Visual Analysis of Hot Spots in the Study of Physical Examination of College Students at Home and Abroad

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Keywords: College students; Physical examination; Bibliometrics; Visualization; The comparative study

Abstract: Objectives: Combined with the COVID-19 epidemic, this paper compared and analyzed the research hotspots and development trends in the field of physical examination for college students at home and abroad, so as to provide reference for the exploration of the development of physical examination research for college students in China. Methods: Based on the literature in the field of health check-ups of college students at home and abroad, this paper uses the visual analysis tool Cite Space V. to make a multi-angle comparative analysis of the cooperation of high-yielding institutions, research hot spots and cutting-edge trends. Results: Domestic research in this field started early, but the development is slow. Foreign research focuses on physical activity and education, medical examination of common diseases, risk factors for college students' health and mental health of college students. Domestic research hotspots mainly include entrance check-up, medical examination results analysis, health education and health management. Conclusions: Firstly, cooperation between research institutions and high-yielding authors should be strengthened in China. Secondly, the research content needs to be further enriched. For example, domestic scholars can take multiple forms of investigation on the COVID-19 epidemic and further grasp the mental health status of contemporary college students with the help of big data analysis. At the same time, there is a lack of research on the risk factors of common diseases and disease prevention education in China. In addition, scholars should actively advocate regular physical examination in colleges and universities to further cultivate students' awareness of health management.

1. Background

Since the outbreak of COVID-19, people's attention to public health emergencies has increased. In the face of diseases like this, which spread rapidly and in various ways, the necessity and importance of disease prevention and control awareness are becoming increasingly prominent. As one of the most direct and clear ways to understand their current situation, physical and mental examination of the subject through medical means and methods is a diagnosis and treatment behavior that can early find disease clues and health risks. With the promulation of the "Healthy China 2030" Program, improving the health level of Chinese people and achieving the goal of "healthy China" have become the key content of national development. As the main force in the new era, the health status of college students is not only related to individual development, but also related to the future of the country [1]. In view of this, based on the CNKI and WOS databases, this thesis uses the Cite Space V which is a visual analysis tool to draw a mapping knowledge domain, then to compare and analyze the chronological distribution, institutional distribution, research hotspots and evaluative trends in the field of physical examinations for college students at home and abroad. So we can accurately grasp the domestic and foreign scholars’ achievements and hotspots in this field.

2. Materials and methods

2.1. Date sources

The data in this article is mainly derived from the Chinese Journal Full-text Database (CNKI)

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and the Web of Science database. The data was collected on June 9, 2020. In the CNKI database, the subject of “college students” and “physical examination” was used to retrieve. The type of literature was limited to journals and the source category and search year was unlimited. A total of 105 journal papers were retrieved. In the Web of Science database, the subject of “college students” and “physical examination” was used to retrieve. The type of literature was limited to article and the source limited to the core collection of Web of Science, but the search year was unlimited. A total of 312 papers were retrieved. In order to ensure the validity of the data, the literature with inconsistent conditions (including meetings, news, etc.) or incomplete information was eliminated manually, and 102 Chinese literatures and 312 foreign literatures were finally obtained.

2.2. Research methods

This article mainly uses literature metrology and co-keyword analysis method. Meanwhile, we compared and analyzed the literature from China and abroad by using visual analysis tool Cite Space V. The time range of domestic literature was set set from 1986 to 2020,and the threshold was set as (C,CC,CCV) = (1,1,20), (1,2,20), (1,3,20). The foreign time was set from 1991 to 2020, and the threshold was set as (C,CC,CCV) = (2,1,20), (2,2,20), (2,3,20). The time slice value was set as 1. Through the above operation, we can draw the network map of institutional cooperation, keyword co-occurrence, hot spot evolution and so on. Combined with the information in the map, we can understand the development trend and hot spot evolution trend of the research field of college students' physical examination, and explore the differences in the research of college students' physical examination at home and abroad from multiple perspectives. Then, we draw some network maps, such as the map of institutions’ cooperation, keyword co-occurrence, hotspot evolution, etc. After analyzing the information from the network maps, we can know the development trends and hotspot trends in the field of physical examination for college students. Also, we can explore the differences between domestic and foreign college students' physical examination research from multiple angles.

3. Results analysis

3.1. Date sources

Figure 1 shows the annual distribution of the research literature on physical examination of college students at home and abroad. The horizontal axis represents the year of literature distribution, while the vertical axis represents the total amount of literature published by scholars in each year. The research on college students' physical examination in China began in 1986. During the 22-year period from 1986 to 2008, the research in this field developed at a relatively slow speed, with an average annual publication of 1 paper, which was in the embryonic stage of research development. From 2009 to 2019, the literature volume changed from a trend of rising volatility to a trend of stable development. This stage was a period of stable development of domestic research, with an average annual publication of 7 papers and a peak of 10 papers in 2013. Foreign research in this field started later than domestic research. Similarly, after the embryonic development, that is, since 1997, the number of foreign publications has been on the rise on the whole and developed rapidly. In 2016, the number of foreign publications reached 39, which was the peak period and then gradually declined.

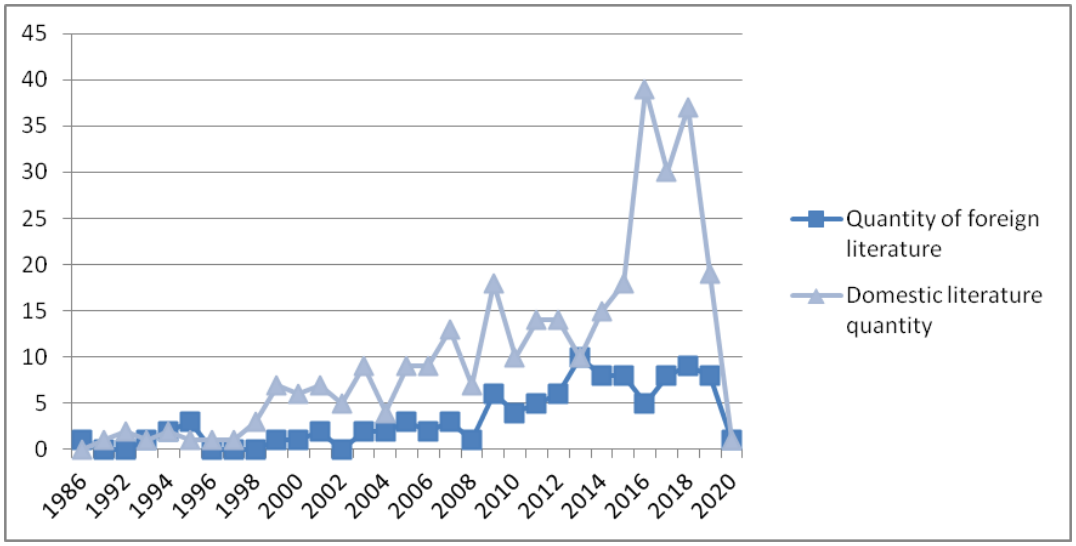

Figure 1 The increasing trend of literature on physical examination of college students at home and abroad

3.2. Date sources

Table 1 lists the top 10 institutions at home and abroad in terms of literature publication volume. By comparison, it is found that the high-frequency publishing institutions in foreign countries are mainly composed of colleges and universities, while the types of high-frequency publishing institutions in China are relatively extensive. In addition to colleges and universities, there are also colleges and universities affiliated hospitals, health centers and physical examination centers.

Table 1 Domestic and foreign literature volume of the top 10 institutions

Domestic high frequency publication agency	Foreign high frequency publication agency
Guangdong College of Commerce Outpatient Department	Michigan State Univ
Jilin Agricultural University Hospital	Harvard Univ
Xi 'an Physical Education College	Univ Tennessee
Guangxi University for Nationalities Hospital Nursing Department	Univ N Carolina
Public Physical Education Department of Jimei University	Univ Washington
School of Public Health, Peking University	Texas A&M Univ
School of Public Health, Taishan Medical College	Univ Calif Irvine
Capital Medical University Hospital	Penn State Univ
School of Pharmacy, Harbin Medical University	Indiana Univ
Capital Medical University Hospital	Iowa State Univ
Physical Examination Center, First Affiliated Hospital of Chongqing Medical University	Univ Minnesota

Figures 2 and 3 are the maps of cooperation between foreign and domestic high-yielding institutions. In the cooperation of foreign prolific institutions, cooperation between American universities is more frequent, and the frequency of cooperation between other countries is lower. For example, the high-frequency cooperation institutions represented by Harvard University have as many as 15 cooperation units in their teams, forming a larger cooperation network. Similarly, the high-frequency institution represented by Michigan State University in the United States, the entire academic team contains 13 cooperative units. In addition to the above two large-scale research teams, there are high-frequency cooperative groups represented by the University of Tennessee, the

University of North Carolina, the University of Washington, the University of Texas A & M, Pennsylvania State University, Indiana University, etc. The domestic high-frequency literature publishing institutions are mainly composed of universities, affiliated hospitals and public health centers of universities. Combined with Table 1 and Figure 3, it can be seen that the top three high-frequency publishing institutions are the Guangdong College of Commerce Outpatient Department, Jilin Agricultural University Hospital and Xi 'an Physical Education College. However, the three academic institutions are in an independent state in the whole cooperation network of high-frequency institutions, without any cooperative relationship with any university or institution. In addition, it can be seen from the Figure that there are four large cooperation networks among domestic academic teams in this field, with Wannan Medical College, Qingdao Chest Hospital, Peking University Medical College and Jimei University as the main forces respectively. The research focuses of the four academic teams are the physical and mental health status of poor college students, tuberculosis screening and tuberculin test of healthy physical examinees, analysis of health physical examination needs and influencing factors of college students, and analysis of health management path of college students.

Figure 2 Map of Cooperation between Foreign institutions

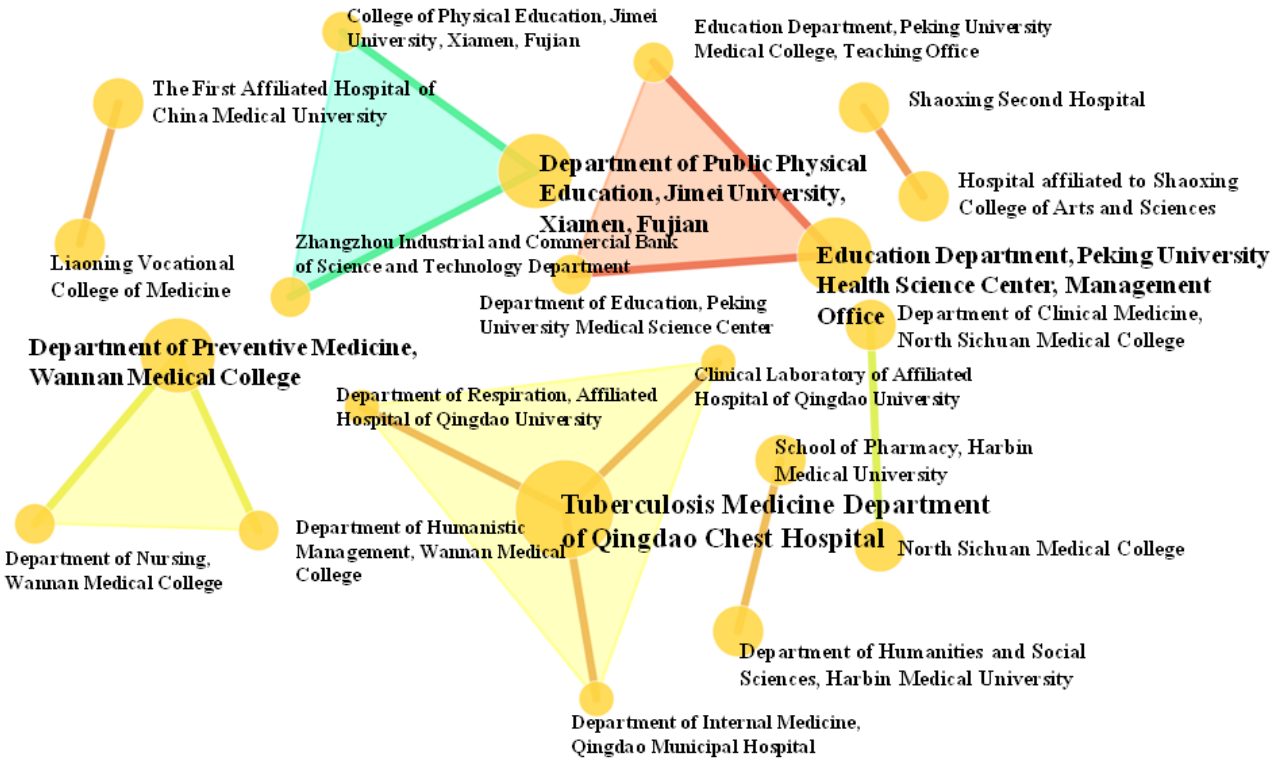

Figure 3 Map of domestic institutional cooperation

3.3. Comparative analysis of research hotspots in physical examinations of college students at home and abroad

Figures 4 and 5 are the co-occurrence maps of keywords at home and abroad respectively. The size of nodes in the maps reflects the frequency of keywords. The connection between nodes represents the connection between keywords, and the more nodes have the connection, the more information is involved, thus becoming a hot spot in this research field. In the domestic keyword co-occurrence map (Figures 4), there are 223 nodes and 216 lines. In addition to the key words of "college students" and "physical examination", the key words with larger nodes include health status, mental health, prevalence rate, young people, health education, health management, etc. In addition, the key words connecting the nodes of "college students" include physical examination, mental health, sub-health knowledge, physical quality, poor vision, public health emergencies, prevention and health care, etc. The key words linking the "physical examination" node are physical condition, hyperuricemia, diet, lifestyle diseases and so on. In the foreign keyword co-occurrence map ((Figures 5), it contains 115 nodes and 212 connections. The keywords with larger nodes have physical activity, college student, education, prevalence, validity, etc. It can be seen from the Figure that the keywords connecting “physical activity” are health exercise, behavior, behavior, obesity, risk factor, etc.

The position of nodes in the map is a manifestation of the centrality. Generally, keywords with strong centrality are in the center of the map. Table 2 is the frequency distribution table of domestic keywords. Combining Figure 4, Figure 5 and Table 2, it can be found that foreign high-frequency words are more concentrated in the spectrum, with a total of 10 keywords with a centrality of more than 0.2, while domestic high-frequency words are slightly loose in the co-occurrence spectrum, with only 2 keywords with a centrality of more than 0.2. These high frequency words with high centrality play a pivotal role in the map, and thus become the hot research topic in this field. Foreign research on college students' physical examination involves many aspects such as physical activity, health education and risks, while domestic research in this field mainly focuses on the high incidence of diseases and factors, physical examination data analysis, health status and physical quality.

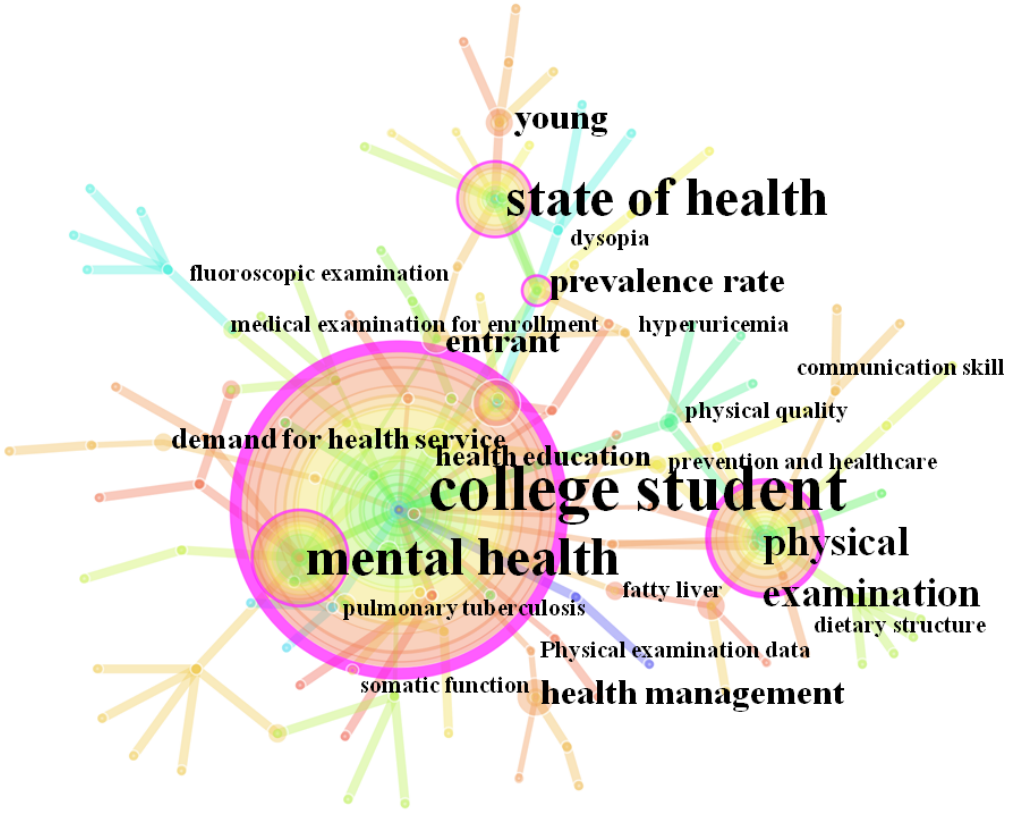

Figure 4 Domestic high frequency keywords co-occurrence network visual atlas

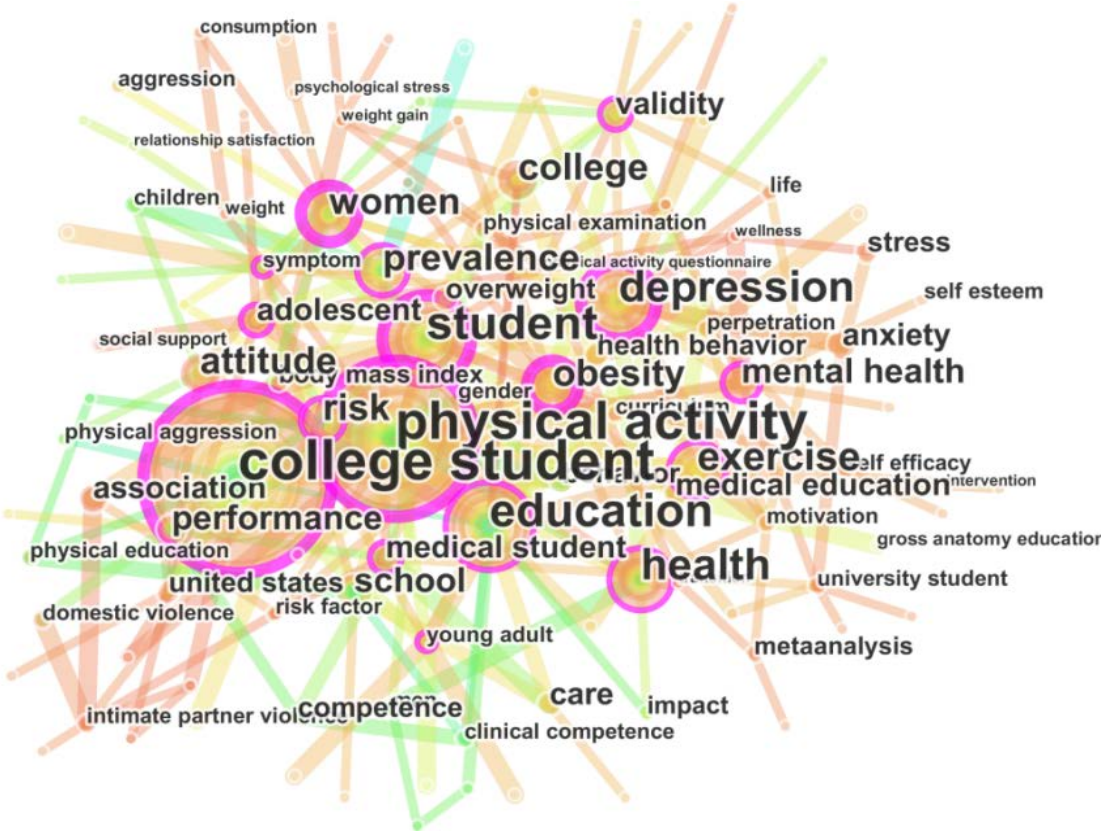

Figure 5 Foreign high frequency keywords co-occurrence network visual atlas

Table 2 Key words frequency of physical examination for college students at home and abroad

Web of science database			CNKI database		
frequency	centricity	keywords	frequency	centricity	keywords
22	0.71	physical activity	25	1.02	College students
19	0.29	college student	9	0.68	physical examination
14	0.23	education	6	0.19	mental health
9	0.27	school	3	0.16	prevalence rate
9	0.21	prevalence	2	0.29	health condition
8	0.32	student	2	0.24	health data
8	0.18	care	2	0.19	health management
6	0.48	validity	2	0.13	physical quality
4	0.43	college	2	0.1	dietary structure
4	0.21	risk	2	0.1	poor sight

3.4. Comparative analysis on the research frontiers of physical examination for college Students at home and abroad

We used the "Timezone" function of the Cite Space software to draw a time zone view of the evolution of hotspots for physical examinations of college students at home and abroad according to time segments. Figure 6 and Figure 7 use time as the horizontal axis. Nodes represent hotspot keywords. The size of the nodes represents word frequency. The connection between them represents the evolution trend of hotspot words in time. As the time goes, domestic and foreign scholars' research hotspots in this field are constantly changing, and related research is also expanding and deepening.

Since there are few foreign literatures retrieved in the field of college students' physical examination in 1991-1999, so Figure 6 can only reflect the evolution trend of research hotspots in this field from 1999-2019. It can be seen from Figure 6, the keyword "college student" first appeared in 2002, and then the subject keyword "physical examination" appeared in 2009 and the keywords at this stage mainly included physical education, physical activity, physical aggression, exercise, etc. Combined with the literature at this stage, we can see that foreign countries pay more attention to college students' physical activities and health level; with the increasing amount of literature, the research content and scope are also deepening and expanding. Keywords that related to the mental health begin to appear in the atlas, such as "depression" (2010), "mental health" (2015), and "anxiety" (2016), "emotion" (2017), etc. It indicates that foreign scholars began to pay attention to the mental health of college students and continuously attached importance to this issue in 2010. Later in the period of 2010-2015, foreign scholars focused more on the common diseases of college students, such as obesity, chronic disease, bulimia nervosa, and posttraumatic stress disorder, etc. Research achievements have increased rapidly between 2016 and 2019. Compared with earlier studies, study at this stage has become more mature, mainly focusing on risk factors that affect college students' health. Representative keywords include sedentary behavior, stress, perpetration, violence, alcohol, etc.

It can be seen from Figure 7 that the evolution of hot spots in the physical examination of college students in China can be roughly divided into four stages. The first stage was from 1986 to 2004. Keywords included college students (1986), physical examination (1994), tuberculosis, genital tumors, physical examination for college students, visual impairment, hepatitis B virus, and physical quality. In the second stage, from 2005 to 2011, key words about psychology began to appear in the graph, such as "mental health", "mental health" and "psychological status", indicating that domestic scholars gradually paid attention to the psychological problems of college students from 2005. The research mainly includes the investigation of the physical and mental health status of poor college students, the research and analysis of the psychological status of healthy physical examination population, etc. At the same time, it can be seen from the Figure that scholars in this stage also gradually shifted their focus to health education and health care. With the increase of literature volume, keywords appearing in the map also increase. Compared with the earlier research,

the research from 2012 to 2019 is more mature. Scholars combine the preliminary research of the previous stage and make further exploration. For example, domestic scholars conducted the research on the curriculum construction and discipline construction in the direction of health in universities at this stage. At the same time, domestic scholars also enriched the content of health education. For example, key words such as "mental health education" and "sub-health knowledge" could be found in the map. In the last stage, 2020, due to the impact of COVID-19 epidemic, the research hotspots of domestic scholars began to change. The key words "COVID-19 epidemic" and "public health emergency" appeared in the map, and the main research content was the consideration of media literacy of college students caused by public health emergency.

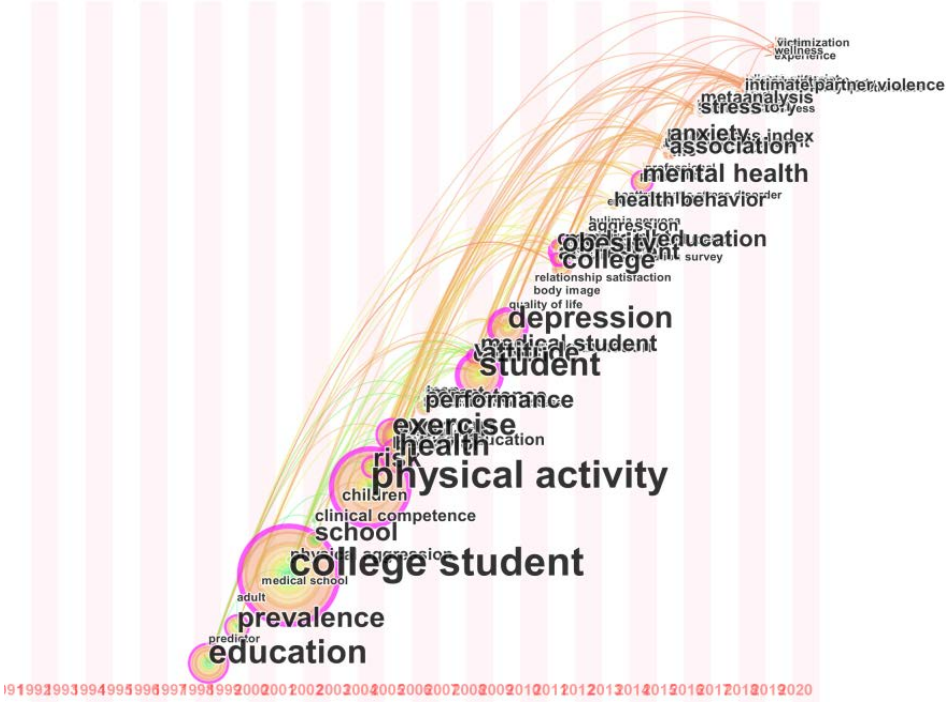

Figure 6 The evolution trend of the hot words in the study of college students' physical examination abroad

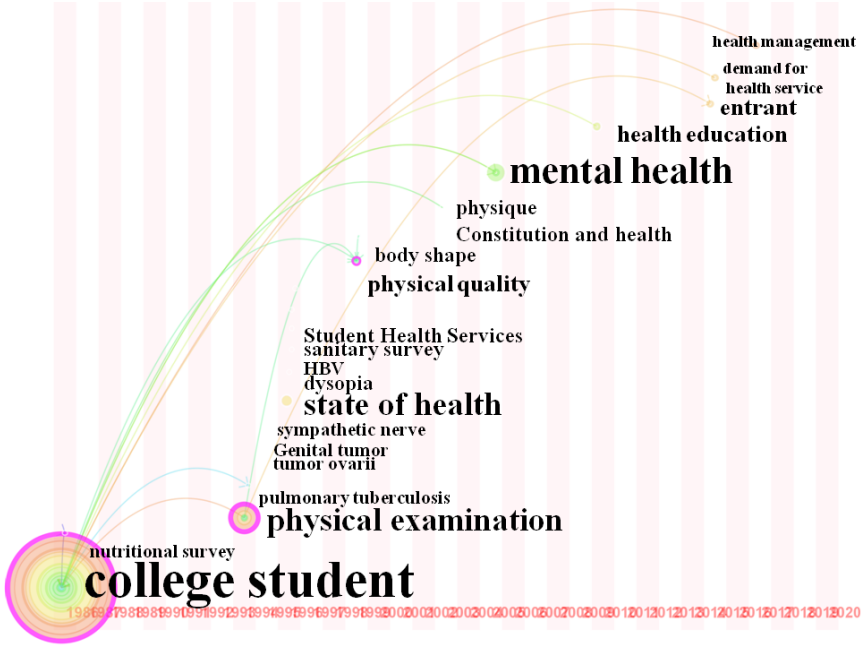

Figure 7 The evolution trend of hot words in the research of college students' physical examination in China

4. Conclusions and suggestions

4.1. Conclusions

Based on bibliometrics and co-word analysis, this paper uses software to make a comparative analysis of the research literature on physical examination of college students at home and abroad, draws the co-occurrence map of key words and hot spot evolution trend map of the research on physical examination of college students at home and abroad, and makes an analysis from the aspects of literature distribution age and academic institutions. The main conclusions are as follows:

First of all, in terms of the chronological distribution of literature, although the domestic research in this field started earlier, the overall trend of development is relatively slow.

Secondly, in terms of the distribution of research institutions, the cooperation of foreign research institutions is relatively concentrated, and the cooperation groups of research institutions and research forces have formed a certain scale, and the research strength of the United States is more prominent. But the cooperation between domestic institutions is relatively low, and the research power is relatively scattered. It indicates that foreign research in the field of college students' physical examination is more concerned and mature. However, there are few cross-type cooperation among foreign high-frequency cooperation institutions, and most of them are cooperation between universities. However, there are many types of cooperative institutions in China. In addition to academic cooperation between universities, there are also cooperation and communication between affiliated hospitals of universities and universities as well as between hospitals.

Thirdly, in terms of the research hotspots, the research hotspots in physical examination of college students at home and abroad not only have similarity but also have differences. The foreign studies are more concentrated in four aspects: physical activities and education, common diseases in physical examination, risk factors of health for college students, and mental health of college students. They focus more on the education for physical activities and the exploration for risk factors of health. The domestic studies' hotspots mainly include entrance examination, result analysis of physical examination, health education, and health management. We focus more on the new entrance physical examination and analysis of its results.

At last, in terms of the hot frontier, the frontier keywords of foreign research are mainly reflected in the psychological diseases of college students and the relationship between college students' behavior and health. For example, some scholars have studied the effects of depression, eating disorder symptoms and exercise on the quality of life of young people [2]; the relationship between college students' social support differences and depression, anxiety symptoms [3]; the research on depression symptoms and weight loss behaviors [4]. The frontier keywords of domestic research are mainly reflected in the result analysis of new entrance physical examination, and the construction and improvement of efficient health management system. The representative studies include the analysis of the fatty liver of college students during physical examination [5]; the incidence of hepatitis B in physical examination of college students and the analysis of preventive measures [6]; the status quo, problems and countermeasures of health management in universities [7] and the application of medical examination data of college students in college health management [8].

4.2. Suggestions

The research on the physical examination of college students in my country can learn from the development of foreign research. Through the focus of foreign research in this field, we can continually explore the development path of our country in this field. This article has the following suggestions for the development of domestic research in this field:

On the one hand, it is necessary to strengthen cooperation among research institutions in our country. Through the comparison of cooperation maps of domestic and foreign prolific institutions, it is found that the number of foreign research institutions is significantly higher than domestic ones, and its cooperation between prolific institutions is more frequent. Therefore, this paper suggests that domestic scholars should pay more attention to the physical examination of college students, deepen their research and thinking in this field, and strengthen academic exchanges and cooperation among cooperative institutions, especially high-frequency publishing institutions, so as to form a

cooperative network with certain research strength, which is conducive to the in-depth study of this topic. At the same time, the types of cooperative institutions can be more diversified, not limited to universities. For example, colleges and universities can share data and exchange results with the physical examination departments or institutions of hospitals, which is conducive for scholars to grasp the latest physical examination data dynamics of college students, understand the current physical health status of college students, and provide theoretical basis for better health education and health management of colleges and universities. In addition, cooperative institutions should break through the restrictions of regions and disciplines, and realize inter-national, inter-regional and inter-professional exchanges and cooperation as soon as possible, so as to learn from each other's achievements in this field, which is conducive to the development and progress of the field of physical examination for college students in China.

On the other hand, domestic research in this field needs to be further enriched. Firstly, domestic scholars should pay more attention to the mental health of college students. Mental illness is a group of diseases characterized by mental behavior deviating from norms, social function decline, maladjustment and mental pain [9]. Combined with coVID-19, this public health emergency has a great psychological impact on people, especially in Hubei Province. As college students whose values have not been formed and whose psychology is relatively fragile, they should get special attention. Scholars can combine this epidemic event, adopt multiple forms of investigation and make use of big data analysis to further understand the mental health status of contemporary college students, find out the root causes of psychological diseases among college students, and strive to solve the problems as soon as possible and eliminate abnormalities in the bud [10]. At the same time, college students, as a special group bearing high expectations of society and parents, are faced with problems such as maladjustment, interpersonal relationship, emotion and employment pressure [11]. In view of the increasing number of psychological problems of college students in China, it is suggested that domestic scholars strengthen their research in this direction to provide theoretical basis for better carrying out mental health education and guidance in colleges and universities. Secondly, domestic research on risk factors analysis and prevention education of common diseases in colleges and universities is deficient in this field. Some scholars have found that most of the common diseases of college students are short-term rapid onset caused by long-term accumulation. For example, bad habits and negative emotions in the study and life have not been corrected in time. Over time, a variety of undesirable factors will lead to abnormal psychological reactions of college students and threats to physical health, eventually leading to psychosomatic diseases [12]. Therefore, in order to enable college students to grasp the knowledge of common disease prevention as early as possible, and to cultivate students' awareness of disease prevention and control, scholars to analyze the health risk factors of this group and study the prevention education of common diseases in universities are very necessary. Thirdly, through the domestic keyword frequency table, we can find that most of the physical examinations for college students in our country are freshman entrance examinations and graduate entry examinations. However, for the development of physical and mental health of college students in China, only 1-2 physical examinations during school are not enough. As a result, colleges and universities cannot grasp the health status of students at all stages in time, and ultimately cannot prevent disease and manage health early. Scholars should actively advocate the organization of regular physical examination in colleges and universities, cultivate students' awareness of their own health management, and achieve “three early”, that is, early detection, early diagnosis and early treatment, to provide an important guarantee for the physical and mental health of Chinese college students.

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