understand and master the structure and content of relevant research.

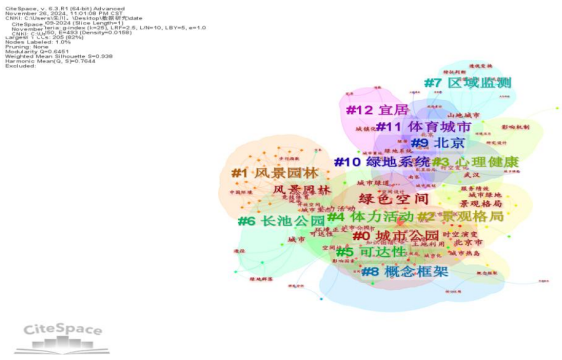

Figure 3 keyword clustering analysis diagram in urban green space

Table 2Urban green space keyword classification table

classify	keyword
spatial planning	"City Park", "Landscape Architecture", "Longchi Park", "Beijing" and "Sports City"
public health	"Mental health" and "Physical activity"
systems assessment	"Landscape pattern", "accessibility", "green space system", "regional monitoring", "conceptual framework" and "livable"

After a thorough analysis, we found complex connections among the 13 clusters of the urban green space study, and the diffusion of these clusters is influenced by multiple factors. Therefore, according to these clusters, we can divide the current hot topics of urban green space research in China into several categories, so as to better grasp the research context [5].(1) quot;City Park quot;, quot;Landscape Architecture quot;, quot;Chang chi Park quot;, quot;Beijing quot; and quot;Sports City quot; is an important work on spatial planning.(2) Public health research. Research around public health includes quot;mental health quot; and quot;physical activity quot;.(3) System evaluation. Studies around the system evaluation include quot;landscape pattern quot;, quot;accessibility quot;, quot;green space system quot;, quot;regional monitoring quot;, quot;conceptual frame work quot; and quot;livable quot;.

Analysis of the emergent map of keywords

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The frontier and trend of a certain research field can be predicted by the change of word frequency. Through the Layout function in Cite Space software, select quot;Byrstness quot;, find 10 keywords, and draw the keyword appearance map. As can be seen from Figure 6, the timing of the emerging words in the field of urban green space research in China is arranged as quot;green space system quot;, quot;city quot;, quot;Beijing quot;, quot;Beijing quot;, quot;spatial pattern quot;, quot;Germany quot;, quot;Beijing quot;, quot;urbanization quot;, quot;Guangzhou quot;, quot;sports city quot; and quot;mental health quot;. These keywords are widely concerned and highly influential research hot spots in Chinese academic circles. The emergence words appear from 2009 to 2024. This paper divides the emergent words into the following three categories: spatial planning, public health, and systematic evaluation. It can be seen from Figure 6 that in recent years, the research on urban green space in China focuses on public health. With the development of economic and social, the importance of the urban ecological construction, the study of residents#039; physical and mental health gradually, the main population is still with the elderly and patients with chronic diseases Cite Space software Layout function can help us to analyze the quot;Byrstness quot; 10 keywords word frequency change, so as to better understand the development dynamics and trend of the research field. According to Figure 6, quot;green space system quot;, quot;city quot;, quot;Beijing quot;, quot;spatial pattern quot;, quot;Germany quot;, quot;Beijing quot;, quot;urbanization quot;, quot;Guangzhou quot;, quot;sports city quot; and quot;mental health quot; are the most concerned keywords in the field of urban green space research in China, which have been at the highest level from 2009 to 2024. These research results have not only been highly valued by the academic circle, but also have had a far-reaching impact. This paper will focus on three key words: spatial planning, public health, and systems assessment. It can be seen from Figure 6 that in recent years, the research on urban green space in China focuses on public health. With the advancement of globalization, the government is paying more and more attention to the environmental protection of cities, and begins to pay more attention to the health of the public, especially those who need to maintain a good body for a long time and patients with chronic diseases.

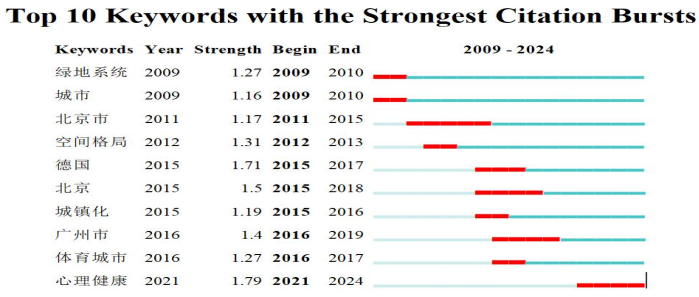

Figure 4 Analysis of keyword keywords in urban green space in the past 15 years

Initial stage (2009-2016): In the initial stage of urban green space research, the research content represented by urban parks, green space and landscape architecture became the mainstream. At this stage, the academic circle mainly takes spatial planning as the research perspective to explore the application and role of green space in the green development of cities and towns.

Mid-term stage (2016-2020): Urban green space construction At the current stage, academic research has gradually shifted its focus from the spatial planning of urban green space to the systematic evaluation of urban green space. The researchers mainly focus on exploring the application and influence of urban green space in cities with relatively favorable economic conditions. Specifically, the researchers mainly focus on the system construction of green space and the challenges faced by these cities in promoting the construction of urban green space.

In-depth research stage (2020-): The later focus of the sustainable development of urban green space mainly focuses on public health, and discusses the application and role of "mental health", "physical activity" and other directions [6]. The rapid development of urban green space has brought new opportunities for the sustainable development of public health, which can not only provide more opportunities for the development of mental health of residents, but improve residents' happiness and satisfaction [7].

To sum up, the focus of urban green space research changes from "spatial planning" in the early stage to "systematic evaluation" in the middle stage, and then to "public health" in the later stage. This evolution process reflects the continuous deepening and expansion of the research on urban green space, and also reflects the important role of urban green space in promoting the development of urban ecological construction.

Conclusion

According to the data analysis of Cite Space, in the research process of urban green space, many scholars no longer only study the planning and layout of green space, but pay attention to the physical and mental health of residents and public health development, and pay attention to the ecological development [8] of harmonious coexistence between man and nature. With the rapid development of social economy, the environment of urban green space has changed, so we should optimize the systematic planning and layout of urban green space, so as to further carry out a systematic evaluation of urban green space. In the future, we should strengthen the cooperation between researchers, deepen the depth of urban green space on public health, and explore the impact of urban green space on residents' physical health, psychological status, social adaptability and ethics. Only by paying close attention to the healthy development of residents in the urban environment can the research space of urban green space be greatly improved. In addition, we can combine the online AI model with the accessibility measurement of the offline urban green space, so as to explore a road more conducive to the development of residents' healthy behavior, and provide a perfect answer for the construction of a clean and beautiful urban green environment.

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Informed Consent Statement

Not applicable.

Data Availability Statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

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Statements and Declarations

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No funding was received for conducting this study. The present study has no relevant financial or non-financial interests to disclose.

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Author Contributions

Not applicable.

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