Data analysis and visualization of mental health research of Chinese and foreign college students

Ke Chen[1], Bin Zhao[2*]

[1]School of Digital Information Technology, Zhejiang Technical Institute of Economics, Zhejiang, China,chenke98@qq.com

[2]School of Public Administration, Heilongjiang University of Science and Technology, Heilongjiang, China,zhbin202206@163.com

*Corresponding author, E-mail:zhbin202206@163.com

Abstract

The purpose of this study is to comprehend the study hotspots and frontiers in the field of college students' mental health in China and overseas, to reveal their similarities and differences, and to clarify the future direction of research. The study visually analyzed 3,314 documents collected by CNKI and 7,931 documents in the Web of Science core collection from 2012 to 2022 using pathfinding network algorithm. The results indicate that a vast network of global partnerships has been established. The number of Chinese scholars published in English journals is increasing rapidly; the hotspots of college students' mental health research in China and abroad mainly focus on the main characteristics of college students' psychological problems, the factors influencing the level of mental health and the responses to mental health management, as well as the differences in the focus of Chinese and foreign stage research and the differences in highlighting the frontier themes. These differences in focus and themes of the frontier are important. Future research should strengthen the study of new technologies such as big data and artificial intelligence in early warning and digital intervention of psychological crisis.

Keywords

mental health; college students; research hotspots; CiteSpace; VOSviewer

1 INTRODUCTION

According a report by the World Health Organization, the mental health of adolescents will likely be negatively affected by the novel coronavirus pneumonia outbreak in the long term (Xinhua New Media, 2021). Mental health problems are becoming more pronounced among Chinese and foreign college students, with worse sleep quality(Shiaolin Huang et al., 2022),and higher incidence of negative emotions (Wang Hao et al., 2022)，This has negative effects on self-esteem, stigma, bullying, and family and social relationships in college (Jiang et al., 2020).. In countries around the world, mental health education and service work for college students have been bolstered. China also attaches great importance to it, with the 2022 Work Highlights of the Ministry of Education published in February proposing the implementation of a mental health promotion program for college students. In April, a national smart education platform launched a mental health theme to improve scientific decision-making and governance.

Extensive attention has been paid by Chinese and foreign scholars, who have conducted many studies from various perspectives(Ma Chuan, 2019).They conducted an empirical analysis of college students' mental health levels(Tong Tianlang et al, 2021). They discussed the development of a mental health education system, as well as methods and approaches to optimization research (Qiu Wenfu, 2017; Giuntini et al., 2020). They explored the mediating role of social media on depression, anxiety, and other mental disorders among college students and the identification of techniques(Ibrahim, Kelly, Adams, & Glazebrook, 2013). prevalence of depression in college students was evaluated and reviewed systematically. All the existing studies in China and abroad mainly focus on the mental health education perspective of college students and coping with psychological problems. China and abroad have fewer comparative analyses. From a method point of view, the subjective experience exposition, content interpretation, investigation, and research of a single topic are mainly used, and the intuitive and visual analysis using measurement software is rarely used. Therefore, it is required to undertake a bibliometric analysis of Chinese and international college students' research on mental health development. By systematically screening and studying Chinese and foreign research literature, they were able to determine where their research originated and where it will go in the future.

2 DATA AND METHODS

2.1 Sources of Data

For Chinese literature, the core journals of China Knowledge Network (CNKI) (Jiang et al., 2020) and CSSCI journals were chosen as data sources to improve the reliability and accuracy of the data. The core collection of the Web of Science (WOS) database was selected for foreign literature, with the year set as 2012-2022 and the search date as March 26, 2022.We searched 3355 Chinese papers with the terms "college students" and "mental health" and obtained 3314 papers after cleaning, de-duplication and screening. Foreign literature was limited to English. The search formula was TS= ("college student*" OR "university student*" OR "undergraduate*") AND ("mental health" OR "psychological health" OR "psychology health" OR "psychologically healthy"), the type of literature was limited to article or review, 7962 documents were retrieved, and after data cleaning, de-duplication, and pre-processing, a total of 7931 valid data were obtained.

2.2 Research Method

In this study, data mining, bibliometrics, and graphical mapping were performed by CiteSpace and VOSviewer software to capture research hotspots and evolutionary trends. Citespace is based on pathfinder network scaling for co-citation analysis, and VOSviewer is mainly used to generate literature maps through relevance and impact calculations. Both of them have their own advantages: Citespace is powerful, highly personalised, and rich in application scenarios; VOSviewer is easy to use, highly reliable, and has simple and beautiful mapping. This study exploits the strengths and avoids the shortcomings, and uses these two

software to conduct visualisation and analysis, draw collaboration networks, cluster maps, time zone maps, and emergence maps, which in turn reveals the research hotspots and cutting-edge trends. In addition, in the part of temporal and spatial distribution, this paper mainly uses Origin software to map the annual distribution of the number of related literature and the distribution of journals.

3 FINDINGS

The annual publication trend of literature is an important indicator to reflect the development of this research field. We counted the statistics of 3314 Chinese and 7931 English literature and plotted the trend of publication volume as shown in Fig. 1. In order to improve accuracy, the presence of Chinese scholars' English literature in WOS was taken into account separately while plotting, and five independent fold lines were plotted.

3.1 Trend Analysis of Issuance

The annual publication trend of literature is an important indicator to reflect the development of this research field. We counted the statistics of 3314 Chinese and 7931 English literature and plotted the trend of publication volume as shown in Fig. 1. In order to improve accuracy, the presence of Chinese scholars' English literature in WOS was taken into account separately while plotting, and five independent fold lines were plotted.
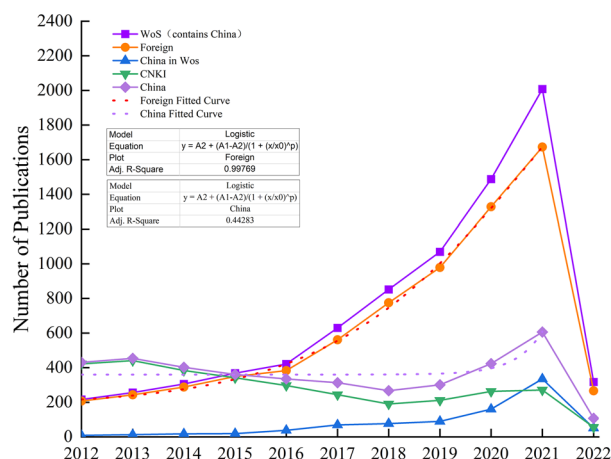

Figure 1 Quantitative trends in Chinese and foreign literature

There are two peaks in the number of literature in China, in 2013 (458) and 2021 (606); the Logistic fit curve function is y=A2+(A1-A2)/(1+(x/x0)^p), R2 =0. 44238, R2 includes [0, 1]. As R2 tends to be closer to 1, the fit of the trend line increases and the development trend becomes more reliable. A low R2 value for Chinese college students' mental health research and low fit indicates that the amount of literature fluctuates more significantly, and there are more influential factors in the development process. The number of literature in foreign countries showed a growing trend during 2012-2015, accelerated in 2016-2021, and reached a peak of 1673 articles in 2021; the logistic fitting curve function was y=A2+(A1-A2)/(1+(x/x0)^p), R2 =0.99769, with a high degree of fit, which indicates that foreign research shows a s table growth trend. The research of foreign scholars on the mental health problems of college students has been heating up.

By comparison, 2015 is the intersection of the amount of published literature on college students' mental health in China and abroad. From 2012 to 2015, the number of Chinese literature was ahead of foreign countries. This is due to the China pay attention to mental health work early. With 17 ministries and commissions including the Ministry of Health and Ministry of Education, jointly initiated the National Mental

Health Work System Development Guideline (2008-2015) in 2008. In 2011, the Ministry of Education also issued the document "Basic Construction Standards for Mental Health Education Work for Students in Ordinary Higher Education Institutions (for Trial Implementation)," which has led to further standardized development of mental health work for Chinese college students, the education system and mechanism have been improved, and the teaching staff have been strengthened.

Comparatively, 2015 marks the time where the number of books written about the mental health of college students in China and elsewhere converge. From 2012 to 2015, the quantity of Chinese literature exceeded that of other nations. This is a result of China's early focus on mental health initiatives. In 2008, seventeen ministries and commissions, including the Ministry of Health and the Ministry of Education, initiated the National Mental Health Work System Development Guideline (2008-2015) collaboratively. The 2011 publication of "Basic Construction Standards for Mental Health Education Work for Students in Ordinary Higher Education Institutions (for Trial Implementation)" by the Ministry of Education has resulted in the further standardization of mental health work for Chinese college students, the improvement of the education system and mechanism, and the strengthening of the teaching staff. This is due to the fact that in 2013, the World Health Organization published the Comprehensive Mental Health Action Plan 2013-2030, which elicited a global response and fast action. The quantity of research studies on college students' mental health has likewise expanded quickly. According to the World Mental Health Report of 2022 published by the World Health Organization, the current state of global mental illness is bleak, especially given the significant impact of the new coronavirus pneumonia epidemic on this, with the global incidence of anxiety and depression increasing by over 25% in the first year of the pandemic alone; however, China has robust epidemic prevention and control, the economy is stable and prosperous, and the mental health of its citizens is excellent. Chinese scholars' English literature in WOS shows slow growth during 2012 -2019 with an average share of 7% and a small share; the number of Chine se scholars' literature in English is increasing rapidly in 2020-2021, surpassing the number of Chinese CNKI in a single go and the share is also increased to 17%, which is related to the fact that many Chinese scholars attach importance to cross-border scientific research exchanges and the difficulty of publishing in Chinese core journals. . This study claims that assessing research conducted by Chinese researchers simply through CNKI is biased and must be studied alongside English and Chinese literature.
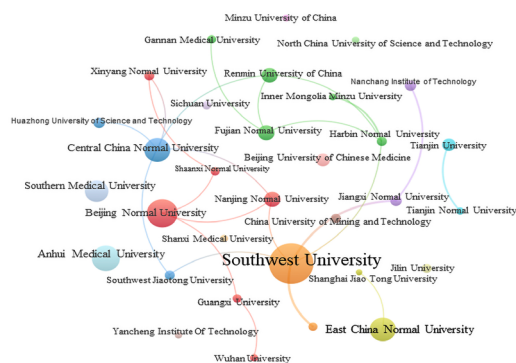
3.2 Core Institution and Author Analysis

The mapping of the institutional cooperation network using VOSViewer software is presented in Fig. 2 (a) and (b). The total number of publishing institutions in Chinese literature is 434, and the top three institutions in terms of the number of published papers are Southwest University (41), Anhui Medical University (35), and Beijing Normal University (34).The primary research institution for Chinese literature is typically a university, whereas the secondary research institution is typically a university's psychology or psychological management department.For instance, focuses on its psychology department. There are 482 foreign-language literature-issuing institutions. The University of Michigan (140), the University of Minnesota (107) and Pennsylvania State University (98) are the top three.

The cooperation between different institutions has facilitated the integration and expansion of research topics and has led to new research directions and areas of study. The sparseness of an institutional cooperation network represents the frequency of institutional cooperation, expressed in the graph as the number and thickness of connecting lines between nodes. There are only 185 connections between institutions publishing Chinese documents, and the network density of institutional cooperation is only 0.002, which indicates the cooperation between institutions is relatively loose, and there is little cooperation among the top three research institutions that publish papers. The number of inter-institutional ties in foreign language literature is 2,317 more than 12 times the number in China; the density of cooperation networks is 0.02, 10 times higher than that in China. Considering the state of research cooperation in other nations, China's tendency to "go it alone" is extremely detrimental to the future development of the discipline and its research, and the status quo should be altered with great care and effort.

(a) China Institutional Partnership Network   (b) Foreign Institutional Partnership Network
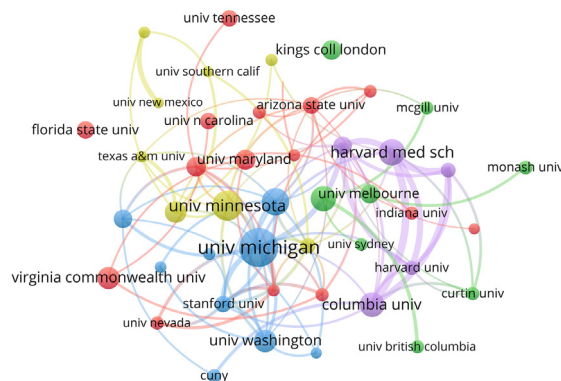

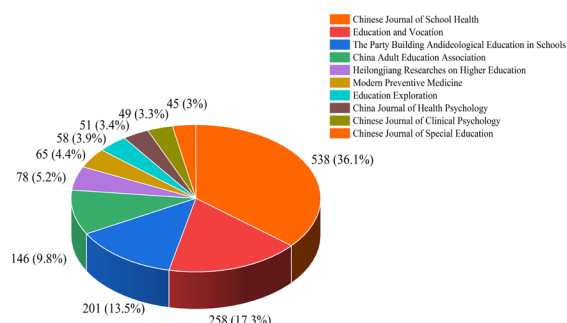Figure 2 Chinese-foreign cooperative school network

The key authors conducted a literature review and recruited prominent scholars in the field of college mental health research among Chinese and international college students. The minimum number of publications of the core authors is N=0.749 (Mmax is the maximum number of papers) according to Price's law. We identified China = 21, N≈4, and the number of published papers reaches 4 to be determined as the core author. There are 149 core authors who have published 790 papers, accounting for 23,8 percent of the total, which is less than the price-specified minimum of 50 percent, and who have not yet established a stable core author base. Zhang Dajun (21 articles), Yao Yingshui (13 articles), and Wei Yulong (9 articles) are the three most influential researchers in China. Dr. Zhang Dajun is an associate professor at Southwest University, a doctoral advisor in developmental and educational psychology, and a member of the postdoctoral psychology expert panel. He primarily conducts research in the areas of developmental, educational, and social psychology, and has additional accomplishments in teaching and social practice.

Foreign Mmax=39, N≈5, and the number of publications that reach 5 can be identified as the central authors, of the total number of core authors. There are 469 with 3473 publications, representing 43.8% of the total publications, almost 50%. Although a stable core group of authors has yet to be formed, it has taken shape, and foreign countries are expected to form a core research group in front of China. Daniel Eisenberg (39 articles), Brenda Happell (32 articles), and Katherine Lust (31 articles) are the three most prominent authors, who are University of California (UCLA) professors of health policy and management and have a strong influence on the field of mental health in higher education. His personal h-index (h-index) is 53 and his i10-index (i10 index) is 99. The results of his research involve studies on the relationship between mental health level and academic attitudes, learning disabilities, academic attitudes, and suicidal ideation among college students. According to him, a positive mindset is an important factor in improving academic satisfaction and sustained effort. He has been cited 660 times in his most highly cited literature, "Prevalence and correlates of depression, anxiety, and suicidality among college students."

3.3 Analysis of Important Journals and Highly Cited Literature

Fig. 3 (a) and (b) show the distribution of college students' mental health literature included in the CNKI and WOS databases. The top three journals in CNKI are the "Chinese Journal of School Health", "Education and Career" and "The Party Building and Ideological Education in Schools" with 538, 258, and 201 articles respectively, exceeding the number of articles published in core journals specializing in psychology such as "Chinese Journal of Clinical Psychology", "Chinese Mental Health Journal" and "China Journal of Health Psychology". The most published journals in WOS are the "Journal of American College Health", "the International Journal of Environmental Research" and "Public Health and Frontiers in Psychology" with 391, 222, and 181 articles respectively. According to the Price Law, since 2012, the Mental Health Research of Chinese University Students has been recognized as one of the top three core journals in the world.

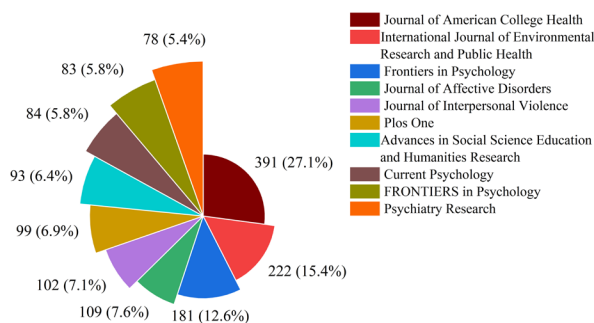(a) Number of articles published in China journals   (b) Number of articles published in foreign journals

Figure 3 Number of papers published in journals at home and abroad

Xin ZQ et al. are the most frequently cited Chinese authors. In the 2012 "Cross-Sectional Historical Study of College Students' Mental Health Changes" in Psychology Journal, 384 citations were given. (Xin Ziqiang et al., 2012). This research did a meta-analysis of 237 papers utilizing the SCL-90 scale and concluded that mental health problems among college students in China have improved steadily over the past quarter-century by combining data on nine criteria, including depression and anxiety.The most frequently cited foreign literature is AK Ibrahim's "A systematic review of studies of depression prevalence in college students," published in the Journal of Psychiatric Research in 2013 (Ibrahim et al., 2013). This study showed that the average prevalence of depression among 48,650 college students was 30.6%, which was much higher than that of the general population.

3.4 Analysis of Country Cooperation

The collaborative network of countries or regions (in the future referred to as "countries") of college student mental health research based on the WOS database is mapped as shown in Figure 4 and the numbers in the figure are the number of publications. Literature on the mental health of college students has been published in 128 countries, forming an extensive network of partnerships worldwide. The United States ranks first with 3752 publications, accounting for 47.3% of the total publications, and has established partnerships with 72 countries, with a total link strength of 1180. China ranks second with 997 publications, accounting for 12.6% of the total publications, and has established partnerships with 59 countries, with a total link strength of 618. The top 10 countries in terms of the quantity of articles published also include the UK, Australia, Canada, Spain, Germany, Turkey, the Netherlands, and Italy. Europe has five of the top ten countries in terms of the quantity of articles published, accounting for half of them. However, the funding institutions that fund the most relevant research in European countries come from the United States, primarily the NIH and the United State. The European Commission and the Spanish government are next in line with the Department of Health and Human Services. The research collaborations are more intense in Europe than in Asia as a whole; among Asian countries, China, Korea, and Japan have more research results, and Thailand, Japan, Vietnam, and Bangladesh have higher breakthrough values and have experienced faster growth in recent years; The United States prioritizes cross-territorial cooperation with China, Canada, the United Kingdom, Australia, and Germany having the strongest linkages and tightest collaboration.Figure 4 Map of country cooperation networks.

Figure 4 Map of country cooperation networks
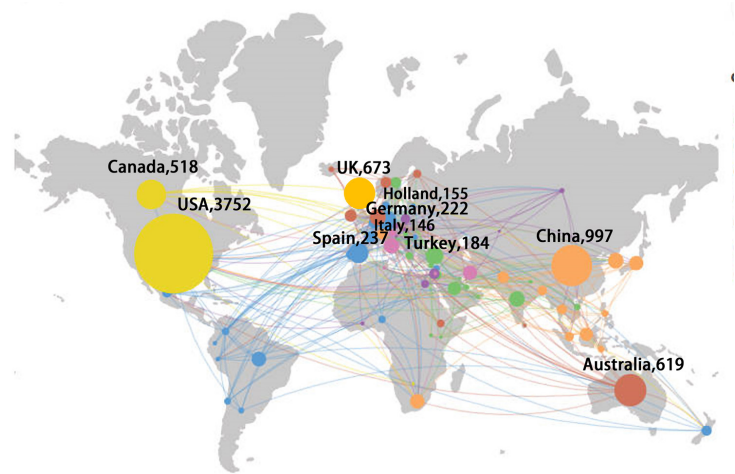
4 ANALYSIS OF CHINESE AND FOREIGN RESEARCH HOTSPOTS

4.1 Mental Health Research Hotspots Among Chinese College Students

Keywords are the author's high-level summary of the content and focus of his research. Through keyword analysis, we can grasp the hotspots that scholars concerned in the research field. Using the Loglikelihood ratio (LLR) algorithm of citespace5.7.R5 software to analyze the Chinese sample data, the co-occurrence clustering profile was obtained, as shown in Figure 5, with clustering module value Q=0.8665 and average profile value S=0.9586. Q > 0.3 and S > 0.7, resulting in significant clustering structure and reasonable and convincing profiling. The ten clusters of research on the mental health of Chinese college students were as follows: college students, depression, mental resilience, mental health, anxiety, psychological crisis intervention, countermeasures, colleges and universities, psychology, and family, with the cluster ranking determining the size of the scale. The research topics were then classified into three categories based on the homogeneity criterion in order to appreciate the similarities and differences in the distribution of hot themes. The central representations of psychological issues, factors affecting the level of mental health, and mental health management interventions among college students.
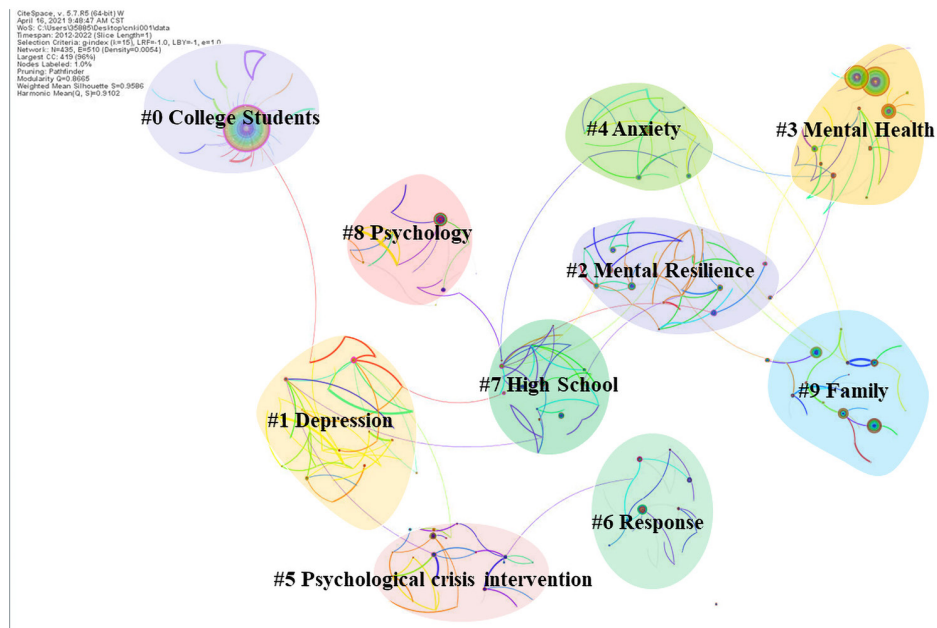

Figure 5 Cluster mapping of mental health keywords among college students in China

These are the external indications of college students' psychological issues. Anxiety and sadness have emerged as mental diseases among students with the greatest detection rate. Extreme anxiety and sadness can adversely influence a person's ability to learn and their quality of life. Ma Chuan analyzed survey data from nearly 20,000 first-year students at nine colleges and universities in Shanghai and discovered that the overall mental health level of the "post-00s" is lower than that of the "post-95s" and that depression, anxiety, and somatic disorders are the most prevalent psychological problems. (Jinghui Chang, etc., 2020) (Gong Chen et al., 2020). The study found that the rate of anxiety and depression among college students during the new coronavirus pneumonia epidemic was over 20%, and depression and anxiety were highly correlated, but the influencing factors were distinct. According to the current research findings, the representations of college students' mental health problems primarily fall into two categories, namely internalized psychological problems and externalized psychological issues, which are the focus of Chinese scholars' research and the operational focus of mental health workers.

The second category is the factors influencing the mental health level of Chinese college students, including # 2 mental toughness and # 9 family clusters; # 2 mental toughness covers "subjective well-being," "positive psychology," "social support," "stress perception," "self-efficacy," "life goals," "emotion regulation " and #9 family contains high-frequency keywords such as " family socioeconomic status," "family status," "parenting style," "parent-child relationship," "single-parent family," and "left-behind experience" as high-frequency keywords. Resilience in the mental domain is the ability to withstand stress, or resilience, that sustains individuals when they have experienced or experience adversity. It is often influenced by "personal power" and "support forces." In terms of "personal power," the mental resilience of college students is influenced by life goals, emotional control, and positive psychology (Biao Feng et al, 2022). Positively correlated with "positive coping," high mental toughness helps to reduce stress and negative events in life (Xiaodong Liu et al., 2019).High mental fortitude decreases stress and unpleasant situations. The majority of assistance comes from family and community, and parents who are compassionate and understanding can prevent their children from self-harming. (Jia Ning You et al., 2013). Those with a history of childhood trauma are less resilient and more susceptible to depression, anxiety, and stress among college students (Chunyang Zhang et al., 2022).

The third category is the responses to mental health management of Chinese college students, which contains four clusters: # 5 psychological crisis intervention, # 6 countermeasures, # 7 colleges and universities, and # 8 psychology, involving high-frequency keywords such as "life education," "safety education," "causal factors," "privacy," "intervention mechanisms," "intervention strategies," reliability, "validity," "adaptation," and so on. It can be seen that the research mainly focuses on the perspective of universities, which is explored both at the operational and the knowledge levels. Highly cited literature author (Qiumei Yu, 2012) analyzed the existing problems of mental health education and counseling in colleges, and argued that there is a need to change the concept, involve all staff, focus on prevention, improve the education and counseling model, strengthen capacity building, and enrich the form of services. One of the most important aspects of college mental health work is timely and effective intervention for students with mental health problems. (Jing Liu et al., 2022) A survey of psychological departments in 122 universities in China found that 70.49% of the universities have designated psychiatric hospitals and 62.3% of the universities have staff on duty to deal with crisis matters, and there are large differences in the mental health management system, crisis intervention system, and treatment methods among the universities. The keyword "Internet addiction" appears in several clusters, which shows that Internet addiction has become one of the important factors influencing the physical and mental health of college students, and the systematic prevention and intervention model of "bio-psycho-social" has been recognized by many parties. Scholars have thought about it at the level of psychology and other knowledge levels, and based on the amount of literature, "positive psychology" has become the first branch of research topic in higher education psychology, and it has been extended to the process of improving the social adjustment ability, sports, arts, entrepreneurship, and other literacy of various youth groups such as poor students and medical students.

4.2 Foreign Students' Mental Health Research Hotspots

The keyword clustering operation was performed on the foreign language sample literature data, and 10 clusters were obtained, as shown in Figure 6, with a cluster module value of Q=0.8113 and an average profile value of S=0.949. Since Q>0.3 and S>0.7, the resulting clusters have meaningful structure and reasonable and compelling patterns. In order of size, clusters are: #0 mindfulness, #1 European American college student, #2 borderline personality symptom, #3 substance use, #4 alcohol use disorder, #5 digital mental health intervention, and #6 COVID-19 pandemic #7 is self-injurious behavior, #8 is interpersonal violence, and #9 is mental health stigma. When comparing the high frequency keys of literature from the Chinese and foreign samples, we found that "depression" and "anxiety" are the two most frequent mental disorders in China and abroad. In China, the focus is on big-picture research, such as "social support," "universities," and "countermeasures." Other countries, on the other hand, pay more attention to specific operational aspects, such as "Stress," "Wellbeing," "Resilience," and "Anxiety." Well-being," "Resilience," and "Stigma," all of which match the keywords in the clusters. The research topics of the foreign sample are further summarized into three domains: central representations, influencing factors, and responses.
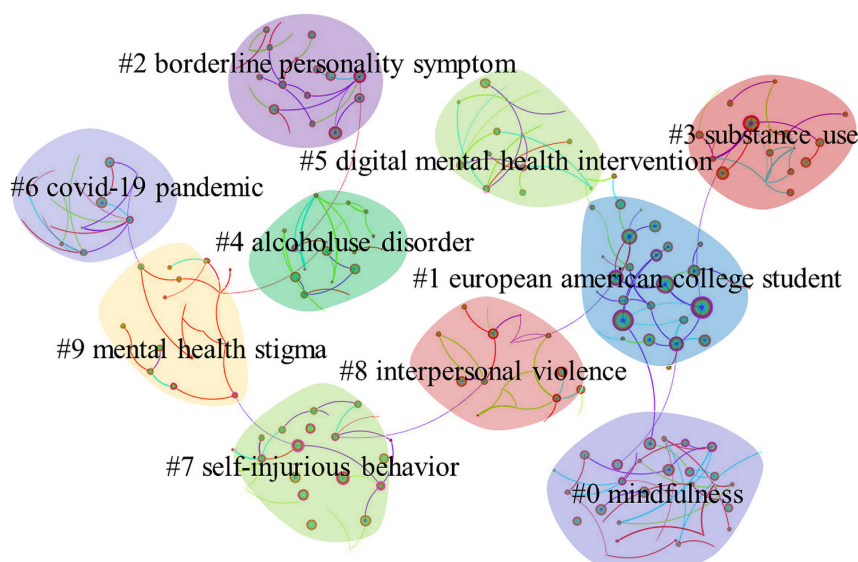

Figure 6 Cluster mapping of foreign college students' mental health keywords

The first group studies central representations of mental health problems among international college students, including three clusters of European and American college students: #1, borderline personality disorder; #2, self-harming behavior; and #7, suicide. There is a cluster of "European and American college students" in NO.1, indicating the large size of the cluster. European-American college students occupy a large proportion of the mental health research of foreign college students and have a wide influence, and their representations have some universality and representativeness; many studies target college students from a specific country, among which studies on American college students are more numerous and have also been subdivided into groups such as Asian-American, second generation Chinese-American, Mexican-American, and Latino American college-level students. Cluster #2 contains the high frequency keyword "borderline personality disorder," a complex psychiatric disorder characterized by interpersonal tension, emotional instability, impulsive behavior, and fuzzy self-awareness. College students' prevalence of borderline personality disorder is equal to or higher than that of the general population, and approximately 1 in 5 suicides in the United States are related to borderline personality disorders. An Australian program called CARE has proven that psychoeducation can effectively improve borderline personality symptoms (Brickell, 2018). College students who struggle with borderline personality disorder benefit from engaging in creative arts such as movies and short videos since it helps promote reflection, which in turn leads to problem-solv-

ing. This method of providing educational treatment has been supported. Cluster # 7: Self-harming behavior was a significant risk factor for suicide attempts across populations, and comparing college students with and without a history of self-injury revealed significant differences in two dimensions of perfectionism and social problem solving (Lucas, Chang, Mingqi, Chang, & Hirsch); the suicide rate in South Korea was substantially higher than the global average, with adolescents having the highest rates of suicidal ideation and suicide attempts, and academic stress was a significant risk factor for suicide, followed by the social stigma of mental illness and antagonistic relationships with their peers and parents (Kwak & Ickovics, 2019).

The second category of factors influencing the level of mental health of college students abroad includes clusters #6: novel coronary pneumonia pandemic, #3: substance abuse, #4: alcohol use disorder, #8: interpersonal violence, and #9: mental health stigma.During the unique coronial pneumonia pandemic overseas, the prevalence of depression, phobias, anxiety, obsessive-compulsive disorder, and other psychological issues among college students grew considerably. Compared to children and older adults, college students had higher rates of anxiety, depression, sleep problems, and suicidal ideation (Dragioti et al., 2022; Liu et al., 2020). (Sundarasen et al., 2020). Abuse of prescription drugs and alcohol by college students may raise their risk of acquiring mental illness. Depression and alcohol use disorders occur frequently combined, and the correlation between alcohol abuse and mental illness is stronger in women than in men (Lo, Monge, Howell, & Cheng, 2013). Grant, JE, et al. (2013). 2–3% of college students reported abusing prescription sedatives, according to a meta-analysis of the psychosocial correlates of sedative medication usage among 9449 students(Grant, Lust, & Chamberlain, 2020). Interpersonal violence and mental illness Stigma and discrimination may be worse than the illness itself, and social interaction is an effective but short-term way to reduce stigma. Thornicroft et al. (2016) found that indirect teaching is more effective than direct contact when it comes to reducing stigma among college students.

The third category, response measures to mental health management for international college students, has two primary clusters: #0 positive thinking and #5 digital treatments for mental health. College students' motivation to seek therapy and treatment is severely impacted by a sense of shame, stigma, and mental disease disclosure. There is an urgent need for effective stress management treatments to address potential therapeutic hurdles, with many foreign universities establishing stress reduction programs, notably therapies based on positive thinking, which are gaining in popularity. Mindfulness-based stress reduction (MBSR) and mindfulness-based cognitive therapy (MBCT) are the most prominent positive thinking-based interventions today (Huberty et al., 2019). However, these therapies are more challenging to administer, time-consuming, and expensive, making them less accessible to college students. Convenience, adaptability, and anonymity improve the accessibility and practicability of internet-based digital mental health interventions (Kanuri et al., 2020). Numerous research have demonstrated that positive meditation applications for smartphones help college students reduce stress and improve negative psychological problems in the short term. Regular use of positive meditation apps can lower psychological stress and boost positive thinking and self-compassion, hence enhancing mental health (Flett, Hayne, Riordan, Thompson, & Conner, 2019; Huberty et al., 2019).

5 FRONTIERS AND TRENDS OF CHINESE AND FOREIGN COLLEGE STUDENT MENTAL HEALTH RESEARCH

5.1 Frontiers and Trends of Mental Health Research Among Chinese College Students

The emergence of keywords refers to the rapid growth in the frequency of keywords over a brief period of time, which may be indicative of the research hotspots' longevity and intensity. The developing keywords of mental health research among Chinese college students are provided in Table 1, and the topics of mental healthcare research among Chinese college students have evolved in phases since 2012. This research is pri-

marily concerned with national mental health policies and the mental health education of college students.

Table 1 Emerging keywords of Chinese college students' mental health research

Keywords burst	Strength	Duration	2012-2022
national minority	2.58	2012-2016	
positive psychology	5.92	2013-2015	
new media	6.07	2014-2017	
group processing	3.33	2015-2017	
interventional studies	8.73	2016-2019	
big data	3.46	2016-2019	
cell phone addiction	2.76	2017-2018	
anxiety	3.7	2018-2022	
violence	3.23	2018-2020	
novel coronavirus pneumonia	8.61	2020-2022	
depression	3.96	2020-2022	
addiction	3.68	2020-2022	

Minority college students, positive psychology, new media, and group processing are the four emergent terms in the first stage, from 2012 to 2015. The mental health of ethnic minority college students received five years of sustained emergent attention, with the majority of studies focusing on significant differences in obsessive-compulsive and phobic factors, followed by studies focusing on significant differences in depression, anxiety, somatization, psychosis, and paranoia factors, due to a combination of factors including geography, ethnic culture, financial ability, employment situation, and language barriers. Minority college students, positive psychology, new media, and group processing are the four emergent terms in the first stage, from 2012 to 2015. The mental health of ethnic minority college students has received five years of sustained emergent attention, with the majority of studies focusing on significant differences in obsessive-compulsive and phobic factors, followed by studies focusing on significant differences in depression, anxiety, somatization, psychosis, and paranoia factors, due to a combination of factors including geography, ethnic culture, financial ability, employment situation, and language barriers. Consistent with the increase and popularity of new media such as Twitter and WeChat, the emergent intensity of "new media" ranked 6.07 on the scale. The new media mobile Internet platform caters to the psychological demands of college students, expands their interpersonal circle, enhances the meaning of the network mental health education system in colleges, and introduces new crisis early warning methods. In the second stage, which spans from 2016 to 2019, there are a greater number of unexpected words, like "interventional study, big data, mobile phone addiction, anxiety, and violence." "Interventional Research" has the highest intensity of emergence, at 8.73. Scholars devote particular attention to the prevention and treatment of mental disease, investigating the factors that influence mental health, the analysis of psychological crisis features, and specific response techniques. (Jiugun Wu, 2019) The scholars are deeply concerned with the prevention and treatment of mental illness, investigating the elements that influence mental health, the study of psychological crisis features, and specific response techniques. High association exists between the term "big data" and the advancement of information technology. The psychological early warning system makes excellent use of big data mining technologies, which has considerably enhanced psychological warnings for college students. College students live in an era of unparalleled information overload and social exclusion, and the "fear of missing out" is becoming increasingly evident, even to the point of "mobile phone addiction," which has drastically altered the pattern of interconnection among college students. From 2020 through March 2022, there will be a rise in mental health research, with emerging terminology such as new coronavirus pneumonia, depression, and addiction. All three of these terms, along with "anxiety," will continue to appear through 2022, indicating that these four themes have been at the forefront of research for some time.

5.2 Frontiers and trends of Foreign College Students' Mental Health Research

Table 2 Foreign college students' mental health emergent keywords

Keywords burst	Strength	Duration	2012-2022
psychiatric disorder	7.1	2012-2016	
distress	3.67	2012-2013	
suicide attempt	3.03	2013-2015	
psychiatric symptom	3.79	2014-2017	
illness stigma	3.74	2015-2016	
acculturative stress	4.48	2017-2018	
mental health stigma	5.13	2019-2020	
smartphone addiction	4.21	2020-2022	
problematic internet use	3.71	2020-2022	
anxiety symptom	3.46	2020-2022	
psychological resilience	3.22	2020-2022	
Autism	2.97	2020-2022	
suicidal thought	2.97	2020-2022	

The emergent terms in mental health research among international college students are displayed in Table 2. Between 2012 and 2022, there is a shift from psychiatric disorder, distress, attempted suicide, and psychiatric symptom to stigma of illness and acculturative stress; keywords that will continue to emerge in the late 2020s and 2022 include smartphone addiction and problematic internet use, anxiety symptoms, psychological resilience, autism, and suicidal thinking, which have become the research focal point and frontier of current and future research.

Psychiatric disorder is the keyword with the highest emergent intensity and longest emergent duration. The keyword with the second-highest emergent intensity is mental health stigma, and terms containing stigma and suicide each appeared twice, indicating that these are important topics in mental health research among international college students. Self-stigma is a significant factor preventing college students from seeking professional help, and the severity of depression correlates with a more negative and pessimistic view of oneself. A meta-analysis of 101 intervention studies involving 26847 subjects in 24 countries (Maunder & White, 2019) revealed that intervention effects were related to intergroup interactions and not to the presence or absence of educational factors, different media of exposure, mental illness of others, etc. Concerning the frequency of suicidal ideation and behavior among college students, the American College Health Association and researchers in China and Korea have previously conducted research. However, there are few globally representative studies, and scholarly findings vary widely. A meta-analysis of 36 samples of college students (634,662 subjects) from North America, Asia, Europe, and Africa revealed a combined prevalence of suicidal ideation and attempt among college students of 22.3%. (Mortier et al.) The frequency of suicidal ideation and suicide attempts among college students in six ASEAN countries (Cambodia, Indonesia, Malaysia, Myanmar, Thailand, and Vietnam) was 11.7% and 2.4%, respectively, according to a study (Peltzer, Yi, & Pengpid, 2017) The study also found that suicidal ideation was strongly linked to psychosocial factors such as sexual abuse in childhood, depressive symptoms, fighting, and low educational attainment. The acculturative stress (heterogeneous stress) keyword had an emergent intensity of 4.48; the United States ranked first in the number of studies on the mental health of college students, and the United States is a multiracial nation with more studies on heterogeneous stress among college students. In the search results for the WoS database core collection with the keywords "cross-cultural stress" and "college students" from 2012 to June 2022, the United States has by far the largest number of publications, with China ranking second. Extended cross-cultural adaptation stress will increase cultural conflicts, and cultural conflicts can ex-

acerbate psychological disorders among college students. Building cohesion should be emphasized in order to decrease cultural conflicts.

6 DISCUSSION

Research on the mental health of college students in China and abroad is multidisciplinary. To promote the advancement of college student mental health research theory and practice, it is recommended to strengthen cooperation and communication between related disciplines, particularly between the critical nodes of computer science and psychology. The average number of citations of research results on the mental health of Chinese college students is low; therefore, it is essential to strengthen scientific research in this field and expand its international influence. In the hotspots of Chinese and foreign college student mental health research, there are three main types of themes: the central representations of college students' psychological problems, the factors influencing the level of mental health, and the responses to mental health management. The research hotspots produce stage changes with the progression of time and technology, emphasizing the key terms with substantial differences. The most prevalent psychological disorders in China and abroad are depression and anxiety. Foreign countries focus on specific operational aspects, such as "psychological resilience," "mental health stigma," "suicidal ideation," "cross-cultural pressure," etc., whereas China focuses on macroscopic research, which is related to the development stage of Chinese college students' mental health work; research trends in China are primarily centered on novel coronaviruses. In China, researchers are primarily concerned with the three facets of a novel coronavirus, depression, and internet addiction, whereas in other countries, they are primarily concerned with smartphone addiction, problematic internet use, anxiety symptoms, psychological resilience, autism, and suicidal thoughts. The hotspots and trends of research on the mental health of college students vary. However, their ultimate goal is to reduce the impact of negative factors on the mental health of college students and to promote the study of dynamic changes and key factors influencing their mental activities.

Although research tools such as CiteSpace and VOSviewer have been widely used in bibliometric-related research, they still have some shortcomings. For example, in the process of extracting and mining literature information, there are problems with the setting of the software parameters, which may leave out certain literature data.Using big data related to machine learning, data mining, artificial intelligence, and other technologies, accurate mining and modeling analysis of college student mental health data can be accomplished, providing the necessary ideas to systematically address the mental health of college students in China and abroad. In the future, we will therefore consider incorporating research methods such as artificial intelligence and big data mining into the study of the mental health of college students. Obviously, this study is an objective bibliometric analysis of Chinese and foreign literature data, and the results are reliable and consistent. Consequently, the findings of this article have particular theoretical value and reference significance for comprehending the research dynamics and most recent trends in the field of college student mental health in China and internationally.

7 CONCLUSION

This research uses the CNKI and WoS databases as data sources to conduct a bibliometric visualization analysis of the research hotspots and trends in college student mental health in China and abroad in the past 10 years and uses literature visualization software such as CiteSpace and VOSviewer to map the knowledge structure network of college student mental health research in China and abroad, providing a comprehensive overview of the evolution of research on related topics in China and abroad. The distribution of important research countries or regions, important research institutions, important authors, keyword clustering, and keyword emergence were used to do a systematic analysis of research hotspots and trends.

The number of college student publications in the subject of mental health is rising and has good promise for future research advancement. Second, in terms of spatial distribution, the United States is at the center

of the network of collaboration and maintains tight ties with Asian and European nations; nevertheless, China ranks second and has fewer publications than the United States by less than 1D/3D. Moreover, both the total and average number of citations in China and other regions are lower than the international level. Thirdly, in terms of cooperation among research institutions, the number of inter-institutional ties between foreign issuing institutions is greater than 12 times that of China, the density of cooperative networks is 10 times that of China, and there is less cooperation among Chinese institutions. Fourth, in terms of journal distribution, China's "Chinese Journal of School Health" "Education and Career", "The Party Building and Ideological Education in Schools", and foreign "Journal of American College Health" "International Journal of Environmental Research and Public Health" and "Frontiers in Psychology" lead the frontier of college student mental health research, with the most significant number of publications and the most significant academic influence.

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