



Visualization and Analysis of College Students' Mental Health Based on CiteSpace Knowledge Graphs

Wenbo Yu¹, Jia Zhang^{2,a}, Yulong Tan^{2,b}, Tianyu Mu^{2,c}, Zhuoran Li^{2,d*}
Yinghao Zhu^{3,e*}

¹Changchun University of Chinese Medicine, Changchun, China

²school of medical Information, Changchun University of Chinese Medicine, Changchun, China

³Center for Innovative Practice, Changchun University of Chinese Medicine, Changchun, China

^a18566071668@163.com, ^bTy11176664921@outlook.com
^c1516510943@qq.com, ^{d*}c125884109@qq.com
^{e*}e27785450@qq.com

Abstract. Purpose: Through the visualization and analysis of knowledge graph, this study explores the publication status, journal distribution, research power, hotspots, and development trend of the research field of college students' mental health in China in the past ten years, which will provide a reference for future research. Methods: The CNKI database was searched, and 3586 articles were included in the study, which were visualized and analyzed by CiteSpace software. RESULTS: In recent years, the number of articles published has slowly declined, and the discipline is in a period of calm. The top three issuing journals were Talent, Chinese Journal of Health Psychology and Contemporary Sports Science and Technology. There were 10 core authors, forming 5 collaborative clusters, multiple small groups, and fewer inter-institutional collaborations. There were 8 organizations with ≥ 10 publications, including Hebei Normal University. The research hotspots are students' mental health, countermeasures, social support, etc., and there are 10 research frontier themes. Conclusion: It is recommended to strengthen cooperation, pay attention to the changes of the times, respond to the needs of the country, and explore other research hotspots.

Keywords: mental health; knowledge graph; visualization analysis; college student.

1 Introduction

In recent years, with the rapid development of society and the explosive growth of network information, the factors affecting the mental health of college students have become more diverse and complex [1] Therefore, it is particularly important to update and re-understand the "factors" that affect the mental health of college students with the development of the times. As Comrade Xi Jinping pointed out during his inspection

© The Author(s) 2024

M. Yu et al. (eds.), *Proceedings of the 2024 5th International Conference on Big Data and Informatization Education (ICBDIE 2024)*, Advances in Intelligent Systems Research 182,

https://doi.org/10.2991/978-94-6463-417-4_47

at China University of Political Science and Law: "China's future belongs to the youth, and the future of the Chinese nation also belongs to the youth. The ideals, beliefs, mental state, and comprehensive quality of the younger generation are an important manifestation of a country's development vitality and an important factor in a country's core competitiveness." [2]. Clarifying the hot spots of contemporary college students' mental health research and grasping the research development trend are necessary conditions and urgent needs to solve the practical problems of young college students, and can promote the better growth and faster development of college students. This research uses bibliometrics and visualization methods, and uses CiteSpace, a knowledge network analysis tool, to draw a scientific knowledge graph of college students' psychological research, and reproduces a panoramic view of the number of articles, journal distribution, analysis of authors and research institutions, research hotspots and development trends of college students' psychological research in China, in order to provide knowledge reference for deepening college students' psychological research.

2 Data and Methods

2.1 data sources

Literature data analytics comes from the China National Knowledge Network Database (CNKI), which searches for "keywords = mental health" and includes "keywords = college students". The source category is "All Journals", and the time is "January 1, 2013 to October 1, 2023". After manual screening, irrelevant entries such as duplicate papers, deletion of meeting notes, introduction of project results, book reviews, speeches, and introduction of research institutions were excluded, and 3,586 valid literatures were finally obtained.

2.2 Method

The research used CiteSpace6.3. R4 software to construct a visual Knowledge Graph, and analyzed the subject distribution, source distribution, author cooperation, institutional cooperation, hotspots, preface and development trend of the annual publication volume of college students' mental health research literature. The time is set as "2013-2023", the time slice is set as "1 year", and the threshold is set as "Top N = 50". The graph is edited and constructed by combining Pathfinder + Pruning sliced networks as the algorithm type. After a series of parameter settings, co-occurrence analysis, cluster analysis and emergence analysis of keywords in the literature are carried out. The visual analysis of the cooperation network between research institutions and authors is carried out to realize the visual presentation of the hotspots and development trends of college students' mental health research in the past 10 years.

CiteSpace is an information visualization application software [3, 4] that can perform literature statistics, cluster analysis and graph presentation on disciplines and knowledge fields set by users [3, 4]. Its role is to detect and dig deep into the information hidden in the data through the analysis of a large number of documents, and finally present the scientific laws, distribution, structure and trends of the discipline

more clearly and intuitively in the form of maps [5, 6]. The analysis and prediction of the information panorama, the research frontiers of hot topics, and the development process of a certain discipline and technology field show strong advantages and accuracy [7]. Compared with the traditional literature sorting analysis, this bibliometric method shows the advantages of comprehensive and objective data [8-9].

3 Result

3.1 Publication volume analysis

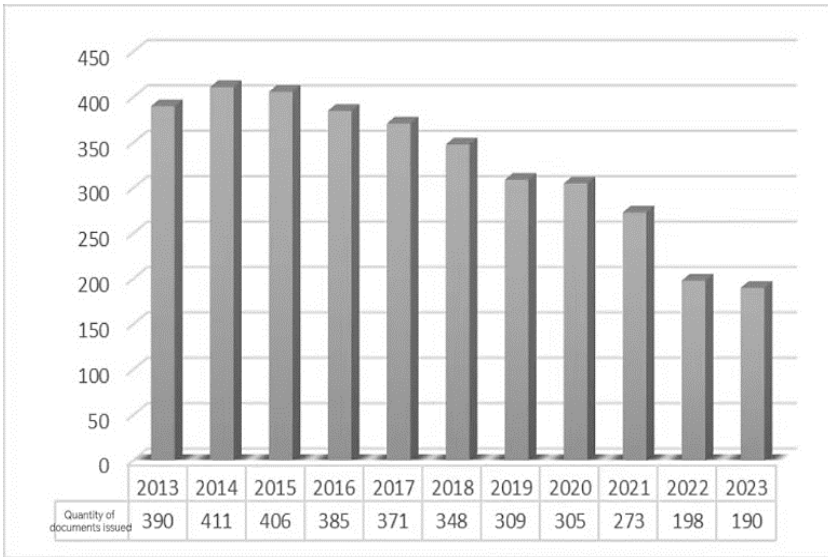


Fig. 1. Annual Trend of Dispatch Volume

Taking time (year) as the horizontal coordinate and the number of publications (number of articles) as the vertical coordinate, the annual distribution map of college students' mental health research papers published in my country from 2013 to 2023 is generated. From the Figure 1, it can be seen that the research heat in this field has shown a slow decline in the past ten years. Although there was a slight recovery in 2014, the overall trend still showed a downward trend. From 2022 to 2023 (October), the downward trend slowed down, and the development of disciplines entered a cooling-off period.

3.2 Distribution of papers and journals

Table 1. Percentage of Journal Distribution Frequency

No.	Percentage of Frequency	Periodical
1	7.96%	Talent
2	6.48%	Chinese Journal of Health Psychology
3	6.19%	Contemporary Sports Science and Technology
4	5.50%	Shanxi Youth
5	5.11%	Science and Education Wenhui (early issue)
6	4.81%	Psychology Monthly
7	4.03%	Industry and Science and Technology Forum
8	4.03%	Education and Teaching Forum
9	3.93%	Education Modernization
10	3.93%	Modern Vocational Education

A brief analysis of the sources of 3,586 journal papers was made to form Table 1. The top ten journals were "Intelligence," "Chinese Journal of Health Psychology," "Contemporary Sports Science and Technology," "Shanxi Youth," "Science and Education Literature Collection (Published in the first ten days)," "Psychological Monthly," "Industry and Science and Technology Forum," "Education and Teaching Forum," "Education Modernization" and "Modern Vocational Education" accounted for 51.97% of the total. Among them, the journal with the highest number of publications was "Intelligence," accounting for 7.96% of the total number of journal papers, followed by "Chinese Journal of Health Psychology," accounting for 6.48% of the total, and the third was "Contemporary Sports Science and Technology," accounting for 6.19% of the total.

3.3 Author analysis

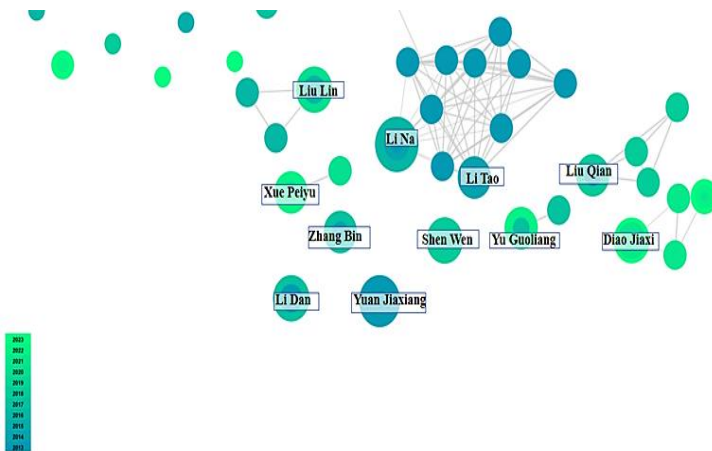


Fig. 2. Co-authorship network diagram of published authors

Visualization analysis of college students' thoughts and mental health based on CiteSpace knowledge graph has been conducted for a long time. Here, we list the top ten high-frequency authors in terms of paper publication frequency: Yuan Jiaxiang (6 papers), Shen Wen (5 papers), Li Dan (5 papers), Liu Lin (5 papers), Diao Jiayi (5 papers), Li Tao (4 papers), Yu Guoliang (4 papers), Zhang Bin (4 papers), Xue Peiyu (4 papers), and Liu Qian (4 papers), as shown in Figure 2. It can be seen that Li Na has the highest number of publications in this field, with a total of seven papers published since 2013, followed closely by Yuan Jiaxiang, Shen Wen, Li Dan, Liu Lin, Diao Jiayi, and others. By importing the literature sample data into CiteSpace software, the co-occurrence network of research authors in this field is obtained (Figure 2). From the connecting lines in the figure, it can be observed that the collaboration group centered around Li Na and Li Tao has the closest collaboration and the largest number of collaborators. There are also many small collaboration groups with a limited number of participants, ranging from one to four people. As shown in Figure 2, Li Na, Li Tao, Yuan Jiaxiang, Shen Wen, Li Dan, Zhang Bin, Liu Qian, and others have been involved in research for a longer time, while Yu Guoliang, Diao Jiayi, Liu Lin, Xue Peiyu, and other emerging researchers have recently joined this study.

3.4 Analysis of research institutions

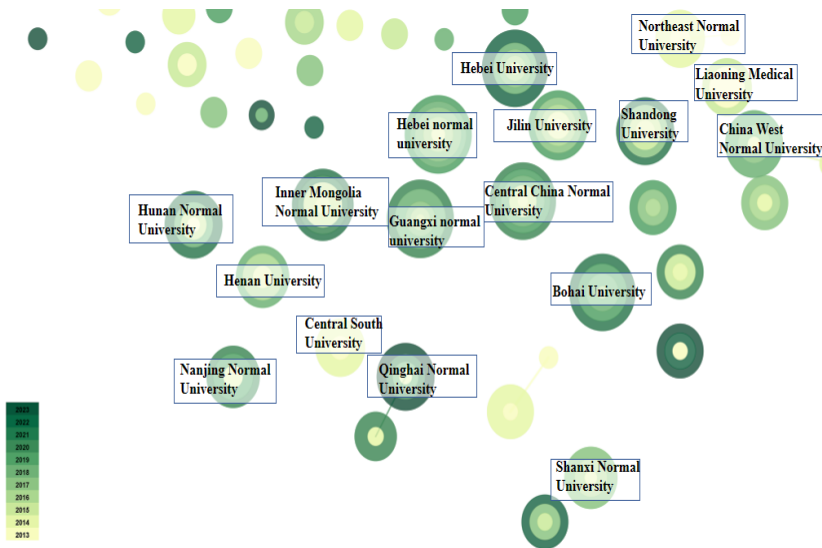


Fig. 3. Co-occurrence network diagram of publishing institutions

After visual analysis using CiteSpace software, a co-occurrence network of publishing institutions was obtained. From Figure 3, the institutions with a higher output of research results in college students' mental health are mainly normal universities, with the top three normal universities in terms of publication volume accounting for 71.42% of the total number of publishing institutions, followed by comprehensive universities. Among them, there are 8 institutions with a publication volume ≥ 10 , namely Hebei

Normal University, Guangxi Normal University, Hebei University, Central China Normal University, Bohai University, Shanghai Normal University, Inner Mongolia Normal University, and Jilin University, with a total of 94 papers. Among them, both Hebei Normal University and Guangxi Normal University have published 13 papers, ranking first in terms of publication volume; Hebei University, Central China Normal University, and Bohai University have published 12 papers, ranking second; Shanghai Normal University and Inner Mongolia Normal University have both published 11 papers, ranking third, as shown in Table 2.

Table 2. Frequency table of publishing institutions

No.	Frequency	Start year	College
1	13	2014	Hebei Normal University
2	13	2015	Guangxi Normal University
3	12	2014	Hebei University
4	12	2014	Central China Normal University
5	12	2016	Bohai University
6	11	2016	Shanghai Normal University
7	11	2014	Inner Mongolia Normal University
8	10	2014	Jilin University
9	9	2013	Hunan Normal University
10	9	2013	Qinghai Normal University
11	9	2014	Shandong University
12	9	2014	Xihua Normal University
13	9	2014	Nanjing Normal University
14	8	2014	Shanxi Normal University
15	8	2014	Henan University
16	8	2014	Hebei Normal University
17	7	2013	Northeastern Normal University
18	7	2013	Liaoning Medical College
19	7	2013	Central South University, China

3.5 Research hotspot

Set the Timespan in CiteSpace to 'from 2013 to 2023', the Slice Length to 1, the data nodes to keywords (college students, mental health), check the 'pruning sliced network', and keep other settings default. This yields a keyword analysis map of college student mental health research composed of 809 nodes and 1488 lines (Figure 4). The area of the network nodes represents the frequency of appearance of the keyword. In addition to the top two keywords "college students" and "mental health," there are six keywords with a frequency of at least 50, namely: education (126 times), countermeasures (116 times), influence (80 times), colleges (71 times), influencing factors (69 times), and physical exercise (68 times).

Using CiteSpace to conduct keyword clustering analysis on literature related to college student mental health research, a keyword clustering map (Figure 5) is obtained,

consisting of 609 nodes and 1488 lines. The Modularity $Q=0.5772>0.3$; Weighted Mean Silhouette $S=0.9197>0.7$, and Harmonic Mean $(Q,S)=0.7093$, indicating a significant clustering structure, good effect, and high credibility. College student mental health research mainly focuses on 20 themes, in order of mental health, followed by social support, colleges, countermeasures, Ba Duan Jin , perfectionism, stress, sports, and libraries.

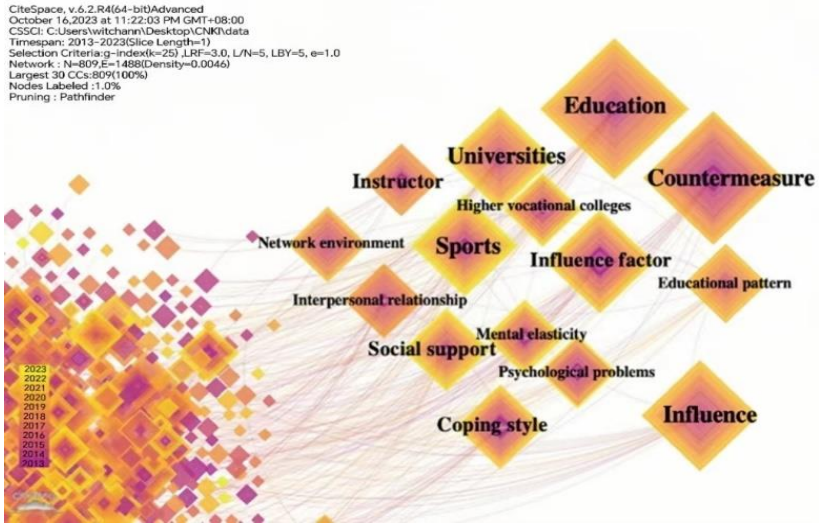


Fig. 4. Keyword Analysis

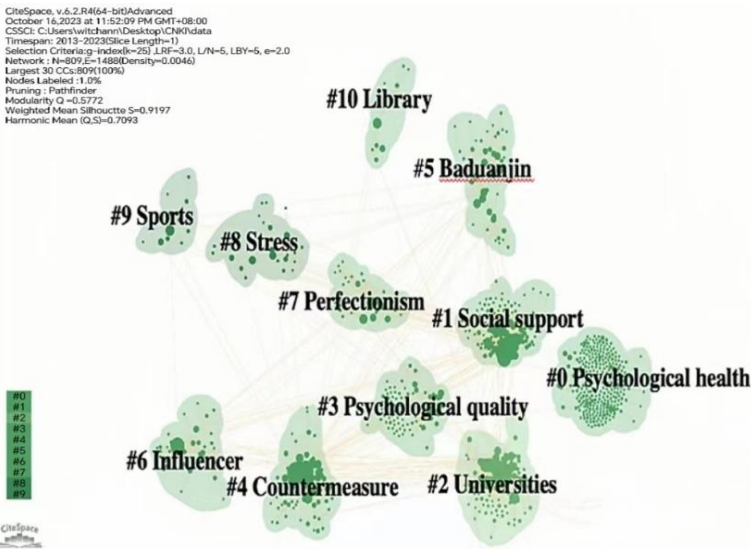


Fig. 5. Keyword Clustering Map

3.6 Research Trends

Keyword burst graph can present keywords and development trends in different periods, visually analyze the research characteristics and mainstream development in the field of college students' mental health, and explore the development trends in this field. This enables the visualization analysis of college students' thoughts and mental health based on CiteSpace knowledge graph to resonate with the times. The results from Figure 6 show that there are 16 sudden keywords, and each research hotspot has a burst trend in a short period of time. As time progresses, research hotspots continue to change.

From 2013 to 2017, prominent keywords include aerobics, educational strategies, music therapy, and physical health. The research hotspots are mostly related to physical, mental, and intellectual health.

Starting in 2018, with the increasing popularity of the Internet in daily life, people have shown more interest and attention to the application of the Internet and new media. Education work and educational models have also attracted increasing attention.

From 2020 to 2023, the outbreak of COVID-19 has led to multiple issues such as epidemic, depressed, anxiety, and smartphone dependency.

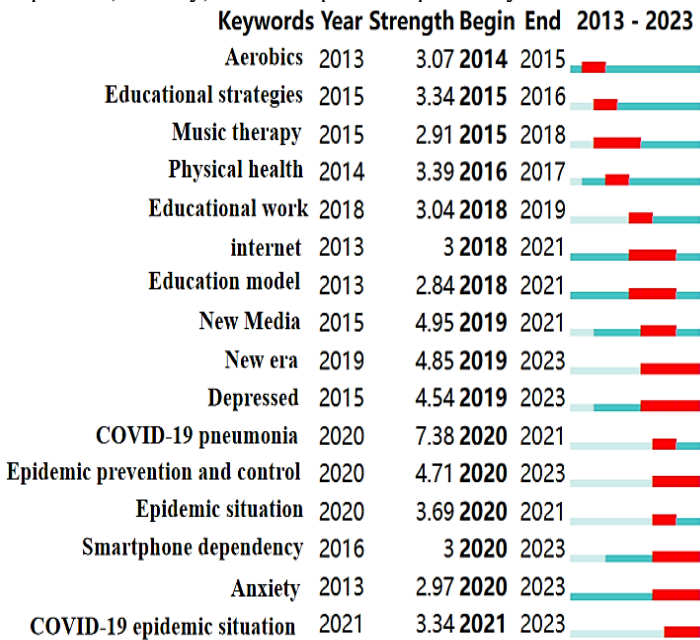


Fig. 6. Keyword emergence diagram

4 Conclusions

This study visualization analysis of the literature on college students' mental health research in the journal library and paper library in CNKI from 2013 to 2023. The results

show that as early as 2013, universities and research institutions have begun to conduct professional research on college students' mental health status, and display research results in the form of journal papers and dissertations. From 2013 to 2014, the number of articles published increased slightly, but since 2014, the number of papers published has shown a steady downward trend. The journal fields of the sources of the papers are roughly the same, but different subjects also have their own characteristics and research directions. Psychology, pedagogy and sports science and technology journals are the main sources of papers, such as "Intelligence," "Chinese Journal of Psychology" and "Contemporary Sports Science and Technology."

Through the analysis of the maps of the contributions of the publishing institutions, we found that most research institutions have a relatively short time for students' mental health-related research. Only a few university research institutes such as Hebei University, Bohai University and Qinghai Normal University have continued to this day, indicating that the sustainability of the research institutions on students' mental health is weak. At the same time, according to the analysis of the authors and research institutions, scholars such as Yuan Jiayang [10-12] and Shen Wen [13-15] have conducted in-depth research on students' mental health. In addition, there are many cooperative teams in this field, but on the whole, these teams are small in scale, the number of collaborators is mainly distributed in 1 to 3 people, and there is no cooperation and connection between the teams. Most of the researchers' papers were published around 2013, and the papers of researchers with more than 5 papers published were mainly distributed in the first 5 to 10 years. From 2013 to 2018, only a few new forces slowed down to devote themselves to research in this field. In recent years, the development trend of college students' mental health, while the degree of cooperation between researchers or research institutions is gradually low.

The visualization analysis of keywords is helpful to understand the hot spots, frontiers and development trends of research. Through keyword analysis and clustering of college students' mental health research, we found that from 2013 till now, the hot spots of college students' mental health research include college students, mental health, education, countermeasures, influence, colleges and universities, influencing factors, physical exercise, coping styles, etc. Combined with the keyword clustering chart, we can see that the research field mainly focuses on keywords such as mental health, social support, colleges and universities, countermeasures, eight-section brocade, perfectionism, pressure, sports, libraries, etc. Analyzed by a large number of nodes and connections, the capture of hot spots and keywords in this research content also follows the development of the times in a wider range, and the content is more comprehensive.

Combined with the keyword highlight atlas analysis, from 2013 to 2017, the highlighted keywords were aerobics, educational countermeasures, music therapy, and physical health. By 2018, keywords such as "Internet," "New Media," "New Era," "Mobile Phone Dependence," "Depression," "Epidemic" have become new research trends. People's application and attention to the Internet and new media have increased, and education work and education mode have also attracted more and more attention. Since the outbreak of COVID-19 pneumonia, multiple problems such as epidemic, depression, anxiety, and mobile phone dependence have been led to one after another.

To sum up, with the progress and development of the times, the factors affecting the mental health of college students are emerging one after another. Scholars such as Xu Science and Technology also said that the experience of contemporary college students living with the Internet is unique [16]. Chen Xu lei also expressed the need to improve the scientific nature, pertinence and effectiveness of ideological and political education in colleges and universities [17]. For example, Huckins et al. found that anxiety and depression associated with the epidemic was closely related to how often students unlocked their cell phones and how long they used them [18]. Therefore, the mental health education of college students should also keep pace with the times. At the same time, more attention should be paid to the analysis and research of college students' mental health. Only by strengthening the communication of authors from all over the country and the cooperation between various institutions and colleges and universities can the research be more extensive and comprehensive, more sustainable, and more effective. On the basis of the existing hot spots and key words, dig deeper into more hidden and undiscovered hot spots and factors, further deepen the research, and make the research on college students' mental health more targeted. At the same time, to strengthen the school's mental construction work, we can guarantee the mental health development of college students from all aspects through the construction and publicity of "psychological clinic," psychological activities, regular psychological tests, "and at the same time, strengthening the psychological construction of our school can be carried out through the construction and publicity of "psychological clinic," the holding of psychological activities, regular psychological tests and other means to ensure the healthy development of college students' mental health from all aspects and to escort the mental health of college students.

Acknowledgment

The authors thank the Key research and development projects of Jilin Provincial Student Innovation Training Program 2023 (Project No. S202310199073).

References

1. Chang Shangxin. Research on the psychological counseling path of college students under the new situation [J]. Taste Classics, 2023 (11): 100-102.
2. Yu Anlong, Liu Wenjia. Xi Jinping's Important Statement on Youth and Youth Work and Its Times Value [J]. Observation and Thinking, 2020 (05): 53-60.
3. Zheng Miaomiao, Hong Wanglong, Zhu Wentao, etc. Application trend of structural equation model analysis in the field of medicine in my country based on CiteSpace visualization [J / OL]. Medical Guide: 1-14 [2023-10-24].
4. Liao Youguo, Lin Muming, He Wei. Scientific knowledge graph of psychological research of Chinese college students in the past 20 years-visualization analysis based on CiteSpaceV [J]. Journal of Southwest University (Social Sciences Edition), 2018, 44 (02): 94-103 + 192-193. DOI: 10.13718 / j.cnki.xdsk. 2018.02.011.

5. Jin Shengxi, Lin Zhengjun. Scientific knowledge graph analysis of the dynamics of international metonymy research 2007-2016. *Foreign Language Research*, 2017, 34 (3): 18-23. DOI:10.13978 / 2017.03.004.
6. Chen Yue, Chen Chaomei, Liu Zeyuan et al. Fang *** of CiteSpace knowledge graph [J]. *Scientific Research*, 2015, 33 (02): 242-253. DOI: 10.16192 / j.cnki.1003-2053.2015.02.009.
7. Hou Jianhua, Hu Zhigang. Review and Prospect of CiteSpace Software Application Research Ko Jan. *Modern Intelligence*, 2013, 33 (4): 99-103. DOI: 10.3969 / j.issn.1008-2013.04.022
8. KimMC, ChenCM. Ascientificreviewofemergingtrendsandnewdevelopmentsinrecommendationsystems [J]. *Scientometrics*, 2015,104 (1): 239-263. DOI: 10.1007 / s11192-015-1595-5.
9. Guo Yaxin, Fan Zhenqiang. The development trend and frontier trends of metonymy research in China: scientific knowledge graph analysis based on visualization technology. *Journal of Guangdong University of Foreign Studies*, 2019, 30 (1): 81-88.
10. Yuan Jiaxiang. The impact of analytic learning stress on the mental health of college students and countermeasures [J]. *Science and Technology Information*, 2013 (14): 144.
11. Yuan Jiaxiang. Investigation and analysis of the mental health status and family environment impact of college students in a university in Tangshan [J]. *Hebei Medicine*, 2013, 35 (17): 2666-2667.
12. Yuan Jiaxiang. A survey on the mental health of college students with different majors in a university [J]. *Science and Technology Information*, 2013 (22): 441.
13. Shen Wen. Research on the reform of college students' mental health teaching mode under the background of massive open online course [J]. *Educational Modernization*, 2018,5 (38): 77-78. DOI: 10.16541 / j.cnki.2095-8420.2018.38.038
14. Shen Wen. The practical exploration of the introduction of reading therapy into the mental health education curriculum of college students [J]. *Contemporary educational practice and teaching research*, 2018 (08): 192-193. DOI: 10.16534 / j.cnki.cn13-9000 / g.2018.1233.
15. Shen Wen, Peng Yang. Exploration and research on the introduction of peer psychological counseling mode into the mental health education curriculum of college students [J]. *Contemporary educational practice and teaching research*, 2017 (08): 176-177. DOI: 10.16534 / j.cnki.cn13-9000 / g.2017.1687.
16. Xu Zhike, Yang Zhijing. Psychological and behavioral guidance strategies for college students after the 2000 in the Internet age [J]. *Western quality-oriented education*, 2023, 9 (20): 105-108. DOI: 10.16681 / j.cnki.wcqe.202320025.
17. Chen Xuelei. Psychological education should be strengthened in ideological and political education in colleges and universities [J]. *Educational Exploration*, 2005 (04): 91-92.
18. Huckins JF, daSilva AW, Wang W, Hedlund E, Rogers C, Nepal SK, Wu J, Obuchi M, Murphy EI, Meyer ML, Wagner DD, Holtzheimer PE, Campbell AT. Mental Health and Behavior of College Students During the Early Phases of the COVID-19 Pandemic: Longitudinal Smartphone and Ecological Momentary Assessment Study. *J Med Internet Res*. 2020 Jun 17;22(6):e20185. doi: 10.2196/20185. PMID: 32519963; PMCID: PMC7301687.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

