



Based on CiteSpace, Research Hot Spots and Frontier Analysis of Physical Education Teachers in China

Dajiang Gong

College of Physical Education and Health Science, Zhejiang Normal University, Jinhua, China
Email: 956937570@qq.com

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Abstract

In order to explore the development vein and future development trend of physical education teacher research, 4120 core literature related to physical education teacher research on CNKI were analyzed by literature method and knowledge graph analysis method. The results show that the research hotspots mainly include PE teachers, PE teaching, school PE, PE education, PE curriculum and PE teachers in colleges and universities. The research frontiers mainly focus on professional development, physical health, physical education in colleges and universities, school physical education, moral education, core literacy, healthy China and other topics.

Subject Areas

Physical Education

Keywords

CiteSpace, Physical Education Teacher, Hot Spots, Research Frontiers

1. Introduction

Education is the source of national development. Teachers are the foundation of education. To make a country strong, we must first strengthen education. To realize the great rejuvenation of the Chinese nation, talents are the key, education is the foundation, and teachers are the foundation [1]. In January 2018, the Central Committee of the COMMUNIST Party of China and The State Council issued The Opinions on Comprehensively Deepening the Reform of Teacher Team Construction in the New Era, proposing to strengthen the training of PE teachers and teachers in short supply, and constantly improve the professional

quality and ability of PE teachers, etc., which shows that the state attaches increasing importance to PE teachers [2]. Through the database retrieval of China National Knowledge Network (CNKI), it is found that since 2002 there has been 4120 core literature related to PE teacher research. If traditional reading method is used to read each one, it is not only a heavy workload, but also difficult to grasp the hot spots and development trends of PE teacher research comprehensively and accurately from a large number of literature data. Based on this, CiteSpace.5.8.R1 visualization software is used to sort out indicators such as the number of publications, core authors, academic journals, scientific research institutions, hot spots and frontiers of physical education teacher research, in order to explore the development vein and future development trend of physical education teacher research. From the macroscopic level, it provides a theoretical and practical reference for the study of physical education teachers in China.

2. Data Sources and Research Methods

2.1. Data Sources

China National Knowledge Network (CNKI) was used as data source. As shown in Table 1, on August 31, 2021, through the advanced search of CNKI with “Physical Education teacher” as the theme, the time span is from January 1, 2002 to August 31, 2021, and the literature source category is set as core journals. A total of 4127 journals were retrieved, and 4120 core literatures were selected and taken as the research object (Figure 1). Among them, core journals refer to the main journals of a certain discipline. Generally, it refers to the professional journals with large amount of professional information and high quality, which can represent the development level of the professional discipline and are valued by the readers of the discipline.



Figure 1. Retrieval result graph.

Table 1. Data sources and retrieval process.

Data source	CNKI
Retrieval methods	Subject = Physical education teacher
Literature source category	Core journals
The time span	January 1, 2002 to August 31, 2021
The retrieval time	August 31, 2021
The retrieval results	A total of 4120 core articles were retrieved

2.2. Research Methods

2.2.1. Literature Method

Through CNKI and other channels, the retrieval and reading of PE teachers and CiteSpace related theme core literature provides a certain basis for the writing of theoretical knowledge and framework of the article.

2.2.2. Knowledge Graph Analysis

Using CiteSpace visualization software developed by Dr. Chen Chaomei based on JAVA language platform, which is mainly based on path Finfer algorithm and co-citation analysis theory, the software can draw collinear map, emergent map, time zone map and cooperation map, etc. Based on the dual characteristics of “graph” and “spectrum”, econometric analysis is conducted on literatures in a certain field to detect the development frontiers and hot spots of research in this field [3].

3. Research Results and Analysis

3.1. Physical Education Teachers Published Papers

Through the data of 4120 core literature selected by CNKI, click “Visualization Analysis” in “Export and Analysis” to get the trend chart (**Figure 2**) of the number of articles published in the research of PHYSICAL education teachers.

To some extent, diachronic changes in the number of publications reflect the research history, development speed and other dynamic evolution processes of this research field [4]. In terms of the overall trend, the number of published papers reached its peak in 2009, which was also a key turning point in the research of physical education teachers, making the trend chart of published papers take on the shape of an iceberg. From 2002 to 2009, the number of papers published on PE teacher research was in the stage of rapid development, which may be related to the opinions on Strengthening the Construction of PE teachers in Primary and Secondary Schools and other relevant documents issued by the state in 2000, which made the field of PE teacher attract the attention of researchers. But from 2010 to today, the decline in the number in the wave state that could be implemented with the 2010 national a new round of “new”, “new” emphasizes the role of physical education teachers from “teaching” in the liberation, advocate “learning to teach” to enhance students’ inquiry learning and the students’ subjectivity [5], Indirectly, the “sense of role” of physical education teachers in the classroom is reduced, which leads to the shift of the research

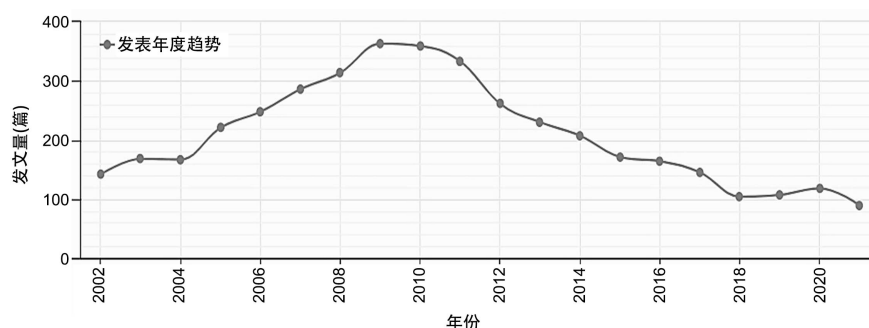


Figure 2. Trend chart of physical education teachers' research publications from 2002 to 2021.

center of physical education to the students, so the amount of physical education teachers' research papers is relatively reduced. Since 2018, the annual fluctuation of publications has not been obvious, it shows that the research on PE teachers has gradually formed a relatively stable state and gradually entered a deeper stage.

3.2. Physical Education Teachers Study Spatial Characteristics

The spatial characteristics of PE teacher research include three modules: core author, academic journal and research institution.

3.2.1. Characteristics of Core Authors

Core authors play an important role in this research field, and the ability of core authors is positively correlated with the number of papers published in core academic journals. The number of high-quality core academic papers also represents their research ability and can be used as one of the bases to judge the level of researchers [6].

Price's Law proposed by The American scientist Price can define the core author, and its formula is: $M_p = 0.749\sqrt{N_{p\max}}$, (M_p is the minimum number of papers published by core authors, $N_{p\max}$ is the number of papers published by most authors), According to the calculation, the authors who published 6 or more papers are the core authors [7]. CiteSpace software analysis shows that there are 33 core authors who have published more than 6 papers. The top 10 authors (Table 2) are selected for analysis, such as Ji Liu (63 papers), Wang Xiaozan (56 papers) and Yin Zhihua (40 papers) from East China Normal University. Wang Jian of Central China Normal University (52); Cheng Chuanyin (27) and Shang Lipai (16) of Nanjing Normal University; Zhao Fuxue, Wuhan Institute of Physical Education (25); Mao Zhenming, Beijing Normal University (15); Yao Lei of Beijing Sport University (15); Chen Yanfei, Beijing Institute of Education (13).

Figure 3 shows that at present, the study of physical education teachers in the formation of the Ji Liu, Wang Xiaozan and Yin Zhihua; Cheng chuanyin and Shang Lipai; Wang jian and Pan lingyun; Zhao Fuxue and Cheng Chuanyin group as the core of the team, but the network Density Density value of only 0.0012, shows that at present the most relevant researchers in a study situation alone, Lack of obvious cooperation and communication between each other.

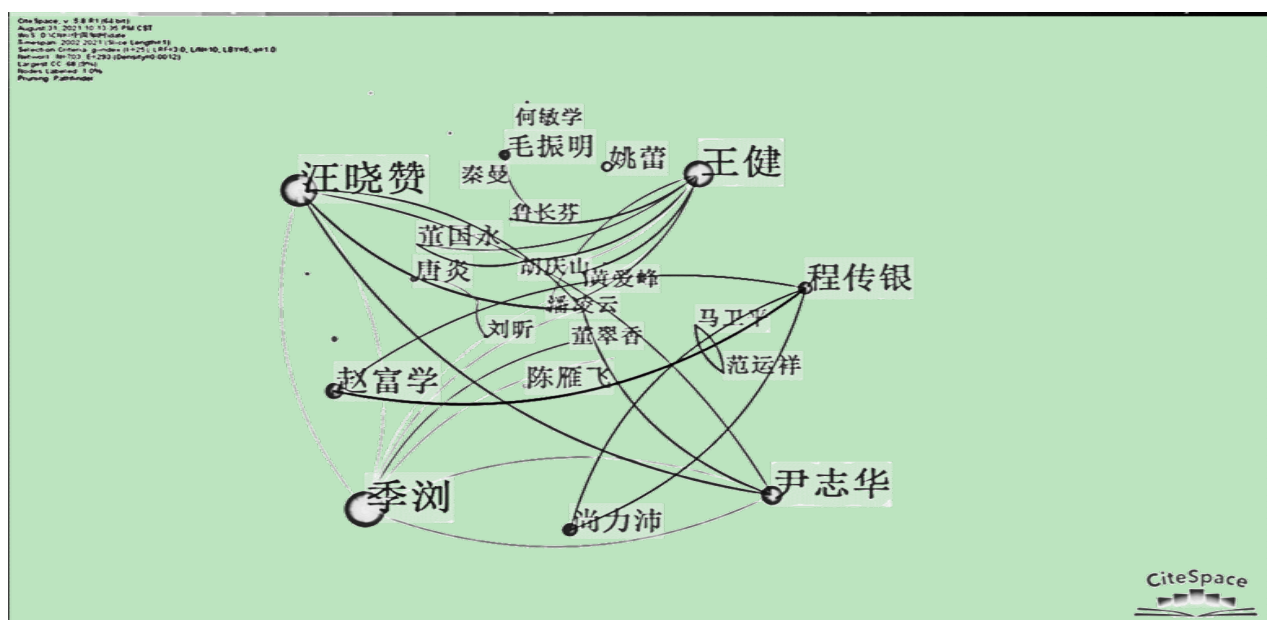


Figure 3. Network co-occurrence knowledge map of core authors in physical education teacher research field.

Table 2. Publications of the top 10 core authors of physical education teacher research.

Serial number	Author	Number of publications (Papers)	unit
1	Ji Liu	63	East China Normal University
2	Wang Xiaozan	56	East China Normal University
3	Wang Jian	52	Central China Normal University
4	Yin Zhihua	40	East China Normal University
5	Cheng Chuanyin	27	Nanjing Normal University
6	Zhao Fuxue	25	Wuhan Physical Education Institute
7	Shang Lipai	16	Nanjing Normal University
8	Mao Zhenming	15	Beijing Normal University
9	Yao Lei	15	Beijing Sport University
10	Chen Yanfei	13	Beijing Institute of Education

3.2.2. Characteristics of Academic Journals

Co-citation of academic journals is an organic combination of unrelated journals to show the cross-fusion relationship between academic journals, which can provide academic researchers with literatures cited in this field and promote the development of this research field [8].

As can be seen from **Table 3**, education periodicals account for 40% and sports periodicals account for 60% of the top 10. The top two educational journals were Education and Careers and Teaching and Management. The top two sports journals are Journal of Beijing Sport University and Journal of Physical Education. The specific data included 353 articles in education journals education and Occupation, 347 articles in Teaching and Management, 196 articles in

Table 3. Distribution of core journals of PE teacher research.

Core Journals	Literature Volume (Papers)
"Education and Careers"	353
"Teaching and Management"	347
"Journal of Beijing Sport University"	311
"Journal of Physical Education"	256
"Adult Education in China"	196
"Sports Culture Guide"	173
"Journal of Wuhan Physical Education University"	66
"Journal of Chinese Education"	32
"Journal of Shandong Institute of Physical Education"	30
"Journal of Chengdu Physical Education University"	29

Chinese Adult Education and 32 articles in Chinese Education Journal. There are 311 articles in the journal of Beijing Sport University, 256 articles in the Journal of Physical Education, 173 articles in the Guide journal of Sports Culture, 66 articles in the Journal of Wuhan Sport University, 30 articles in the Journal of Shandong Sport University and 29 articles in the Journal of Chengdu Sport University. It can be seen from the top ten core journals that the focus of China's PE teacher research journals is mainly on PE journals and education journals.

3.2.3. Characteristics of Research Institutions

The core research institution represents the core group of research knowledge creation in this field. The analysis of the research institution and the understanding of its research characteristics will enable scholars and researchers to have cognition of the machine research results in the subject direction of the core research institution in this field, which is conducive to the mutual cooperation and development between the research fields [9].

As can be seen from **Figure 4**, five of the top 10 scientific research institutions are physical education institutions. Looking from the post number, the top 10 are 128 from East China Normal University, 103 from Beijing Sports University, 89 from Central China Normal University, 87 from Shanghai University of Sport, 78 from Nanjing Normal University, 60 from Capital University of Physical Education and Sports, 58 from Wuhan Sports University, 53 from Beijing Normal University, 50 from Xi'an Physical Education University and 47 from Zhengzhou University. From the data, physical education colleges and normal colleges are the main forces and important bases of physical education teacher research in China, and the number of articles published by normal colleges and universities is slightly higher than that of physical education colleges and universities, which may be because normal colleges and universities focus on the development of school sports, and physical education colleges and universities not only study school sports, but also competitive sports and social sports. Therefore, the research on PE teachers in PE colleges is relatively less than that in normal colleges.

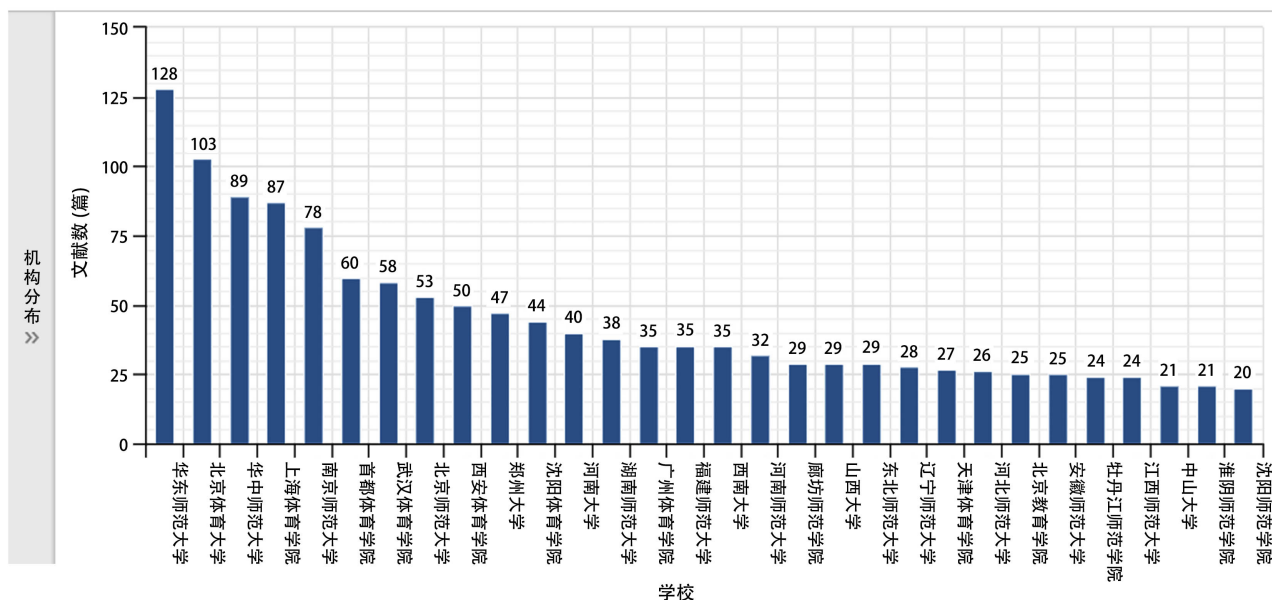


Figure 4. Distribution of PE teachers' research institutions.

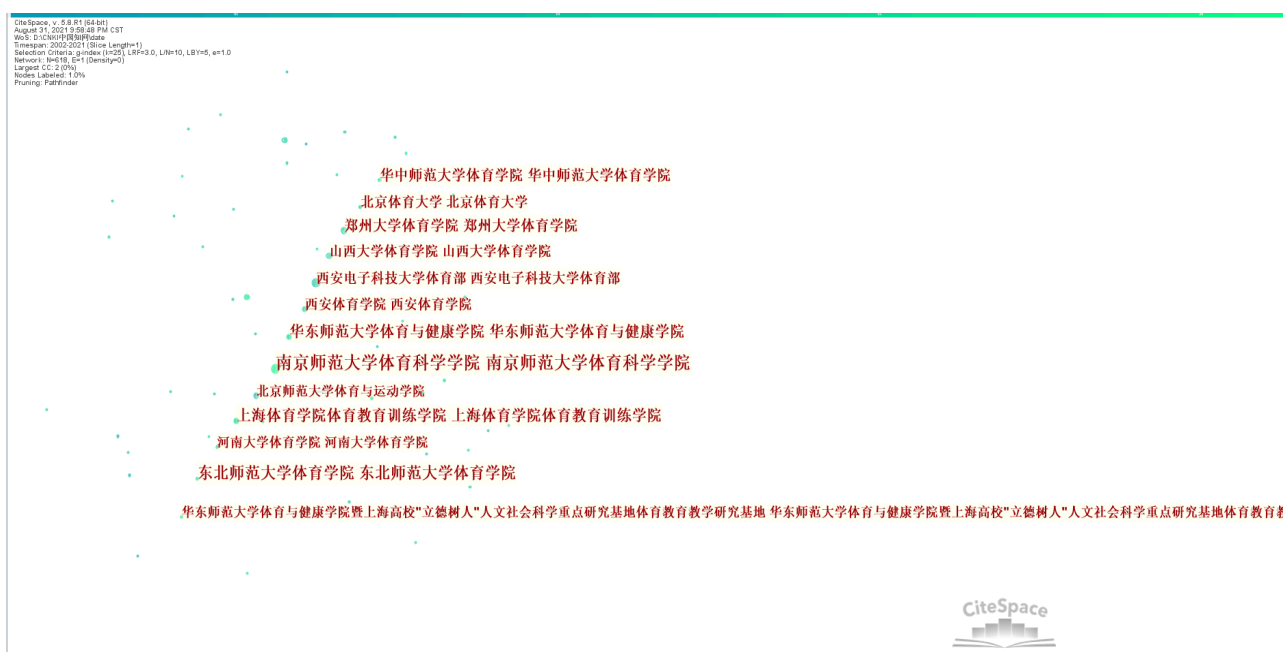


Figure 5. Co-occurrence knowledge map of PE teachers' research institutions.

The larger the text of research institutions in **Figure 5** is, the larger the number of published papers is. Its N value is 618, indicating that there are 618 research institutions in the selected core literature. E value is 1, indicating that only one of these research institutions has an obvious cooperative relationship. Density value is 0, indicating that the cooperation Density among research institutions is too low and the distribution of research institutions is too scattered. It is hoped that the exchange and cooperation between research institutions can be strengthened and the research on PE teachers can be further deepened.

3.3. Analysis of Research Hotspots in the Field of PE Teachers

Keywords are a high summary of the research topic of a paper, and the statistics and analysis of high-frequency keywords can reflect hot topics in a certain research field [10].

Centrality was developed by The American sociologist Lynton. Freeman first proposed that centrality can interact with different information points in the network and measure the ability of one point to connect with other points. If the centrality exceeds 0.1, this node is significant and a key node [11]. As can be seen from **Table 4**, the word frequency of the keyword “PHYSICAL education teacher” is the highest in the selected literature, reaching 862 times with a centrality of 0.29, which may be related to the fact that “physical education teacher” is the theme of this study. This is followed by physical education, school physical education, physical education and so on. The above keywords are hot topics in the field of PHYSICAL education teacher research, and play the intermediary role of “bridge” in this field. At the same time, small nodes with strong correlation are distributed around the keyword nodes, indicating that the academic research in the field of physical education teacher presents a diversified and multi-perspective research trend.

It can be seen from **Table 4** and **Figure 6** that the top three keywords are respectively physical education teacher, physical education and school physical education, which are closely related. The branch of school physical education includes physical education teacher and physical education, and physical education teacher is the leader of physical education. Most of the research on PE teachers in China is concentrated in universities and other scientific research institutions, so the proportion of research on PE teachers in colleges and universities is slightly higher.

Table 4. Keyword data table.

Keywords	Word Frequency	Centricity	Keywords	Word Frequency	Centricity
Physical education teachers	862	0.29	College sports	111	0.08
Sports teaching	458	0.20	Physical Education	96	0.10
School sports	396	0.26	Physical education	74	0.09
The sports education	277	0.21	Continue to education	740	0.03
Physical education curriculum	159	0.17	College students	70	0.04
College physical education teacher	132	0.12	Quality education	68	0.05
Regular institutions of higher learning	121	0.08	Sports teachers	67	0.09
Primary and secondary schools	111	0.08	The curriculum reform	61	0.07

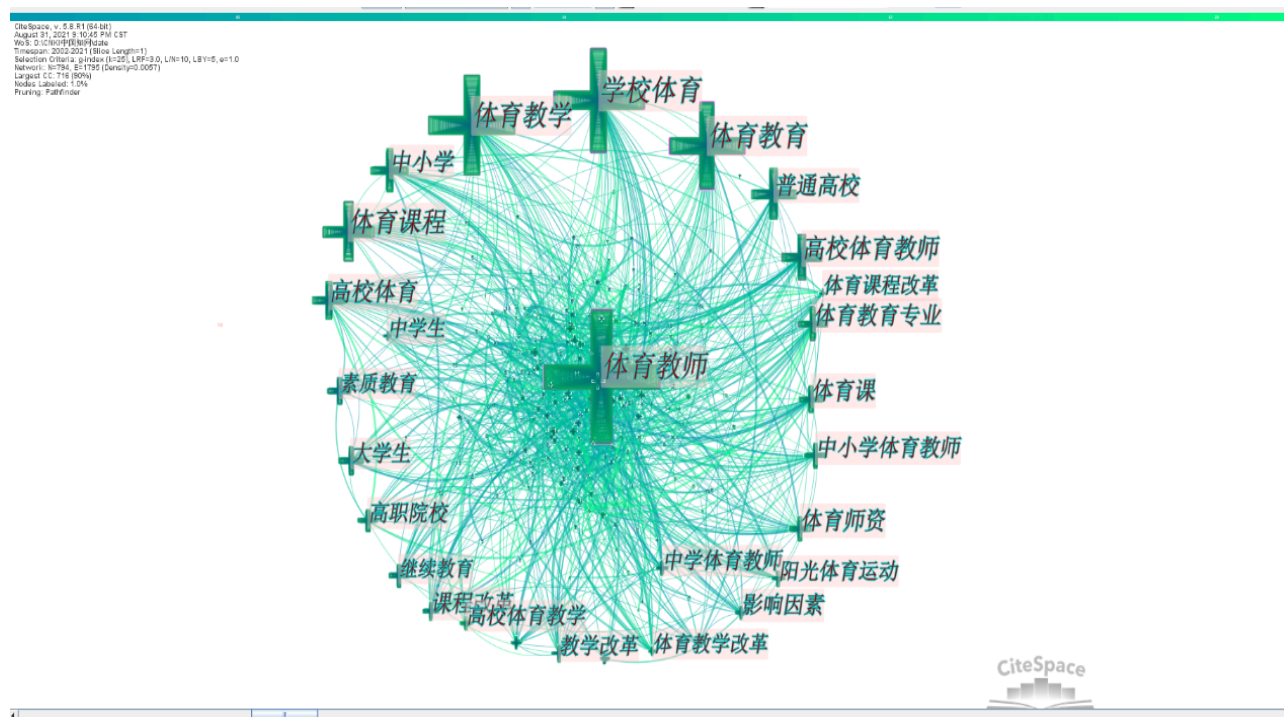


Figure 6. Co-occurrence knowledge map of PE teachers' research keywords.

3.4. Research Frontier Analysis of PE Teacher Field

A burst is a large change in the value of a variable over a short period of time. Burst detection of CiteSpace is to detect the word frequency with fast growth and high rate of change from imported research data by testing the time distribution of word frequency, and analyze the frontier trend of this discipline research according to the changing trend of word frequency [12].

As can be seen from Figure 7, appeared in the period 2002-2021 a total of 25 highlight keywords, they represent a certain stage in time, by the PE teachers' research in the field of influential events that caused by the background of topic focus, starting from the emergent time until now keywords, represents the physical education teachers in the field of research frontier [13]. Professional development, physical health, physical education in colleges and universities, school physical education, moral education, core literacy, and healthy China are the seven emerging keywords that will last until 2021. Therefore, it is considered that these seven keywords currently represent the frontier topics in the field of physical education teacher research, and may also be the frontier topics in the future.

In terms of moral cultivation and core literacy, the report of the 18th CPC National Congress took moral cultivation as the fundamental task of education. The Third Plenary Session of the 18th CPC Central Committee proposed to adhere to moral cultivation, and the report of the 19th CPC National Congress proposed to implement the fundamental task of moral cultivation. In 2020, the Central Committee of the COMMUNIST Party of China and The State Council

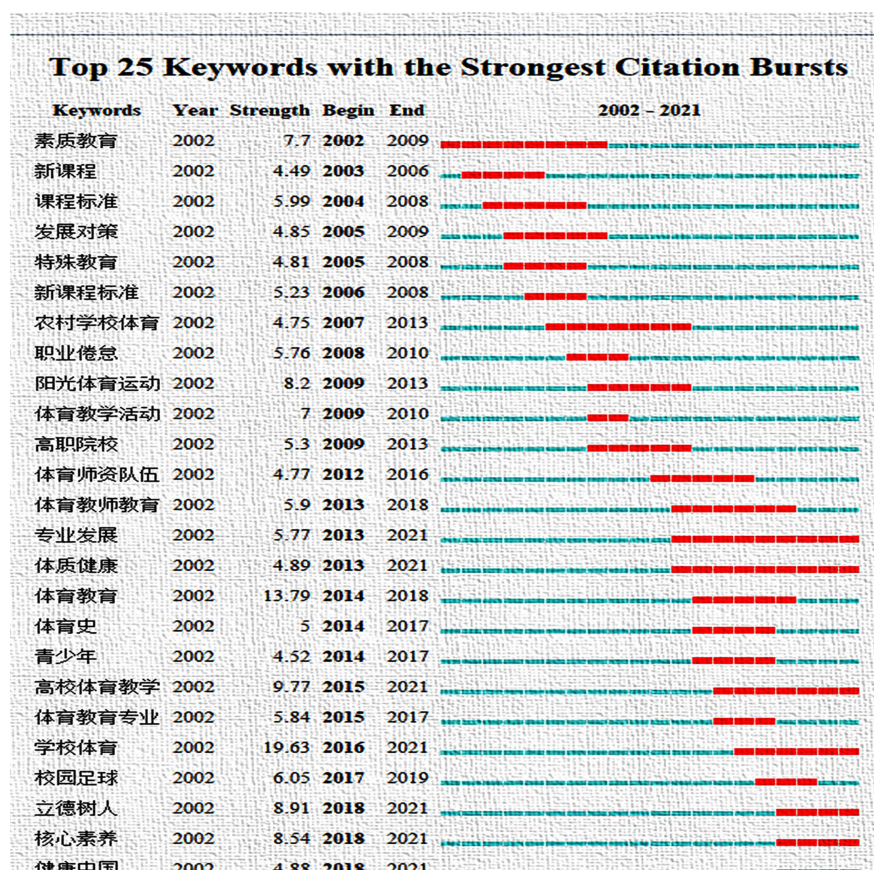


Figure 7. Distribution of key words in PE teachers' research.

issued opinions on Comprehensively Strengthening and Improving School PHYSICAL Education in the New Era [14], proposing that school physical education should be positioned and realized as the fundamental task of establishing morality and cultivating talents, and the basic project of improving students' comprehensive quality. Therefore, the fundamental task of moral education is the mission of our school sports. At present, the core literacy of physical education is one of the hot topics in the field of physical education curriculum reform both at home and abroad.

In terms of physical education in colleges and universities, the reform of physical education in colleges and universities started from the Yangzhou Conference in 1979. In recent years, the reform of physical education in colleges and universities gradually tends to integrate disciplines. Some scholars have carried out research on the reform of physical education in colleges and universities from the aspects of teaching objectives, teaching modes, teaching methods, teaching contents and national policies. On June 23, 2021, the Ministry of Education issued the Teaching Reform Guidance Outline of physical Education and Health (Trial), which is the first guiding document on school physical education reform issued by the Ministry of Education. Due to the issuance of government policies, physical education reform has once again become a hot topic in the field of physical education teachers' research.

In terms of school physical education and professional development, General Secretary Xi Jinping stressed at the National Education Conference in 2018 that “we should establish the education concept of health first, provide all physical education classes, and help students enjoy fun, enhance their physique, improve their personality, and temper their willpower in physical exercise.” This lightens the beacon for the development of school physical education in our country, and at the same time injects new power into school physical education research in our country. Physical education teacher is an important part of school physical education. Strengthening the professional development of physical education teachers and improving the professional quality of physical education teachers is an important node in the process of school physical education. PE teacher professional development is based on one of the main hot topics since PETE Conference in 2012. The research mainly focuses on the methods, connotations and influencing factors of PE teacher professional development [15].

In terms of healthy China and physical health, the CPC Central Committee and The State Council issued the Outline of Healthy China 2030 in 2016, which clearly stated that health education should be included in the national education system as an important basic content of quality education in the future. In 2017, the 19th National Congress of the Communist Party of China (CPC) proposed “accelerating the construction of a powerful country in sports and promoting the development of national fitness”, aiming to strengthen the physical health of the people, improve the health quality of the people and promote the development of healthy China. Students are the flowers of the motherland and the afterwave of national construction and development. The students’ physical health is related to the future development of the country. The students’ physical health has always been the focus of the country and society. Therefore, cultivating students’ awareness of lifelong physical education through school physical education is a key step to improve the physical health of Chinese people and promote the development of healthy China, and an important basis for implementing the strategy of “Healthy China” [16].

4. Conclusions

Through visual analysis and mapping of scientific knowledge of core journals of PE teacher research, the following conclusions are drawn:

- 1) From the point of view of the number of published papers, the number of published papers reached a peak in 2009, the number of published papers from 2002 to 2009 was in a stage of rapid development, and the number of published papers of PE teacher research was in a wave decline since 2010.
- 2) The core authors of PE teacher research mainly include Ji Liu, Wang Xiaozan, Yin Zhihua, Wang Jian and Cheng Chuanyin. The author’s collaborative team is mainly represented by Ji Liu, Wang Xiaozan and Yin Zhihua; Cheng Chuanyin and Shang Lipei; Wang Jian and Pan Lingyun; Zhao Fuxue and Cheng Chuanyin. But most researchers do not cooperate well. The focus of published

journals in the field of physical education teacher research is mainly educational journals and physical education journals. The research institutions in the field of physical education teachers take physical education colleges and normal universities as the main bases, but the cooperation density of each institution is not strong, and the research institutions are scattered. Therefore, it is necessary to encourage different scholars and scientific research institutions to strengthen exchanges and cooperation, realize resource sharing and complementarity, and contribute to the research in the field of physical education teachers in China.

3) The high-frequency words mainly include physical education teacher, physical education teaching, school physical education, physical education, physical education course, etc. The research frontiers mainly focus on “professional development”, “physical health”, “physical education in colleges and universities”, “school physical education”, “moral education”, “core literacy”, “healthy China” and other topics.

Conflicts of Interest

The author declares no conflicts of interest.

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