

人居环境视角下儿童与绿色空间研究进展

—— 基于文献计量分析

Research Progress on Children and Green Space from the Perspective of Human Settlement Environment — Based on Bibliometrics Analysis

李佳滢 张秦英* 陈进 赵迪 田靖雯

LI Jiaying, ZHANG Qinying*, CHEN Jin, ZHAO Di, TIAN Jingwen

摘要：基于可视化文献分析软件，以 Web of Science 与 CNKI 数据库中近 30 年的相关文献为研究对象，对其发文量、学科分布、国家与研究机构、基础知识与研究热点等内容进行分析。结果表明：（1）儿童与绿色空间的刊文量总体呈现波动上升的态势，内容融合了不同领域与学科的相关知识，形成了多个国家与机构的合作平台；（2）绿色空间与儿童健康以及绿色空间的影响特征成为目前两个主要的知识基础；（3）研究热点聚焦儿童亲自然、环境暴露评估、环境社会公平和非正式绿地。结果旨在进一步完善儿童与绿色空间领域的系统性、推动人居环境学科的发展。

关键词：儿童；绿色空间；人居环境；可视化分析

Abstract: Based on the visual literature analysis software, and taking the relevant literature in the Web of Science and CNKI databases in the past 30 years as the research objective, this paper analyze publications volume, disciplinary distribution, countries and research institutions as well as basic knowledge and research hotspots. The results show that: (1) the number of publications on children and green space rise in fluctuation, and the content integrates relevant knowledge from different fields and disciplines, forming the collaborative platforms of multiple countries and institutions; (2) currently, the two main knowledge bases are green space and children's health as well as the influence characteristics of green space; (3) the research hotspots focus on children's pro-environment, environmental exposure assessment, environmental social fairness and informal green spaces. The results aim to provide further improve the systematism of field of children and green space and promoting the development of the subject of human settlement

environment.

Key words: Children; Green space; Human settlement environment; Visual analysis

李佳滢 / 女 / 1994 年生 / 天津大学建筑学院在读博士研究生 / 研究方向: 风景园林规划设计理论与理论

LI Jiaying, female, was born in 1994. She is a PhD student at the School of Architecture, Tianjin University. Research direction: landscape and urban planning.

张秦英 / 女 / 1977 年生 / 天津大学建筑学院副教授, 博士 / 研究方向: 园林植物资源与景观应用

通信作者邮箱 (Corresponding author E-mail): qinying_zhang@163.com

ZHANG Qinying, female, was born in 1977, and gets a doctoral degree. She is an associate professor at the School of Architecture, Tianjin University. Research direction: landscape plant resources and landscape applications.

陈进 / 女 / 1998 年生 / 天津大学建筑学院在读硕士研究生 / 研究方向: 风景园林规划设计理论与理论

CHEN Jin, female, was born in 1998. She is a master student at the School of Architecture, Tianjin University. Research direction: landscape and urban planning.

赵迪 / 女 / 1981 年生 / 天津大学建筑学院副教授, 博士 / 研究方向: 风景园林规划设计理论与理论

ZHAO Di, female, was born in 1981, and gets a doctoral degree. She is an associate professor at the School of Architecture, Tianjin University. Research direction: landscape architecture planning design and theories, community building, royal gardens in Qing Dynasty.

田靖雯 / 女 / 1998 年生 / 天津大学建筑学院在读硕士研究生 / 研究方向: 园林植物资源与景观应用

TIAN Jingwen, female, was born in 1998. She is a master student at the School of Architecture, Tianjin University. Research direction: landscape plant resources and landscape applications.

随着儿童友好城市建设发展的提出, 儿童在城市建设中的权益逐渐受到关注。联合国儿童基金会在《2012 年世界儿童状况报告》中明确提出城市应该为儿童提供一个可以容纳植物和动物的绿色空间^[1], 人们越来越意识到建设一个健康安全的绿色空间对于促进儿童福

祉的重要性。儿童作为特殊的社会群体，看待自然及对室外活动空间的需求与成人存在较大差异，目前学者们从哪些视角进行相关研究？绿色空间如何影响儿童的身心健康发育？什么样的绿色空间能够有效增进儿童福祉，最大限度满足儿童需求？面对庞大数量的文献，定量梳理儿童与绿色空间的研究概况与发展脉络，揭示重点内容和热点趋势，有助于促进该领域的进一步发展。文献计量分析可以帮助寻找学科领域的研究现状、进展与前沿，为分析研究领域的趋势与动态提供量化参考。本文以科学引文检索 Web of Science（简称“WOS”）核心数据库与中文引文数据库 CNKI 作为数据来源，对 1985 年—2019 年中儿童与绿色空间相关的文献进行统计与可视化分析。对其中近 280 篇文献进行了深入阅读，从而梳理了近 30 年该领域的内容与成果。

1. 数据来源与研究方法

本文在 WOS 核心数据库中定义本次检索为 $TS= ("green\ space\ OR\ greenspace\ OR\ open\ space\ OR\ outdoor\ space")\ AND\ TS= ("child\ OR\ adolescent\ OR\ youth")$ ，通过剔除不相关的学科类别共得到文献 1951 篇。在 CNKI 数据库中定义本次检索为 $SU=(\text{儿童}+\text{幼儿}+\text{青少年}) * (\text{绿地}+\text{绿色空间}+\text{开放空间}+\text{户外空间}+\text{户外环境}+\text{公共空间})$ ，分别在中国学术期刊网络出版总库、中国学位论文全文数据库中进行检索，通过剔除无关数据，共得到文献 1752 篇。整体数据采集跨度为 1985 年—2019 年，时间截至 2019 年 12 月 20 日。文献计量法是基于数学与统计学对文献进行定量分析的方法^[2]。本文利用 WOS 和 CNKI 数据库中的“分析检索结果”功能及 Excel 对文献进行时间、学科上的统计，并通过科学可视化软件 CiteSpace 与 VOSviewer 对研究文献的国家与机构、共被引文献与关键词进行可视化分析。

2. 结果与分析

2.1 刊文时间与数量

近 30 年来儿童与绿色空间研究议题的刊文量呈现波动增长的态势（图 1）。在 WOS 数据库中，2005 年前文献数量较少，自 2014 年开始有了较为明显的增长，年度论文达到 106 篇。在 CNKI 数据库中，国内文献数量与国外呈现相同的增长趋势，并在近五年内显著增长。可以看出约有 90% 左右的文章都是过去 10 年的研究成果，研究体系逐步构建，研究话题逐渐升温。

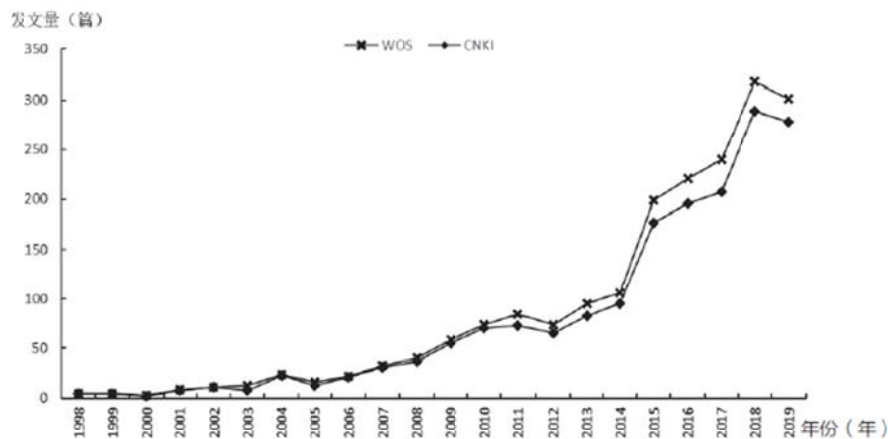
2.2 学科分布特征

国内外数据库文献发文量见表 1 和表 2。在 WOS 数据库中，文献收录的学科领域依

次为公众环境与职业健康、教育研究、生态环境科学、环境研究、地理学与城市研究。在 CNKI 数据库中依次为城市规划与市政、城市经济、教育、体育、环境、建筑科学。综合来看，多维学科的交叉研究是该领域的发展方向，公众健康学科从要素识别儿童健康与环境风险，教育和心理学科重点反映儿童空间成长与生活经验，地理学在数据量化的背景下推动儿童友好城市的发展，而生态学科的加入有助于儿童与环境建立相辅相成的关系。

2.3 研究国家与机构

通过对 WOS 来源的发文国家与机构进行可视化分析，约有 102 个国家产生了合作关系，形成了 464 条连接线合作网络。其中美国、英国、加拿大等中心度较高，已成为核心的研究高地。研究机构以高校为主，其中迪肯大学、西澳大利亚、奥塔哥大学、英属哥伦比亚大学与墨尔本大学表现出较高的研究聚焦性与学术扩散性。各个国家与机构之间已经建立了广泛的学术合作，形成了跨区域的协同研究机制与平台。来源于中国的文献数量也明显增多，但偏点状分布，与其他研究机构的联系与合作程度较低。



1
刊文时间与数量分布图
The Distribution Chart of Time and Quantity of the Publication

表 1 学科发文量前 6 位 (WOS)

Table 1 Top 6 of Disciplinary Papers Published (WOS)

序号	WOS	发文量
1	公共、环境和职业健康	340
2	教育与教育研究	284
3	环境科学	169
4	环境研究	149
5	地理学	135
6	城市研究	102

表 2 学科发文量前 6 位 (CNKI)

Table 2 Top 6 of Disciplinary Papers Published (CNKI)

序号	CNKI	发文量
1	城市规划与市政	302
2	城市经济	225
3	教育	105
4	体育	97
5	环境	86
6	建筑科学	61

2.4 知识基础分析

通过对文献的共被引分析可以得到一个研究领域的知识结构，对于理解领域的核心与基础有重要的启示。在 CiteSpace 中导入文献数据，通过 LLR 算法对聚类结果进行自动标识。节点类型在 15 以上的共有 10 个聚类，结合聚类结果与最高引用文献进行分析，得出研究基础主要集中在以下两个方面。

2.4.1 绿色空间与儿童健康

该研究基础内容主要包括“#0 注意力恢复 (attention restoration)”“#1 积极活动 (active play)”“#2 儿科 (pediatric)”“#3 玩耍 (play)”“#4 肥胖 (obesity)”“#6 儿童保育 (child care)”等关键词，整体发文时间较早，证实了绿色空间在身体特征、体力活动与心理健康方面对

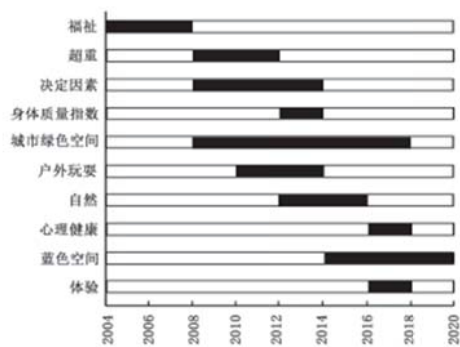
儿童的促进作用。对儿童身体特征而言，绿色空间的访问次数的增加，可以有效预防儿童超重和肥胖^[3]、降低近视概率^[4]、促进大脑认知发育^[5]。在体力活动方面，社区环境会增加儿童结构化和非结构化体育活动的潜力^[6]，学校与附近的公园亦会影响青少年发生中度至强烈的身体活动的概率^[7]。此外，绿色空间可以有效降低儿童的社交、情感和行为困难等心理问题^[8]。当周围有自然景观时，他们会表现出积极的情绪，减少压力、愤怒、抑郁、焦虑、注意力不集中等问题，甚至会得到更好的考试成绩^[9-10]。

2.4.2 绿色空间的影响特征

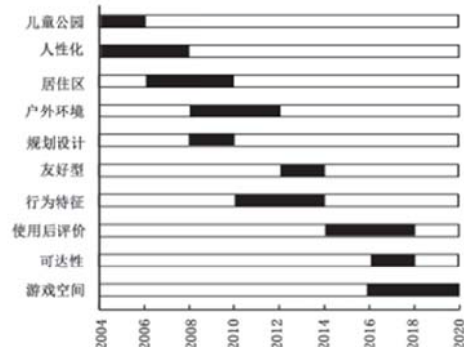
该研究基础主要包括“#5自然环境 (natural environments)”“#7 绿度 (greenness)”“#8 绿色空间数量 (greenspace quantity)”“#9 亲生物性 (biophilia)”，发文时间较晚，主要关注影响儿童使用的绿色空间特征。绿地数量、密度与距离对于促进儿童福祉具有重要作用^[11]，随着家庭住址与社区公园距离的接近，儿童在绿地中花费的时间逐渐增加，儿童观看屏幕时间有效减少^[4]。其次，不同类型的绿色空间积极支持着儿童的行为发展，城市综合公园作为城市开放空间的面状系统是儿童活动的主要场所^[12]；邻里空间是为儿童提供娱乐体育活动的重要地方，并支持更加积极的生活方式，有助于增加亲子活动^[13]；自然式的游戏场地能够使孩子们从玩耍中学习，激发身心成长^[14]。此外，在绿色空间的设计特征中，公园设施的可用性、环境管理水平、安全性与自然性要素是吸引儿童进入的主要原因^[15]；自由活动的空间范围是提升儿童体育活动的关键策略^[16]；儿童对于半开敞的空间形态、色彩丰富的植物材料与具有律动感的铺装图案等设计特征具有特殊的偏好^[17]；非结构化的材料有利于鼓励儿童玩耍^[18]；植物、水、地形和松散的零部件这四项空间特征是改善儿童亲自然体验的必要因素^[19]。

2.5 研究热点梳理

关键词是对论文内容的高度概括与精炼描述，高频关键词通常被用来展示学科领域中的研究热点。关键词突现主要用于识别在一段时间序列中频次变化率较高的主题词，多表征新兴研究前沿，从侧面可为热点演进变化提供佐证。本文将文献数据进行分析，获得关键词聚类图谱与突现词图谱（图 2—图 3）。研究热点内容如下。



2
2004年—2020年WOS高频突现词
High-frequency Burst Terms in
WOS from 2004 to 2020



3
2004年—2020年CNKI高频突现词
High-frequency Burst Terms in
CNKI from 2004 to 2020

2.5.1 儿童亲自然

随着城市的快速发展，人们逐渐意识到与大自然建立联系对儿童有非常积极的影响，恢复力评估、认知测度方法、参与式设计^[20]、心理评估问卷成为量化儿童与自然环境关联性的主要工具。相比于成年人，自然环境所提供的开放性、多样性、创造力与野性更为儿童所喜欢^[21]。城市中绿地的自然属性有助于儿童参与户外体验^[22]，学校及住区附近的自然空间更容易被儿童日常使用^[23]，提高私人绿地（庭院）的生物多样性价值，将有效促进儿童体验自然的机会^[24]。除此之外，城市废弃地、近自然等生境等儿童“自我空间”也在一定程度上改善了儿童自然缺失的现象^[25]。

2.5.2 环境暴露评估

现代环境的恶化造成了人们的健康负担，早期的成长环境暴露将会对儿童的健康机制产生重要影响。当前，影响儿童健康最普遍和最严重的环境危险为空气污染、水污染和有毒化学品，特别是在胎儿和儿童发育的脆弱阶段^[26]。大气污染会导致儿童支气管炎与哮喘的发作和儿童动脉扩张压的降低^[27]；重金属污染会造成儿童神经系统不可逆转的损害，并带来一定的致癌作用^[28]；绿色空间有助于减少儿童遭受环境污染的危害，例如越靠近住宅区绿地，儿童患支气管炎的风险就越低^[29]；在绿地中活动可以减少空气污染伤害，从而提高认知水平^[30]。相关研究大多通过评估动态环境暴露与儿童行为活动，将绿色空间特征数据进行耦合分析以实现环境污染影响的量化测度。

2.5.3 环境社会公平

环境公平起源于美国的环境运动，是实现社会和谐与可持续发展的重要方面，也是近年来社会问题的研究热点之一，儿童的机会公平也同样受到重视^[31]。多位学者结合社会分层与生态系统理论，采用定性与定量研究结合的方法开展儿童环境公平研究。研究议题主要表现在以下两个方面：一是因种族、文化背景、社会经济地位的不同，儿童对自然和绿地的体验与使用产生差异。来自低收入家庭的儿童，使用的绿色通道、运动场和体育活动是有限的^[23]，城市边缘地带的儿童更容易受到环境污染的伤害，加剧心理上的不公平；二是绿地可达性影响儿童使用绿色空间。儿童的地理范围受限于他们穿越空间的能力和对成年人的依赖。对自然区域的不熟悉、参与障碍、缺乏可用的交通费用等都是阻碍儿童使用绿色空间的因素^[32]。

2.5.4 非正式绿地

随着城市化的加速发展，儿童在森林、田野与花园中探索和玩耍的机会越来越少。除了针对城市的严格意义上的绿色空间外，一些非正式绿地，也逐渐被开发为儿童获取知识和接触自然的场所。学校内的自然区域通过提供游戏机会以促进儿童的身心健康与学业成功，创造了兼具合作性与挑战性的空间^[33]。其次，自然界中的蓝色空间也有利于儿童的行为活动与幸福感。儿童在蓝色空间中的经历可能会影响到成年时的体育活动，从而产生持久的影响^[34]。此外，步行环境同样被视为儿童重要的娱乐场所^[35]。这一类研究，多采用在线问卷调查、儿童电子地图、参与式等方式进行，通过咨询儿童理解他们的认知与偏好。

3. 结论与展望

本文对近 30 年儿童与绿色空间的相关核心文献进行了计量分析，客观呈现了研究文献的发文趋势、学科与期刊、国家与机构分布、知识基础与研究热点。结果表明，儿童与绿色空间已成为目前普遍关注的热点问题之一。研究涉及多学科交叉融合，各个国家与机构之间形成了广泛的合作平台，促进了该领域的多样性发展。知识基础开始从绿色空间对儿童的健康影响向绿色空间的可供性特征转变，并演化出“儿童亲自然”“环境暴露评估”“环境社会公平”与“非正式绿地”等研究热点，这些问题仍将是未来关注的重要方面。儿童福祉与城市发展已成为目前的公共话题并逐渐扩散，成为人居环境视角下公众与环境建设的重要内容。文献的计量分析客观地呈现了该领域的研究现状和发展趋势，相关成果为推动儿童友好城市的可持续发展提供理论基础。

With the development of child-friendly city construction, children's rights and interests in urban construction are gradually getting attention. In The Status Report of the World's Children 2012, UNICEF clearly proposed that cities should provide a green space for children that can accommodate plants and animals^[1]. People are increasingly aware of the importance of building a healthy and safe green space to promote children's well-being. As a special social group, children have quite different views of the nature and demands for the space of outdoor activities compared with adults, so what perspectives are the scholars currently conducting such research? How do green spaces affect children's physical and mental health development? What kind of green spaces are effective in promoting children's well-being and meeting their needs to the maximum extent? In the face of the vast amount of literature, sorting out the research situations and development context on children and green spaces, quantitatively reveals key elements and hotspots trends, helping promote the further development of the field. Bibliometrics analysis can help find the current status, progress and frontiers of the research in the subject area, and provide quantitative references for analyzing the trends and dynamics of the research field. In this paper, the Web of Science (WOS, for short) core database and CNKI database were used as data sources to statistically and visually analyze the literature related to children and green space from 1985 to 2019, among which nearly 280 publications were read intensively to sort out the contents and achievements in this field in the past 30 years.

1. Data Sources and Research Methods

In this paper, this search was defined in the WOS core database as TS= ("green space OR greenspace OR open space OR outdoor space") AND TS= ("child OR adolescent OR youth"), and the total of 1951 documents were obtained by excluding irrelevant subject categories. In CNKI database, this search was defined as SU = (child + cheeper + adolescent) * (greenland + green space + open space + outdoor space + outdoor environment + public space), and the search was conducted in the Chinese Academic Journals Online Publishing Database and the Chinese Master's and Doctoral Dissertation Full Text Database respectively, and a total of 1752 articles were obtained by eliminating irrelevant data. The overall data collection spanned from 1985 to 2019, and the time was up to December 20, 2019. Bibliometric method is a way of quantitative analysis on literature based on mathematics and statistics^[2]. In this paper, we used the function of

“Analyze Search Results” in WOS and CNKI databases and Excel to count time and subject of the literature, and visually analyze visualized the countries and institutions of the research literature as well as co-cited literature and keywords through the scientific visualization software CiteSpace and VOSviewer.

2. Results and Analysis

2.1 Time and Quantity of the Publications

The number of publications on the topic of children and green space research had shown a fluctuating growth in the last 30 years (figure 1). In the WOS database, the number of publications was low before 2005, but increased significantly from 2014. The number of publications reached 106 in that year. In the CNKI database, the volume of domestic literature showed the same growth trend as abroad, with a significant increase in the last five years. It can be seen that about 90% of the articles were the research results of the past 10 years, the research system was gradually built and the research topics were gradually warmed up.

2.2 Characteristics of Disciplinary Distribution

The number of literature published in domestic and foreign databases was shown in Table 1 and Table 2. In the WOS database, the subject areas that literature is included are, in order PUBLIC ENVIRONMENTAL OCCUPATIONAL HEALTH, EDUCATION& EDUCATION RESEARCH, ENVIRONMENTAL SCIENCES, ENVIRONMENTAL STUDIES, GEOGRAPHY & URBAN STUDIES. In the CNKI database, they are URBAN PLANNING & MUNICIPALITY, URBAN ECONOMY, EDUCATION, SPORTS, ENVIRONMENT and BUILDING SCIENCES in order. Taken together, the intersection of multidimensional disciplines is the development direction of the field, with the subject of public health distinguishing children’s health and environmental risks in terms of elements; the subject of education and psychology mainly reflecting children’s spatial growth and life experiences; the subject of geography promoting the development of child-friendly cities in the context of data quantification, and participation of ecology helping establish a mutually reinforcing relationship between children and the environment.

2.3 Countries and Institutions of the Research

Through the visual analysis of the countries and institutions that the published papers belong to in

WOS sources, about 102 countries have generated collaborative relationships, forming a cooperation network of 464 connecting lines. Among them, countries like the United States, the United Kingdom, and Canada have a high degree of centrality, and had become the core research area. The research institutions were mainly universities, including Deakin University, The University of Western Australia, University of Otago, The University of British Columbia, and University of Melbourne, showing a high level of research convergence and academic proliferation. Extensive academic collaborations had been established among various countries and institutions, forming the crossregional collaborative research mechanisms and platforms. The quantity of literature originating from China also increased significantly, but it was inclined to be scattered, with a low degree of connection and cooperation with other institutions.

2.4 Analysis of Knowledge Base

The analysis of the literature's co-citation can yield the knowledge structure of a research field, which is an important enlightenment for understanding the core and foundation of the field. The literature data were imported in CiteSpace and the clustering results were automatically identified by the LLR algorithm. There were 10 clusters with node types above 15. Combining the clustering results with the highest cited literature for analysis, it was concluded that the research knowledge base was mainly focused on the following two aspects.

2.4.1 Green Space and Children's Health

The basis of this research mainly includes “#0 attention restoration” “#1 active play” “#2 pediatric” “#3 play” “#4 obesity” “#6 childcare”, which were published early overall and confirmed the role of green space in promoting children's physical characteristics, physical activities and mental health. For children's physical characteristics, the increase of the visit times to green space are effective in preventing overweight and obesity^[3], reducing the chance of myopia^[4], and promoting brain cognitive development^[5]. In terms of physical activity, community environments increases children's potential for structured and unstructured physical activities^[6], and schools and nearby parks also influence the probability of moderate to intense physical activities among adolescents^[7]. In addition, green space is effective in reducing children's psychological problems such as social, emotional, and behavioral difficulties^[8]. When surrounded by natural landscapes, they will show positive emotions, reduce problems such as stress, anger, depression, anxiety, inattention, and even get better test scores^[9-10].

2.4.2 Influential Characteristics of Green Space

The basis of this research includes “#5 natural environments” “#7 greenness” “#8 greenspace quantity” and “#9 biophilia”, which were published late and mainly focused on the characteristics of green space that influence children’s access. The quantity, density and distance of green space play an important role in promoting children’s well-being ^[11]. Children spend progressively more time in green space and less time watching screens with the proximity of home addresses to community parks increasing ^[4]. Secondly, different types of green spaces actively support children’s behavioral development; urban integrated parks as faceted systems of urban open space are a major venue for children’s activities ^[12]; neighborhood areas are important places that provide recreational and physical activities for children and support more active lifestyles, contributing to enhancing parent-child activities ^[13]; and nature-based playgrounds enable children to learn from playing and stimulate physical and mental growth ^[14]. In addition, among the design characteristics of green space, the availability of park facilities, the level of environmental management, safety and natural elements are the main reasons for attracting children to enter ^[15]; the range of space for freely moving is a key strategy for enhancing children’s physical activities ^[16]; children have a special preference for the design characteristics such as semi-open spatial patterns, colorful plant materials and paving patterns with a sense of rhythm ^[17]; unstructured materials are conducive to encouraging children to play ^[18]; the four spatial characteristics of plants, water, terrain and loose parts are necessary factors to improve children's pro- environment experience ^[19].

2.5 Sorting out Research Hotspots

Keywords are highly summarized and concise descriptions of the paper, and highfrequency keywords are often used to demonstrate research hotspots in subject areas. Keyword mutations are mainly used to identify subject terms with high frequency change rates in a sequence of time, mostly characterizing emerging research frontiers, which can provide supporting evidence for the evolutionary changes of hotspots from the side. In this paper, the literature data are analyzed to obtain the keyword clustering mapping and the burst terms mapping (figure 2 and figure 3). The research hotspots are listed below.

2.5.1 Children’s Pro-Environment

With the rapid development of cities, there was a growing awareness that establishing a

connection with the nature has a very positive impact on children, and resilience assessments, cognitive measures, participation design^[20] and psychological assessment questionnaires had become the main tools for quantifying children's connectedness to the natural environment. The openness, diversity, creativity and wildness offered by the natural environment are preferred by children over adults. The natural attributes of urban green space facilitated^[21] children's participation in outdoor experiences^[22]; natural space near schools and residential areas are more likely to be used by children on a daily basis^[23], and increasing the biodiversity value of private green space (yards) will effectively promote children's opportunities to experience the nature^[24]. In addition, children's "self-space" such as urban abandoned areas and near-nature habitats also improve children's nature deficit to some extent^[25].

2.5.2 Environmental Exposure Assessment

Modern environmental degradation leads to a health burden for people, and early growth environmental exposures will have a significant impact on the health mechanisms of children. Currently, the most prevalent and serious environmental hazards affecting children's health are air pollution, water pollution, and toxic chemicals, especially during the vulnerable stages of fetal and infantile growth^[26]. Atmospheric pollution can lead to the onset of bronchitis and asthma in children and a decrease in arterial dilation pressure in children^[27]; heavy metal pollution can cause irreversible damage to the nervous system of children and bring about a certain carcinogenic effects^[28]. Green space help reduce children's exposure to environmental pollution, for example, the closer they are to green spaces in residential areas, the lower the risk of bronchitis in children^[29]; being active in green space can reduce damage caused by air pollution and thus improve cognitive levels^[30]. Most of the relevant researches assess dynamic environmental exposures and children's behavioral activities and couple green space characteristics data to achieve quantitative measures of environmental pollution effects.

2.5.3 Environmental Social Fairness

Environmental fairness originated from the environmental movement in the United States. It is not only an important aspect of realizing social harmony and sustainable development, but also one of the research hotspots of social problems in recent years. The fairness of opportunities for children has also received attention^[31]. Several scholars adopted a combination of qualitative and quantitative research methods to conduct research on children's environmental fairness with

the social stratification and ecosystem theories. The research topics were mainly in the following two aspects. Firstly, children's experience and use of the nature and green space differ according to their ethnicity, cultural background and socio-economic status. Children from low-income families have limited access to greenways, playgrounds, and physical activities^[23], and children in urban fringe areas are more vulnerable to environmental pollution, exacerbating psychological unfairness. Secondly, green space accessibility has impact on children's use of green space, children's geographical range is limited by their ability to traverse space and reliance on adults. Unfamiliarity with natural areas, barriers to participation, and lack of available transportation costs are also the factors that prevent children from using green space^[32].

2.5.4 Informal Green Space

As urbanization accelerates, children have fewer and fewer opportunities to explore and play in forests, fields and gardens. In addition to green space for the city in the strict sense, a lot of informal green space is increasingly being developed as places for children to gain knowledge and access the nature. Natural areas in schools create collaborative and creative opportunities to promote children's physical and mental health as well as academic success through providing play opportunities^[33]. Second, blue space in the nature also facilitates children's behavioral activities and emotional well-being. Children's experiences in blue space might have a lasting impact on physical activity in adulthood^[34]. In addition, walking environments are likewise considered important recreational places for children^[35]. In this category, researches are mostly conducted by using online questionnaires, electronic maps for children, and participatory approaches to understand their perceptions and preferences by consulting children.

3. Conclusion and Outlook

This paper presents bibliometrics analysis of the core literature on children and green space over the past 30 years, having objectively shows the trends of publishing the research literature, disciplines and journals, distribution of countries and institutions, and the knowledge base and research hotspots. The results showed that children and green space has become one of the hot issues. The researches involve multidisciplinary cross-fertilization, and a wide range of cooperation platforms had been formed among various countries and institutions, promoting diverse development of the field. The knowledge base begins to shift from the health effects of

green space on children to the availability characteristics of green space, and evolves into “children’s pro-environment” “environmental exposure assessment” “environmental social fairness” and “informal green space”. These issues will continue to be important aspects that people pay attention to in the future. Currently, children’s well-being and urban development have become public topics and gradually proliferated, as well as become important content of public and environmental construction in the perspective of human settlement environment. The bibliometric analysis of the literature objectively presents the current status and development trend of research in this field, and the relevant results provide a theoretical basis for promoting the sustainable development of child-friendly cities.

参考文献 (References):

- [1] 联合国儿童基金会.2012年世界儿童状况报告：城市化世界中的儿童[R].美国：纽约，2012.
UNICEF. The Status Report of the World's Children 2012 : Children in the urbanized world[R]. the USA, New York, 2012.
- [2] 王曰芬, 路菲, 吴小雷. 文献计量和内容分析的比较与综合研究[J]. 图书情报工作, 2005(9):72-75.
WANG Yuefeng, LU Fei, WU Xiaolei. Comparative and Synthetic Research on Content Analysis and Bibliometrics[J]. Library and Information Service, 2005(9):72-75.
- [3] Veitch J.,van Stralen M. M.et al.The neighborhood social environment and body mass index among youth: a mediation analysis[J]. Int J Behav Nutr Phys Act,2012(9):31.
- [4] Akpinar Abdullah. Urban green spaces for children: A cross-sectional study of associations with distance, physical activity, screen time, general health, and overweight[J]. Urban Forestry & Urban Greening, 2017(25):66-73.
- [5] Dadvand Payam, Pujol Jesus et al .The Association between Lifelong Greenspace Exposure and 3-Dimensional Brain Magnetic Resonance Imaging in Barcelona Schoolchildren[J]. Environmental Health Perspectives,2018(126):27012.
- [6] Wheeler Benedict W., Cooper Ashley R.et al. Greenspace and children's physical activity: A GPS/GIS analysis of the PEACH project[J]. Preventive Medicine, 2010(51):148-152.
- [7] Boone-Heinonen J., Casanova K.et al. Where can they play? Outdoor spaces and physical

activity among adolescents in U.S. urbanized areas[J]. *Prev Med*,2010(51):295-298.

[8] Tucker Patricia, Irwin Jennifer D.et al. Adolescents' Perspectives of Home, School and Neighborhood Environmental Influences on Physical Activity and Dietary Behaviors[J]. *Children Youth and Environments*, 2008(18):12-35. Systematic Review[J]. *Journal of Pediatric Nursing*, 2017(37):3-7.

[10] Chawla Louise, Keena Kelly.et al. Green schoolyards as havens from stress and resources for resilience in childhood and adolescence[J]. *Health & Place*,2014(28):1-13.

[11] Feng Xiaoqi, Astell-Burt Thomas. Residential Green Space Quantity and Quality and Child Well-being: A Longitudinal Study[J]. *American Journal of Preventive Medicine*, 2017(53):616-624.

[12] 庞瑀锡. 北京城市综合公园儿童活动场地使用状况评价(POE)研究[D]. 北京: 北京林业大学, 2015.

PANG Yuxi. The Research of Post Occupancy Evaluation on the Children's playground in Beijing Comprehensive park [D]. Beijing: Beijing Forestry University,2015.

[13] 胡剑锋, 刘畅, 曹弈璘. 邻里交往空间实践探索——亲子成长与运动活力视角下的社区公园[J]. *风景园林*, 2018(25):116-122.

HU Jianfeng, LIU Chang, CAO Yilin. Practice and Exploration of Neighborhood Communication Space——Community Park in the Perspective of Parent-child Growth and Activities[J]. *Landscape Architecture*, 2018(25):116-122.

[14] 鲍鲁泉. 儿童户外游戏场地自然化设计探析[J]. *中国城市林业*, 2013, 11(03):38-40.

BAO Luquan. Naturalizing Design of Children's Outdoor Playgrounds[J]. *Journal of Chinese Urban Forestry*, 2013, 11(03):38-40.

[15] Ries Amy V., Voorhees Carolyn C.et al. A Quantitative Examination of Park Characteristics Related to Park Use and Physical Activity Among Urban Youth[J]. *Journal of Adolescent Health*, 2009(45):S64-S70.

[16] Ding D , Sallis J F , Kerr J.et al. Neighborhood Environment and Physical Activity Among Youth: A Review[J]. *American Journal of Preventive Medicine*, 2011, 41(4):0-455.

[17] Veitch Jenny, Salmon Jo.et al. Adolescents' ratings of features of parks that encourage park visitation and physical activity[J]. *International Journal of Behavioral Nutrition and Physical Activity*, 2016(13).

- [18] E. Houser Natalie, Roach Lindsay.et al. Let the Children Play: Scoping Review on the Implementation and Use of Loose Parts for Promoting Physical Activity Participation[J]. AIMS Public Health, 2016(3):781-799.
- [19] 赵琳瑄. 城市绿地条件下儿童亲自然状况研究[D]. 天津: 天津大学, 2018.
ZHAO Lingxuan. The research on present situation of children's Connection to Nature in Tianjin[D]. Tianjin: Tianjin University, 2018.
- [20] 赵迪,钱欣.儿童参与式景观设计的理念与实践[J].景观设计,2019(05):12-19.
ZHAO Di, QIAN Xin. Theories and Practice of Child-participation Landscape Design[J]. Landscape Design,2019(05):12-19.
- [21] Freeman Claire, Stein Aviva.et al. City Children's Nature Knowledge and Contact: It Is Not Just About Biodiversity Provision[J]. Environment and Behavior, 2017(50):1145-1171.
- [22] Gundersen V., Skår M.et al. Children and nearby nature: A nationwide parental survey from Norway[J]. Urban Forestry & Urban Greening, 2016(17):116-125.
- [23] Ridgers Nicola D., Knowles Zoe R., Sayers Jo. Encouraging play in the natural environment: a child-focused case study of Forest School[J]. Children's Geographies, 2012(10):49-65.
- [24] Waterston Sarah, Grueger Barbara, Samson Lindy. Housing need in Canada: Healthy lives start at home[J]. Paediatrics & Child Health, 2015(20):403-407.
- [25] Freeman Claire, Stein Aviva.et al. City Children's Nature Knowledge and Contact: It Is Not Just About Biodiversity Provision[J]. Environment and Behavior,2017(50):1145-1171.
- [26] Laborde Amalia, Tomasina Fernando.et al. Children's Health in Latin America: The Influence of Environmental Exposures[J]. Environmental Health Perspectives, 2015(123): 201-209.
- [2 7] 洪建国. 环境污染对儿童支气管哮喘的影响[J] . 中华实用儿科临床杂志,2015(30): 241-244.
HONG Jianguo. Impact of pollution on asthma in childhood[J]. Chinese Journal of Practical Pediatrics, 2015(30):241-244.
- [28] 潘尚霞. 南方某工业区环境重金属暴露对儿童神经和肾脏早期影响[D]. 北京: 中国科学院大学, 2017.
PAN Shangxia. Effects of environmental heavy metals exposure on children's neurodevelopment and early kidney damage in an industrial area in southern China[D]. Beijing: University of

Chinese Academy of Sciences, 2017.

[29] Tischer Christina, Gascon Mireia.et al. Urban green and grey space in relation to respiratory health in children[J]. European Respiratory Journal,2017(49):1502112.

[30] Heynen Nik, Perkins Harold A., Roy Parama. The Political Ecology of Uneven Urban Green Space[J]. Urban Affairs Review, 2016(42):3-25.

[31] 刘雅心,顾阳,胡一可.环境公平视角下的社区绿道选线评价与导控策略[J].景观设计, 2021(03):30-35.

LIU Yaxin, GU Yang, HU Yike. Evaluation and Guidance and Control Strategy for Community Greenway Route Selection from the Perspective of Environmental Justice[J]. Landscape Design,2021(03):30-35.

[32] Nazelle Audrey, Nieuwen J, Mark J.et al. Improving health through policies that promote active travel: A review of evidence to support integrated health impact assessment[J]. Environment International, 2011(37):766-777.

[33] Strife Susan, Downey Liam. Childhood Development and Access to Nature[J]. Organization & Environment, 2009(22):99-122.

[34] Dzhambov Angel M., Markevych Iana.et al. Multiple pathways link urban green and bluespace to mental health in young adults[J]. Environmental Research, 2018(166):223-233.

[35] Katharine McKinnon. Children and Their Urban Environment: Changing Worlds – By Claire Freeman and Paul Tranter [J]. Geographical Research, 2012(4):436- 453.

(整理: 赵迪)