



Bibliometric Analysis of Physical Education Research in China from 2014 to 2024

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Abstract

This study focuses on a corpus of 1,585 journal papers related to physical education from the CNKI database, uses CiteSpace software to perform an in-depth analysis of data associated with physical education research. By constructing a knowledge graph, the study systematically categorizes information on the volume of published papers of physical education research in China, their provincial distribution, and the main journals that publish such studies, presenting a comprehensive overview of the prolific institutions, authors, and collaborations. This approach provides substantial data support for gaining a deeper understanding of the current state of physical education research in China. The findings reveal that the annual number of published journal papers in this field has generally maintained a stable upward trend. The provincial distribution of contributing institutions is dominated by regions such as Jiangsu and Hunan, with the main journals that carry these papers also concentrated in these regions. The most prolific institutions and authors are mainly composed of sports universities and their faculty members.

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CCS Concepts

• **General and reference** → **Metrics; Surveys and overviews.**

Keywords

physical education, knowledge graph, CiteSpace

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1 Introduction

The growth and development of contemporary sports science researchers increasingly depend on a solid research foundation and the ability to efficiently translate research into practical applications. Therefore, conducting an in-depth analysis of the progress in China's sports science discipline, such as identifying gaps in research topics, recognizing imbalances in regional contributions, and pinpointing differences in research focus among various institutions, then summarizing and consolidating the latest developments in sports science is of indispensable importance for Chinese researchers to grasp the trends in sports science research, identify cutting-edge issues, and advance the theoretical and practical aspects of sports in China.

This study uses the relevant literature from the China National Knowledge Infrastructure (CNKI) database and uses bibliometric methods [1] along with knowledge visualization tools, such as CiteSpace [2], to investigate the structure of the Chinese sports

science research network, track trends in disciplinary development and pinpoint the main journals, provinces, institutions, and researchers. Since its introduction, CiteSpace has garnered significant attention in the international arena of scientometrics and has also been actively adopted in China. Within the realm of sports science, the tool has been instrumental in revealing the forefront of disciplinary development, patterns of research collaboration, knowledge structures, and more, spanning across multiple research domains including strength training, Olympic sports, high-altitude training strategies, national sports policies, student physical fitness and health, etc., thereby promoting the study of visualization of the knowledge structure in sports science.

The study systematically searched for data related to physical education research on the CNKI platform. Using the search term ‘physical education’, the time span covered was from 2014 to 2024, with the search carried out up to 1st July 2024. A total of 1,585 relevant journal papers were retrieved. CiteSpace was used to perform a comprehensive analysis that integrates quantitative and qualitative approaches, with the aim of thoroughly understanding development trends, key themes, collaborations and other aspects within the field of physical education.

The primary contributions of this study are highlighted in the following key aspects.

- We first perform a systematic categorization of the volume of published papers, their provincial distribution, and the main journals that publish such studies. The result of the bibliometric investigation reveals the continued growing attention to physical education research in China.
- We analyze collaboration between researchers and institutions by constructing a knowledge graph using CiteSpace and discuss the importance of collaboration in the field of physical education research.
- We investigate research trends and focal topics among leading researchers and institutions to provide direction for the deepening and comprehensive development of physical education research in China.

2 Research Method

CiteSpace is a software specifically designed for bibliometric analysis in targeted fields, which visualizes the structure and development trends of research in a particular academic discipline. By importing data from relevant literature, it generates scientific knowledge graphs and performs cluster analysis on the collaboration of prolific institutions and authors. The software enables detailed analysis and processing of publication volumes by institutions and authors through features like ‘institutions’ and ‘author’. Furthermore, to gain a more comprehensive understanding of the progress in physical education, the study also used Excel for mathematical statistics, analyzing data such as the volume of annual publications and the main journals. This integrated approach facilitates an in-depth development of the threads underlying physical education research, revealing trends in disciplinary development and key factors. The collaborative use of CiteSpace and Excel provide a more comprehensive and in-depth understanding of research trends and collaborations in the field of physical education [3].

3 Analysis of Research Outcomes

3.1 Physical Education Research Annual Publications

The volume of annual publications in physical education research shows the following trends illustrated in Figure 1: over the 11-year period from 2014 to 2024, the number of publications fluctuates upward, with significant increases occurring between 2014 and 2015, and again between 2022 and 2023; there is a sharp decrease in 2024 (as of 1st July). In general, the volume of publications in physical education research fluctuates mainly between 100 and 200 papers, with two clear increases and a significant decrease observed between 2014 and 2024. This indicates that physical education research has attracted considerable attention in China, with significant increases between 2014 and 2015, and again between 2022 and 2023, but with a decline in attention in the first six months of 2024.

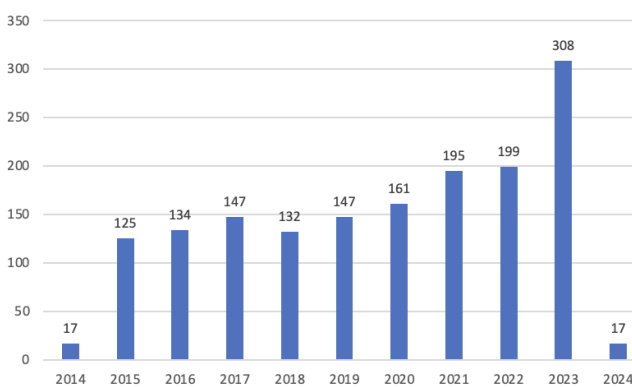


Figure 1: Physical education research annual publications 2014-2024.

3.2 Statistics of Prolific Provinces in Physical Education Research

This study finds that the literature on physical education research covers 31 provincial level regions in China. Figure 2 details the top 10 provinces in the provincial distribution of the physical education research literature from 2014 to 2024. In particular, Jiangsu is the most active province in the field of physical education research, with 152 papers, representing 9.6% of the total number of papers, ranking first nationwide. The second is Hunan, with 143 papers, representing 9.0%. Sichuan Province ranks third, with a total of 122 papers, representing 7.7%. From this provincial distribution, it can be seen that the regional distribution of physical education research in China does not align perfectly with the levels of regional economic development [4]. Instead, some provinces, such as Hunan, place a relatively greater emphasis on physical education research, demonstrating a vibrant trend. This distribution may reflect differences in professional strength and the levels of development of research institutions in the field of physical education in various provinces. To better understand the underlying reasons, a more

in-depth analysis of policy support and the research environment in each province in the field of physical education may be necessary.

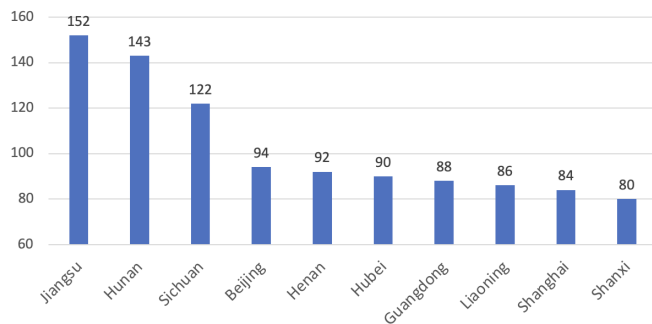


Figure 2: Top 10 provinces in the provincial distribution of the physical education research literature 2014-2024.

In recent years, Jiangsu has seen a surge of outstanding talents in the field of physical education research [5], a trend that was supported and emphasized by the issuance of *Implementation Opinions on Comprehensively Strengthening and Improving School Sports Work in the New Era* by the Jiangsu Provincial Government on August 27, 2021. The release of these implementation opinions further highlights Jiangsu Province’s high regard for physical education research at the national level. Similarly, note the leading position demonstrated by Hunan and Sichuan in the field of physical education research. This may also reflect the attention and support that Hunan and Sichuan give to physical education, as well as the success of these regions in cultivating, attracting and supporting talent in physical education. The leadership of these provincial level regions in the research of physical education can be closely related to government advocacy, investment support, and the development of research institutions in these regions. Such initiatives contribute to improving the level of research in physical education, which is beneficial to the development of sports in these regions and the advancement of the discipline nationwide.

3.3 Analysis of Main Journals

A total of 1,585 papers were retrieved in 352 different main journals between 2014 and 2024. Among these, a journal had published 200 or more papers, which represents 15.1% of the total number of papers. In addition, five journals had more than 50 papers each, making up 18.0% of the total number of papers. For journals with 30 to 50 papers, there were four source journals, representing 10.2% of the total number of papers. The subject classification [6] of the physical education research literature mainly includes sports technology, sports equipment, sports academia, sports science, and sports activities [7].

The high-volume journals for the literature on physical education research are listed in Table 1. In terms of the number of papers they carry, *Contemporary Sports Science and Technology* ranks 1st with 239 papers. *Science & Technology of Stationery & Sporting Goods* ranks 2nd with 64 papers. *Youth Sports* ranks 3rd with 61 papers. *Sports Science and Technology* and *Sports World(Scholarly)* rank 4th and 5th with 56 and 54 papers, respectively. *Bulletin of Sports Science*

& *Technology* ranks 6th with 53 papers. It is clear that *Contemporary Sports Science and Technology* makes a significant contribution to the field of physical education research. Moreover, it shows that the literature on physical education research comes mainly from professional journals related to sports.

Table 1: Analysis of Journals in Physical Education Research 2014-2024

Journal Name	Number	Porportion
Contemporary Sports Technology	239	15.1%
Science & Technology of Stationery & Sporting Goods	64	4.0%
Youth Sports	61	3.8%
Sports Science and Technology	56	3.5%
Sports World(Scholarly)	54	3.4%
Bulletin of Sports Science & Technology	53	3.3%
Sports Culture Guide	48	3.0%
Science & Technology Information	46	2.9%
Journal of Beijing Sport University	36	2.3%
Sports	31	2.0%

3.4 Analysis of Prolific Institutions

The top 20 institutions that have published 25 or more papers are illustrated in Figure 3 and Figure 4. The statistical analysis of these institutions shows that sports universities play a dominant role in the field of physical education research in China. Among these 20 institutions, sports universities account for 11, making up a significant 55%. This indicates that institutions dedicated to the investigation of physical education are mainly concentrated in specialized sports universities.

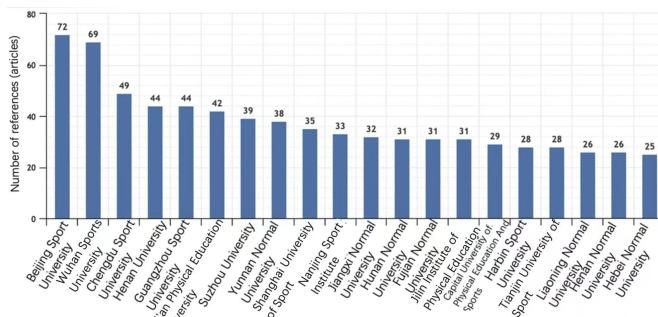


Figure 3: Prolific institutions in physical education research 2014-2024

Among these 20 institutions, two universities have published more than 50 papers. Beijing Sport University leads the list with 72 papers, followed by Wuhan Sports University with 69 papers. Chengdu Sport University ranks 3rd with 49 papers. Henan University and Guangzhou Sport University are tied for 4th place with 44 papers each. Xi’an Physical Education University has 42 papers,

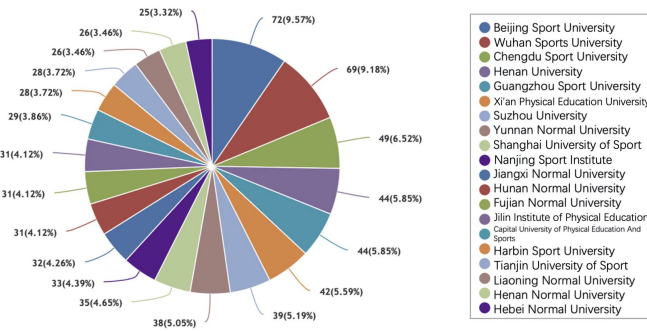


Figure 4: The distribution of prolific institutions in physical education research 2014-2024.

ranking 5th. In addition, universities that have published 30 or more papers include Suzhou University, Yunnan Normal University, Shanghai University of Sport, Nanjing Sport Institute, Jiangxi Normal University, Hunan Normal University, Fujian Normal University, and Jilin Institute of Physical Education, with 39, 38, 35, 33, 32, 31, 31, and 31 papers, respectively. Finally, Capital University of Physical Education and Sports, Harbin Sport University, Tianjin University of Sport, Liaoning Normal University, Henan Normal University, and Hebei Normal University have published 25 or more papers, with 29, 28, 28, 26, 27, and 25 papers, respectively.

3.5 Analysis of Prolific Authors

In general, one of the objective criteria for evaluating a researcher’s productivity is the number of papers they publish, which is highly correlated with the number of high-quality papers published in core journals. Consequently, the number of published papers becomes an important criterion for evaluating talent in a specific field [8]. According to statistics, we find that Wang Xiaozan, who affiliates East China Normal University, has published 6 papers as the most prolific author. Moreover, we use Price Law to determine the selection criteria for prolific authors, the formula for core authors is $M = 0.749\sqrt{N_{max}}$, where $N_{max} = 6$, which is the number of papers published by the most prolific author. Thus, calculating this yields $M = 1.833$. Following the principle of rounding, authors who have published more than 2 papers are considered core authors. Through bibliometric analysis, we have listed in Table 2 the prolific authors who published more than 2 papers between 2014 and 2024, totaling 5 authors. Among them, Wang Xiaozan is first with six papers; Yin Zhihua ranks second with four papers; Li Liang, Zhu Qiao, and Cheng Chuanyin are tied for third with three papers each. The total number of papers published by these five prolific authors is 19, which represents 1.2% of the total.

3.6 Analysis of Collaboration between Prolific Authors

The knowledge graph of the collaboration among prolific authors, with 296 nodes and 136 links, is shown in Figure 5. The nodes represent the authors, and the size of the nodes reflects the number of papers published by each author. The link between nodes represents collaborative relationships, the thickness of the links

Table 2: Top 5 Prolific Authors 2014-2024

Name	Number	Affiliated Institution
Wang Xiaozan	6	East China Normal University
Yin Zhihua	4	East China Normal University
Cheng Chuanyin	3	Nanjing Normal University
Li Liang	3	Shanghai University of Sport
Zhu Qiao	3	Nanjing Sport Institute

reflecting the frequency of collaborations between authors. Observing the knowledge graph, it displays a relatively discrete feature, with small clusters forming collaborative groups. For example, the collaborative group formed by Wang Xiaozan, Yin Zhihua, Yu Jiajun, Phillip, Xu Yanxian, and Li Chenxi demonstrates close collaboration within a small cluster, while the distribution of the overall 296 authors is relatively discrete, with limited collaborative relationships. The limitation of collaborative relationships among authors is unfavorable for the sharing and dissemination of research [9, 10]. However, from another perspective, there is undoubtedly significant potential for the development of collaboration in the field of sports science in China [11].



Figure 5: Collaborations with prolific authors in physical education research 2014-2024.

Through investigations on the CNKI, Baidu Scholar, and the official websites of the institutions where these prolific authors are affiliated, we find that the most prolific author Wang Xiaozan, and the second most prolific author, Yin Zhihua, are both from the College of Physical Education & Health at East China Normal University, serving as professors. These two authors have made outstanding contributions to the field of physical education research. The investigation also reveals a high-quality collaboration between Wang Xiaozan and Yin Zhihua shown in Figure 6. It can be inferred that the prolificacy is closely related to the tight collaboration between researchers in physical education.

Regarding the distribution of institutions where the authors are affiliated, comparing the prolific institutions listed in Figure 3 with the prolific authors in Table 2, we find that most of the prolific

authors in the field of physical education research are affiliated with outstanding sports science research institutions, many of which are sports universities. Most of the prolific authors come from prolific institutions, which are also an essential part of the formation of these institutions. Moreover, the distribution of prolific authors largely conforms to the Power Law distribution pattern. Thus, it can be concluded that prolific authors are a necessary condition for the status of prolific institutions. By studying prolific authors, one can provide rapid insight into research topics and trends in this field.



Figure 6: Collaborations with main prolific authors in physical education research 2014-2024.

4 Conclusion

In summary, through a comprehensive literature analysis, this study elucidates the current status and development trends of physical education research in China, providing systematic support for a deeper understanding of the field, providing important references for current research, and laying a solid foundation for future research directions. In addition, this study indicates that various sports universities and other related institutions have made significant contributions to physical education research in China, generating a series of important papers. Conducting sports research centered around sports universities is a distinctive feature of the sports academic community, with Beijing Sport University and Wuhan Sports University serving as important bases for physical education research in China. The five prolific authors all work at universities and have made important contributions to the development of this research field, such as Wang Xiaozan and Yin Zhihua being outstanding researcher representatives.

Through the review of these institutions and authors, we have drawn the following conclusions. Firstly, talent concentration has a positive promoting effect on the production and publication of high-quality research. Moreover, we find that prolific authors and institutions play an important leading role in the writing and publication of papers, forming a virtuous interactive relationship. This phenomenon not only enhances the academic standards of related disciplines, but also has a positive driving effect on the overall

development of the discipline. Secondly, the overall activity of physical education research in China is on the rise. We observe that China’s sports researchers have shown significant vitality in physical education research. This indicates that these researchers possess high-level research capabilities and strength, and are expected to make more significant contributions to China’s physical education. Finally, we identify that in the field of physical education research, the most prolific institutions exhibit distinctive sports-related characteristics. These institutions and their findings have contributed positively to the advancement and in-depth development of physical education within China.

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