



## Research article

# Frontiers and hotspots in anxiety disorders: A bibliometric analysis from 2004 to 2024

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## ABSTRACT

**Objective:** This study aimed to analyze research on anxiety disorders using VOSviewer and CiteSpace to identify research hotspots and future directions.

**Methods:** We conducted a comprehensive search on the Web of Science Core Collection (WoSCC) for relevant studies about anxiety disorders published within the past two decades (from 2004 to 2024). VOSviewer and CiteSpace were mainly used to analyze the authors, institutions, countries, publishing journals, reference co-citation patterns, keyword co-occurrence, keyword clustering, and other aspects to construct a knowledge atlas.

**Results:** A total of 22,267 publications related to anxiety disorders were retrieved. The number of publications about anxiety disorders has generally increased over time, with some fluctuations. The United States emerged as the most productive country, with Harvard University identified as the most prolific institution and Brenda W. J. H. Penninx as the most prolific author in the field. **Conclusion:** This research identified the most influential publications, authors, journals, institutions, and countries in the field of anxiety research. Future research directions are involved advanced treatments based on pharmacotherapy, psychotherapy and digital interventions, mechanism exploration to anxiety disorders based on neurobiological and genetic basis, influence of social and environmental factors on the onset of anxiety disorders.

## 1. Introduction

Anxiety disorders are categorized as a cluster of mental conditions characterized by excessive fear, persistent anxiousness, or avoidance of perceived threats in the environment or internal to oneself [1–3], including generalized anxiety disorder, panic disorder, agoraphobia, specific phobia, social anxiety disorder, separation anxiety disorder, selective mutism and other specified anxiety disorders based on the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) [4] and the International Classification of Diseases 11th Revision (ICD-11) [5]. Anxiety disorders have emerged as crucial mental health concerns, exerting a

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progressively greater influence on a substantial segment of the global population. Extensive studies have clearly shown that anxiety disorders are the most prevalent form of mental illness [2], causing considerable economic losses and detriment to the mental and physical well-being of billions of individuals annually [6–8]. Since the beginning of the 21st century, the incidence and occurrence of anxiety disorders have greatly increased and have received attention from countries and associations. For example, the World Health Organization (WHO) proposed the Comprehensive Mental Health Action Plan (2013–2030), and the National Institute of Mental Health (NIMH) conducted the Collaborative Anxiety Treatment Study of Children and Adolescents. It would be worthwhile to review and analyze the development situation of the research on anxiety disorders over the past 20 years. Therefore, analyzing and summarizing the current state of research on anxiety disorders through visual knowledge mapping is conducive to clarifying research hotspots and directions, deepening researchers' understanding and exploration of the field, and promoting the healthy development of patients' pathophysiology.

Bibliometrics applies statistical analysis to scrutinize published information, including journal articles, books, datasets, and blogs, along with their associated metadata, such as abstracts, keywords, and citations. Bibliometrics aims to elucidate and establish connections among scholarly works and gain insight into the developmental trajectory and emerging frontiers of pertinent academic domains through a rigorous quantitative analysis of published literature, and it has become a widely accepted method for assessing research [9]. Despite numerous articles focusing on different aspects of anxiety disorders [10,11], there remains a notable dearth of comprehensive bibliometric analyses that encompass the holistic development of this field and are capable of providing an intuitive impression for readers. Consequently, this study aimed to conduct a thorough analysis of anxiety disorder-related research since the beginning of the 21st century and to provide an extensive outlook using visualization and bibliometric analysis to determine research trends and frontier areas of interest. The findings identify existing hotspots of research on anxiety disorders, provide a valuable reference for future researchers in the field, and contribute to potential clinical practice.

## 2. Materials and methods

### 2.1. Data sources and search strategies

Data for the bibliometric analysis in this study were obtained from the Web of Science Core Collection (WoSCC), a comprehensive and standardized database widely used in academia. The search formula employed in this study was defined as follows: Topic Sentence (TS) = (“anxiety disorder” OR “separation anxiety disorder” OR “selective mutism”) OR (“specific phobia” OR “isolated phobia”) OR (“social anxiety disorder” OR “social phobias”) OR (“panic disorder” OR “episodic paroxysmal anxiety”) OR (“agoraphobia” OR “generalized anxiety disorder”) OR (“phobic anxiety disorder” OR “mixed anxiety disorders”). The search period was limited to January 1, 2004, and May 1, 2024. Only articles classified as “Article” or “Review” were selected, and the language was restricted to English, resulting in a total of 22,267 articles. The search results were exported as plain text files in the TXT format, following the aforementioned search formula for WoSCC. The search was concluded on May 1, 2024, to minimize potential data bias resulting from subsequent database updates. Fig. 1 shows a flowchart of the literature retrieval process.

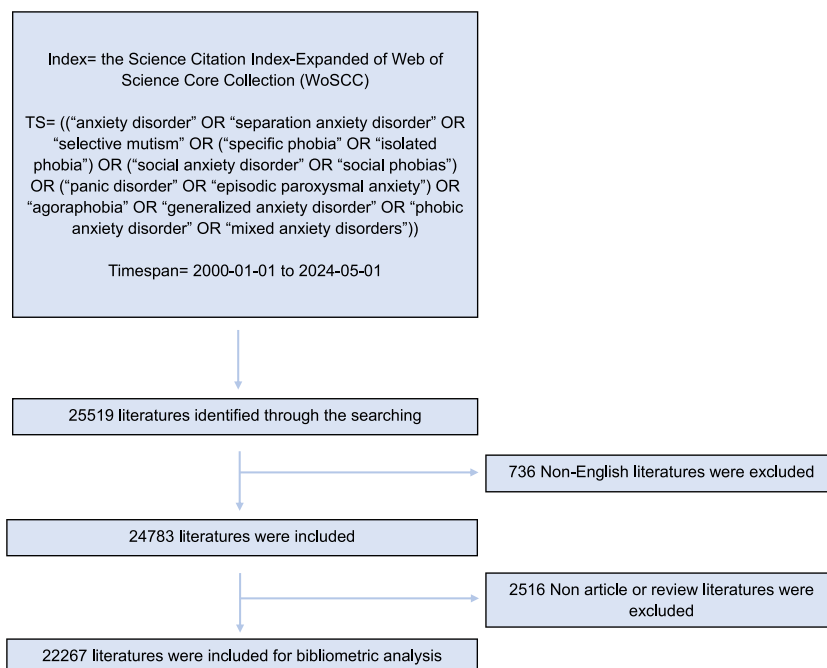


Fig. 1. Flow chart of the literature collection process.

## 2.2. Visualization and data processing

CiteSpace software (version 6.3. R1), VOSviewer (version 1.6.20), Bibliometrix (version 4.0) (R-Tool of R-Studio), and Microsoft Excel 2010 were used to conduct visual and cluster analyses to explore and reveal trends and hotspots in anxiety disorders. VOSviewer is a software tool for constructing and visualizing bibliometric networks developed by the Center for Science and Technology Studies at Leiden University [12]. CiteSpace, developed by Chaomei Chen, is currently the most widely used software for bibliometric analysis [13]. The Bibliometrix R package is an open-source tool used for quantitative research in bibliometrics [14]. These three software packages are comprehensive and reliable tools that have been used by many researchers. Using the three software packages, we visualized and analyzed the distribution and collaboration of countries/regions, authors and institutions, a dual-map overlay of journals, reference collaboration, and literature bursts. Excel was used to process the data from VOSviewer to determine the annual occurrence of the keywords. During data processing, we employed the merging function of the mentioned software or manual proofreading and screening to eliminate duplicate or irrelevant data to ensure accuracy and credibility of data and results. The above process is conducted by two members simultaneously, and the results are compared to reduce data bias owing to the subjectivity of the processor.

## 3. Results

### 3.1. Distribution by countries/regions

Anxiety-related studies involved 99 countries/regions. Fig. 2A shows that the main focus of the research activity is observed in countries situated in the Northern Hemisphere, with prominent associations between the United States, Europe, and Asia. Strong links have been observed between Oceania, North America, and Europe.

As shown in Fig. 2B, the collaboration network comprised the top 50 countries with over 50 documents and 500 citations. The network's countries/regions were categorized into 18 clusters based on their proximity and collaborative efforts, which were distinguished by different colors. The results of the collaboration network are shown in Table 1, indicating that the United States leads in citations (443,604), significantly surpassing all other countries, followed by Germany (127,983) and England (103,635). In terms of the number of documents, the United States ranks the highest (8,319), followed by Germany (2,247) and England (2,138). The significance and quality of a country's publications can be inferred from its total number of citations; the top five countries were the USA, Germany, England, the Netherlands, and Australia. The total link strength reflects a country's level of activity and collaboration with other countries in the research; the top five countries were the USA, England, Germany, the Netherlands, and Australia.

For international collaboration, we calculated the number of documents with authors from the same country (Single Country Publication or SCP) and the number of documents with authors from different country affiliations (Multiple Country Publication or MCP) for each country (Fig. 2C). Red lines indicate SCP, wherein at least one foreign coauthor exists, whereas blue lines represent MCP. Majority of articles are published by individual countries, which suggest that an international cooperation should be strengthened, and strong cooperation is required.

### 3.2. Distribution by institutions

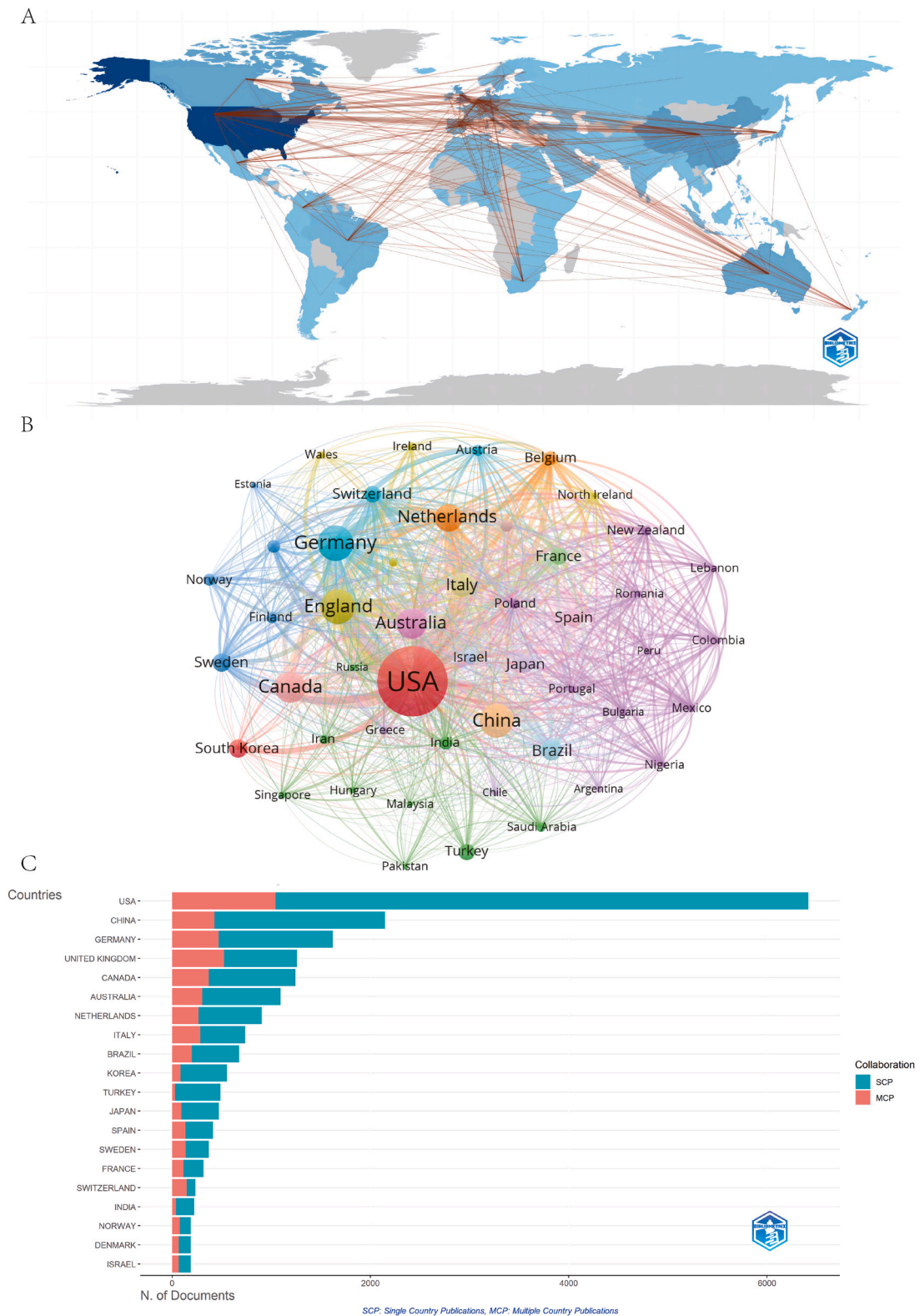
Table 2 presents the top 10 institutions in terms of the number of publications and centrality. The institution with the most publications was Harvard University (1,126), followed by the University of California System (990) and the University of London (859). Notably, the United States holds a prominent position with seven of the top 10 institutions, whereas the United Kingdom contributes two institutions to the list. Harvard University, the University of California System, the University of London, Harvard Medical School, and the US Department of Veterans Affairs are among the top five institutions, emphasizing their significant contributions and influential roles in anxiety-related research.

Fig. 3A shows the collaboration network of the institutions visualized in VOSviewer, where a positive correlation between the number of publications and size of the nodes reveals a collaborative relationship among the institutions. The institutions were divided into 10 clusters based on their proximity. Notably, the nodes of the deep-purple clusters, representing institutions mainly from North America, including Harvard University and Columbia University, were larger, emphasizing the significant contributions of North American institutions.

In the overlay map of the collaboration network based on the average publication year, a warm color indicates a more recent publication year, and a cold color indicates an older publication year (Fig. 3B). Interestingly, the clusters of institutions from North America exhibited a relatively old publication year, suggesting that these institutions published a significant number of articles earlier. In addition, the nodes of the light purple cluster in the collaboration network, representing Chinese institutions, including Southern Medical University and Peking University, appear yellow in the overlay map, suggesting that Chinese institutions have been actively engaged in anxiety research in recent years and have made significant contributions to the field.

### 3.3. Distribution by authors

The analysis of author citations and co-citations offers valuable insights into the different aspects of author contributions. Co-authorship analysis refers to articles by two authors simultaneously cited by a third author. In Tables 3A and 3B, Brenda W. J. H. Penninx (128) leads with the most publications, followed by Daniel S. Pine (122) and Murray B. Stein (114). The most



**Fig. 2.** Analysis of the Anxiety-related countries/regions. (A) The collaboration map of countries/regions involving in anxiety-related research. The links between countries/regions indicates the connections and collaboration. The degree of involvement of countries/regions is proportional to the depth of colors and numbers of links. (B) The analysis of collaboration network visualized in VOSviewer. The figure shows the top 50 countries delivering more than 50 documents with over 500 citations. The clusters with different colors indicate the degree of collaboration between

countries/regions and the size of nodes indicates the contribution or the degree of involvement. (C) The analysis of countries' publications based on the collaboration relationship. The red lines, representing single country publication, indicates the number of documents from single country. The blue lines, representing multiple country publications, indicates the number of publications from multiple countries.

**Table 1**

Analysis of Top 10 countries in terms of number of articles, total citation and total link strength.

Ranks	Country	Documents	Citations	Total link strength
1	USA	8319	443604	5677
2	Germany	2247	127983	2579
3	England	2138	103635	3212
4	China	2098	50246	1698
5	Canada	1781	65372	1805
6	Australia	1621	71057	2008
7	Netherlands	1390	82497	2335
8	Italy	1060	45784	2071
9	Brazil	850	25687	1303
10	Spain	666	30468	1712

**Table 2**

The top 10 institutions in terms of number of publications and corresponding centrality.

Ranks	Institutions	Publications	Centrality
1	Harvard University	1126	0.28
2	University of California System	990	0.11
3	University of London	859	0.13
4	Harvard Medical School	699	0.19
5	US Department of Veterans Affairs	699	0.14
6	Veterans Health Administration (VHA)	684	0.36
7	Columbia University	662	0.18
8	King's College London	493	0.24
9	Pennsylvania Commonwealth System of Higher Education (PCSHE)	481	0.06
10	Vrije Universiteit Amsterdam	458	0.15

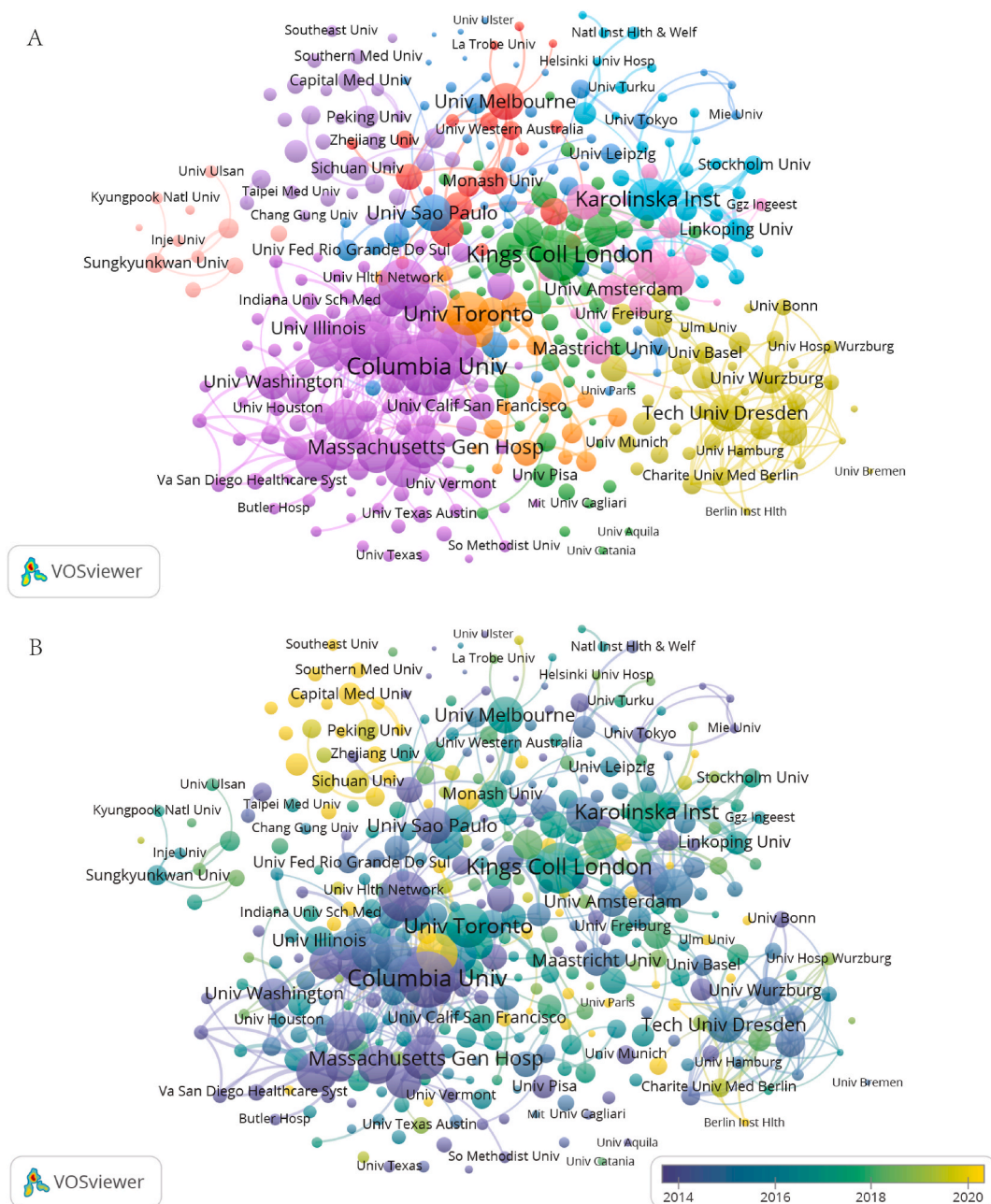
frequently cited author was Bernd Loewe (24,153), followed by Kurt Kroenke (23,802) and Janet B. W. Williams (22,565). In addition, the top three authors with the highest co-citation frequency were Ronald C. Kessler (9,175), Robert Leopold Spitzer (5,147), and Kurt Kroenke (4,938). It is noteworthy that several authors frequently appeared in different tables. Kurt Kroenke, for instance, ranks second and third in terms of citations and co-citations, respectively, showing that he is committed to the hotspots of anxiety research and produces high-quality studies. Authors such as Daniel S. Pine and Murray B. Stein appear simultaneously in terms of publications and citations, emphasizing their prolific output and high-quality contributions.

Fig. 4A illustrates the collaborative network of authors with over 20 documents and 200 citations. The authors were classified into 16 clusters based on their proximity, and the sizes of the nodes corresponded to the total link strength of each author. Notably, the nodes within the light-blue clusters exhibited larger nodes, indicating active collaboration among the authors within these clusters. Fig. 4B presents an author map based on the number of publications visualized in CiteSpace, which aligns with the findings in Table 3A. Brenda W. J. H. Penninx and Daniel S. Pine emerge as the two most prolific authors. However, the color of the nodes and links surrounding the nodes reveal that Daniel S. Pine engaged in earlier research, whereas Brenda W. J. H. Penninx is actively involved in more recent collaborations.

### 3.4. Distribution by journals

Through the analysis of the Bibliometrix, the related information of journals focusing on anxiety-related research was accumulated, with the journal's impact factor (IF) and journal citation report (JCR) quartile serving as indicators of impact and quality. Tables 4 and 5 show the top 10 journals in terms of publications and total local citations, respectively, along with their corresponding IF and JCR quartiles. Table 4 shows that the journal with the most publications is the *Journal of Affective Disorders* (1,136) (6.6, Q1), followed by *Depression and Anxiety* (563) (7.4, Q1) and *Frontiers in Psychiatry* (530) (4.7, Q3). Among the top 10 journals in terms of the number of publications, three were in Quartile 1 and four had an IF above 5. In addition, among the top 10 journals in terms of the frequency of total local citations, *JAMA Psychiatry (Archives of General Psychiatry)* (34,049) (25.8, Q1) takes the leading position, followed by the *American Journal of Psychiatry* (30,766) (17.7, Q1) and *Journal of Affective Disorders* (24,436) (6.6, Q1).

Among the journals with the highest frequency of citations, nine were in Quartile 1, and five had an IF above 10. Among the top 10 journals in terms of publications, five are also among the top 10 journals in terms of total local citations, including the *Journal of Affective Disorders*, *Journal of Clinical Psychiatry*, *Psychological Medicine*, *Depression and Anxiety*, and *Psychiatry Research*, indicating their significant influence in the field.



**Fig. 3.** Analysis of the anxiety-related institutions. (A) The collaboration network of top 400 institutions with over 10 publications and 200 citations. The nodes with different colors represent different clusters and the size of nodes represents the number of publications. (B) The overlay map to the collaboration network of institutions based on the publication year. The warm color indicates recent average publication year and the cold color indicates early average publication year.

A citation burst refers to a sudden increase in citations [15], suggesting that the journal/author/link has received particular attention in a particular period and provides researchers with information highly relevant to journals. Fig. 5A shows that the *International Journal of Environmental Research and Public Health* (653.83) exhibits the strongest citation burst from 2019 to date, followed by *Frontiers in Psychiatry* (641.68) and *Journal of General Internal Medicine* (616.22). *Science* (2004–2015) and *Psychopharmacology* (2004–2015) had the longest citation burst periods.

The color of the tree rings indicates the year of publication, which has been helpful for understanding the popularity of journals in recent years. The *American Journal of Psychiatry* has the largest radius, indicating the highest number of citations (Fig. 5B). Moreover, the color of tree rings in *Psychopharmacology* and *International Clinical Psychopharmacology*, for example, is mild, suggesting that they have been published earlier. By contrast, the color of the tree ring in the *Archives of Internal Medicine* indicates a recent active

**Table 3A**

The top 10 authors in terms of number of documents.

Rank	Author	Documents	Citations	Total link strength
1	Brenda W. J. H. Penninx	128	9106	316
2	Daniel S. Pine	122	11442	309
3	Murray B. Stein	114	10136	331
4	Dan J. Stein	110	5536	283
5	Gerhard Andersson	98	6887	237
6	Hans-Ulrich Wittchen	94	6242	569
7	Ronald C. Kessler	85	9306	433
8	Michelle G. Craske	82	6299	238
9	Katharina Domschke	81	3135	475
10	Pim Cuijpers	78	8579	237

**Table 3B**

The top 10 authors in terms of co-citations and citations.

Rnak	Author	Co-Citations	Total Link Strength	Author	Citations	Total Link Strength
1	Ronald C. Kessler	9175	194773	Bernd Loewe	24153	2476
2	Robert Leopold Spitzer	5147	45118	Kurt Kroenke	23802	2626
3	Kurt Kroenke	4938	45907	Janet B. W. Williams	22565	2353
4	Hans Ülrich Wittchen	3018	80058	Robert Leopold Spitzer	22561	2351
5	Aaron T. Beck	2852	61074	Daniel S. Pine	11442	8381
6	Murray B. Stein	2614	91533	Murray B. Stein	10136	7548
7	David V. Sheehan	2508	55431	Ronald C. Kessler	9306	2319
8	Kenneth S. Kendler	2103	56458	Brenda W. J. H. Penninx	9106	6449
9	Bridget F. Grant	1902	42552	Pim Cuijpers	8579	3845
10	Maria Hamilton	1886	35819	Bridget F. Grant	7286	1284

involvement. Some tree rings are marked with fuchsia rings at the edges, indicating the high centrality ( $>0.1$ ) of the journals.

Fig. 5C shows the analysis of the dual-map overlay of journals focusing on anxiety research, which can provide a more visual representation of the distribution of individual academic journals, development of citation trajectories, and changes in research focus. The colored curves indicate citation connections; citing journals are mainly from MOLECULAR BIOLOGY, GENETICS, CLINICAL, and MEDICINE (research frontiers), whereas cited journals are mainly from MOLECULAR BIOLOGY, NURSING, HEALTH, MEDICINE, DERMATOLOGY, and SURGERY (knowledge base). Notably, the convergence of knowledge flow from multiple subject areas into research frontiers indicates that research on anxiety disorders is becoming more extensive and comprehensive.

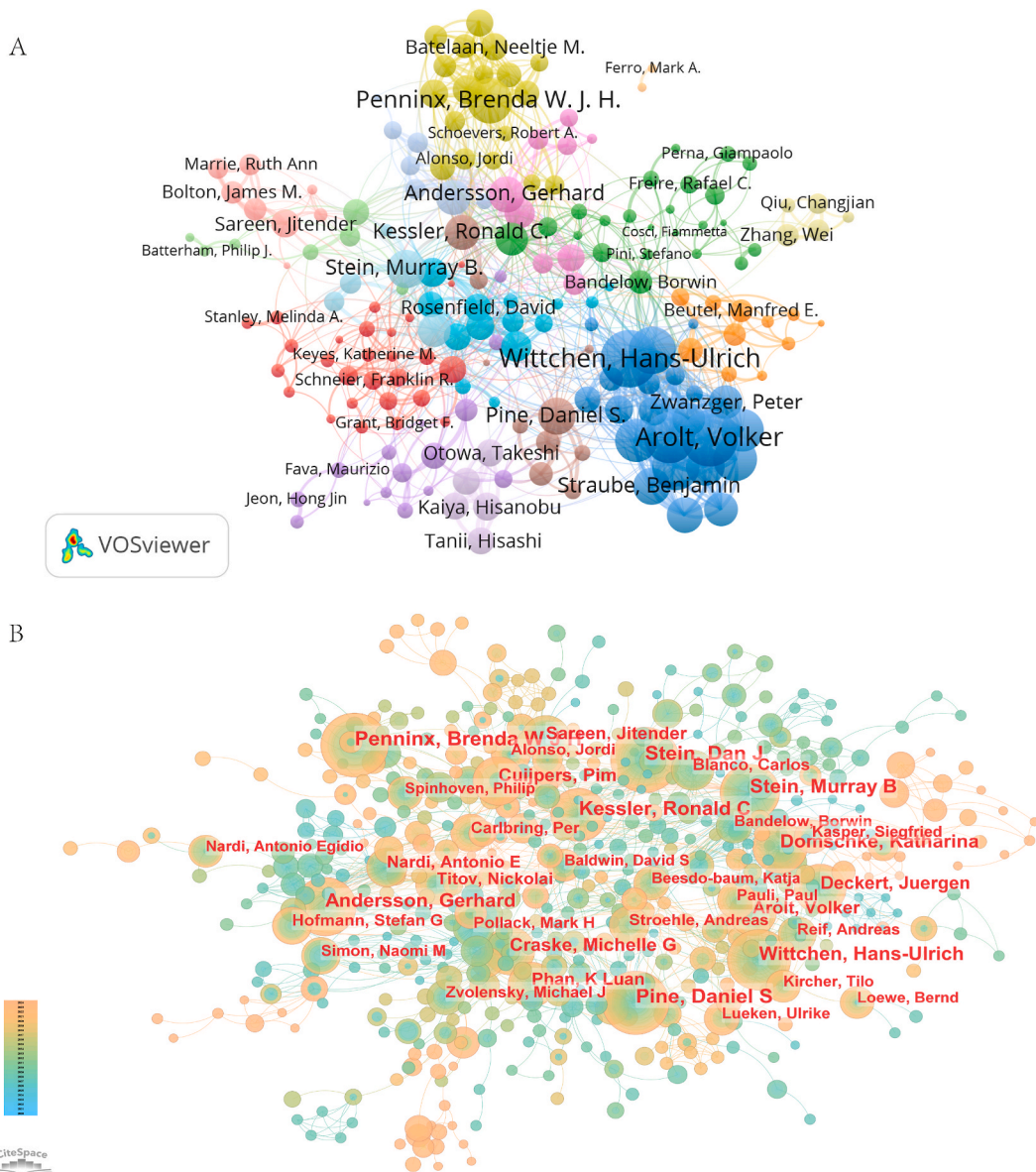
### 3.5. Keywords analysis

Keywords reflect the core content of an article, and keyword analysis can be used to understand the frontiers and hotspots of research. Table 6 shows the top 20 keywords by frequency of occurrences, where “depression” (7280) was the most frequently used keyword, followed by “anxiety” (6431) and “prevalence” (3822). Instead of “anxiety”, the word “depression” ranks first in the ranking of keywords, reflecting the tight connection between depression and anxiety disorder. Notably, comorbidity, the fourth most frequently occurring keyword, revealed common comorbid conditions in anxiety disorders. It is noteworthy that keywords associated with the pathogenesis of anxiety disorders such as “amygdala”, “prefrontal cortex”, and “psychopathology” appear repeatedly in the table, proving that research on the pathogenesis of anxiety disorders is popular.

Fig. 6A shows the annual occurrence of keywords with the highest frequency over the past two decades. Similar to the analysis in Table 6, “depression”, “prevalence”, “panic disorder”, “generalized anxiety disorder”, and “anxiety” occur most frequently in the anxiety-related research. There was a substantial increase in all keywords from 2019 onward, reaching a peak in 2022, coinciding with the most severe period of the coronavirus disease (COVID-19) pandemic, which suggested a considerable relationship between the growing concern about anxiety and the pandemic.

Fig. 6B analyzes anxiety-related terms at over 30 frequencies annually, providing insights into the development history and trending topics in anxiety research. Recent trend topics include “COVID-19”, “hierarchical taxonomy”, “agoraphobia” and “cognitive-behavioral therapy.” By contrast, the shift in focus from early topics such as “fluoxetine”, “diagnostic interview schedule” and “long-term treatment” indicates a transition in anxiety-related research toward precision and molecularization.

Fig. 6C shows the co-occurrence relationships between the keywords divided into four clusters based on their proximity. Red clusters focus on clinical research (quality of life, mental health, and impact), blue clusters emphasize physiological or pathological phenomena (anxiety sensitivity, responses, and amygdala), green clusters are associated with epidemiological research (follow-up, rating scale, and comorbidity), and yellow clusters focus on therapy and treatment research (serotonin reuptake inhibitors, placebo, and double-blind). This network highlights the multidimensional aspects of anxiety research, encompassing the clinical, physiological, epidemiological, and therapeutic aspects.



**Fig. 4.** Analysis of anxiety-related authors. (A) The collaboration network of the top 200 co-authors with over 20 documents and 200 citations. The nodes of different colors represent different clusters and the size of nodes represents the total link strength of authors. (B) The tree ring map of authors' publications. The size of nodes is proportional to the number of publications of authors. The color of the annual ring represents the corresponding publication time, and the thickness of each ring is proportional to the number of publications in the corresponding time. The links between authors represent the collaboration relationship of the authors.

### 3.6. Reference analysis

Table 7 lists the top 10 articles in terms of citation frequency. The most frequently cited article is “A brief measure for assessing generalized anxiety disorder - The GAD-7” (Spitzer et al., 2006) (16,574), which established the GAD-7 scale used to identify probable cases of GAD and recognized for its simplicity and reliability [16]. Next, “Factors Associated with Mental Health Outcomes among Health Care Workers Exposed to Coronavirus Disease 2019” (Lai et al., 2020) (4345) is a cross-sectional study on mental health outcomes among Chinese health care workers exposed to COVID-19 [17]. The third-ranking article is “The psychological impact of the COVID-19 epidemic on college students in China” (Cao et al., 2020) (2904), which discusses the impact of the epidemic on the anxiety levels of Chinese college students and the causes of anxiety using a questionnaire [18].

Fig. 7A shows the 25 references with the strongest citation bursts. The publication with the strongest citation burst was the “Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition” (DSM-V) (strength = 330.46), which was published by the American Psychiatric Association (APA) in 2013 and widely accepted by clinicians and researchers. This criterion has been an essential



**Table 4**

The top 10 Journals in terms of publications, IF and JCR Quar tile.

Rank	Journal	Publications	IF(2023)	JCR Quartile
1	Journal Of Affective Disorders	1136	6.6	Q1
2	Depression And Anxiety	563	7.4	Q1
3	Frontiers In Psychiatry	530	4.7	Q3
4	Plos One	498	3.7	Q2
5	Psychiatry Research	465	2.3	Q4
6	Bmc Psychiatry	426	4.4	Q2
7	Psychological Medicine	372	6.9	Q1
8	Journal Of Psychiatric Research	344	4.8	Q2
9	Journal Of Clinical Psychiatry	288	5.3	Q2
10	International Journal Of Environmental Research And Public Health	253	4.61	Q2

**Table 5**

The top 10 Journals in terms of number of local citations, number of documents, IF and JCR quartile.

Ranks	Sources	Number Of Local Citations	Number Of Documents	IF(2023)	JCR Quartile
1	Jama Psychiatry*** (Archives of General Psychiatry)	3479 + 30570 = 34049	77 + 88 = 165	25.8	Q1
2	American Journal of Psychiatry*	30766	142	17.7	Q1
3	Journal Of Affective Disorders*	24436	1136	6.7	Q1
4	Biological Psychiatry*	21877	163	10.7	Q1
5	Journal Of Clinical Psychiatry*	20130	288	5.4	Q2
6	Psychological Medicine*	16652	372	6.9	Q1
7	Behaviour Research and Therapy	16400	344	4.1	Q1
8	Depression And Anxiety*	13753	563	7.5	Q1
9	British Journal of Psychiatry	13113	84	10.6	Q1
10	Psychiatry Research*	12541	465	11.4	Q1

Abbreviations.

\*,The journal is the core resource (classify by Bradford Law) of Anxiety-related research.

\*\*,Archives Of General Psychiatry has change the journal title into *Jama Psychiatry* since 2013.

reference in anxiety-related research, and the strongest citation burst confirms its authority and importance. Furthermore, results show that 2020 had the highest number of citation bursts, occurring seven times, surpassing other years, and persisting until the present. This observation underscores the increased attention dedicated to anxiety-related research in recent years. Moreover, two other references exhibit strengths exceeding 100, including “Diagnostic and Statistical Manual of Mental Disorders” (strength = 237.24) and “Lifetime Prevalence and Age-of-Onset Distributions of DSM-IV Disorders in the National Comorbidity Survey Replication” (strength = 174).

Fig. 7B shows the annual number of citations of anxiety studies, indicating sustained interest over the years. In particular, a slow decrease (2012–2019), followed by a sharp increase (2019–2020), suggests the potential impact of the COVID-19 outbreak on anxiety studies, reflecting an increased focus during this period.

By extracting keywords from highly cited articles, a clustering process based on similarity was employed to reveal hotspots in related fields and offer information for authors to seek research directions. In addition, by marking the number of citations of documents associated with this keyword, the research status of related research directions over the years has a clear understanding of the development of each research direction on anxiety disorders. Fig. 7C illustrates a timeline of highly cited references in anxiety-related research. The references were grouped into 18 clusters, and each was assigned a unique identifier: #0 COVID-19, #1 pregabalin, #2 amygdala, #3 social anxiety disorder, #4 error-related negativity, #5 virtual reality, #6 Internet, #7 neuropeptides, #8 course, #9 D-cycloserine, #10 Mendelian randomization, #11 epidemiology, #12 primary care, #13 network analysis, #14 panic disorder, #15 mental health, #16 neurosteroids, #17 public safety personnel, and #18 blood pressure. Popular research directions in the past five years include #0 COVID-19, #5 virtual reality, and #10 Mendelian randomization.

## 4. Discussion

### 4.1. General distribution

The analysis in this study was based on 22,267 anxiety disorder-related articles from 2216 journals and 73,627 authors in the WoSCC database from January 1, 2004, to May 1, 2024. Over the past 20 years, the number of research articles on anxiety disorders has remained consistently high, indicating sustained research interest in this field. In recent years, the COVID-19 pandemic has propelled research on anxiety disorder to a focal point, with a primary emphasis on two aspects: epidemic health management and neuroinflammation. Moreover, there has been a discernible increase in research dedicated to unraveling the pathological mechanisms underlying anxiety.

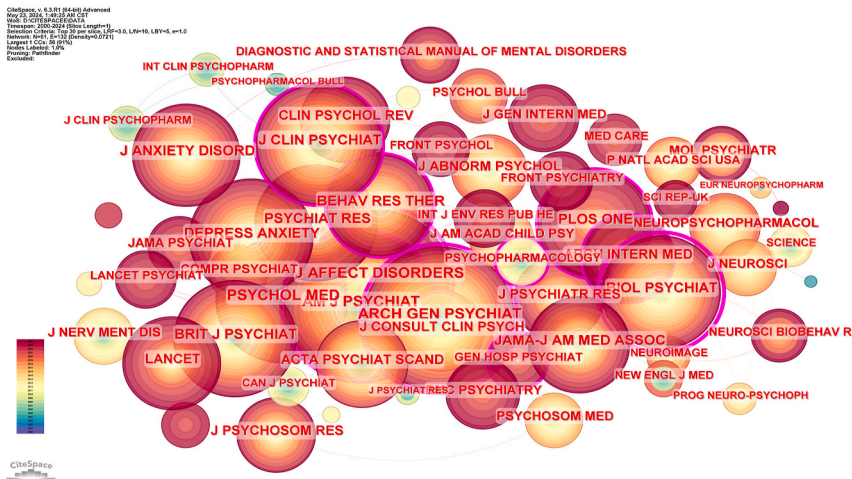
In the analysis of countries/regions, this study scrutinized the number of published articles and the frequency of collaborations on

A

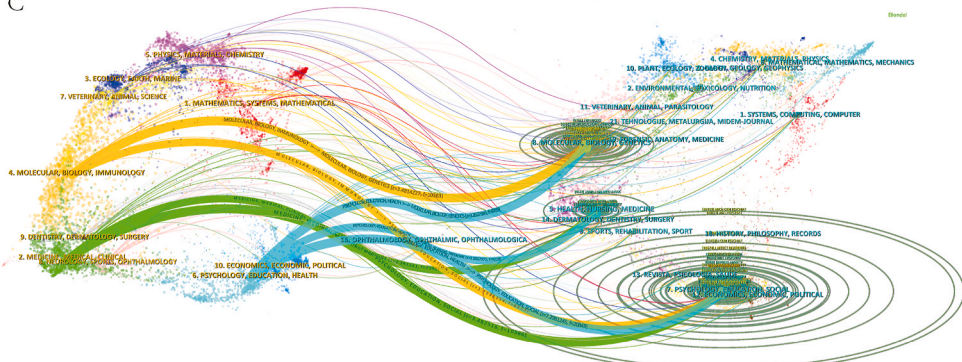
## Top 25 Cited Journals with the Strongest Citation Bursts

Cited Journals	Year	Strength	Begin	End	2004 - 2024
J CLIN PSYCHOPHARM	2004	425.67	2004	2012	
PSYCHOPHARMACOLOGY	2004	403.72	2004	2015	
INT CLIN PSYCHOPHARM	2004	365.36	2004	2012	
SCIENCE	2004	297.06	2004	2015	
J NERV MENT DIS	2004	270.65	2004	2014	
J PSYCHIAT RES	2004	253.64	2004	2009	
DIAGN STAT MAN MENT	2008	311.82	2008	2013	
EUR PSYCHIAT	2009	280.81	2009	2014	
NEUROIMAGE	2009	316.46	2012	2019	
BEHAV THER	2016	338.45	2016	2020	
JAMA PSYCHIAT	2016	327.23	2018	2024	
J GEN INTERN MED	2019	616.22	2019	2024	
PLOS ONE	2013	429.07	2019	2024	
BMC PSYCHIATRY	2016	418.76	2019	2024	
MED CARE	2019	417.84	2019	2024	
FRONT PSYCHIATRY	2020	641.68	2020	2024	
ARCH INTERN MED	2008	611.66	2020	2024	
LANCET PSYCHIAT	2020	557.02	2020	2024	
BMJ-BRIT MED J	2020	431.94	2020	2024	
INT J ENV RES PUB HE	2021	653.83	2021	2024	
FRONT PSYCHOL	2021	589.18	2021	2024	
BRAIN BEHAV IMMUN	2021	284.79	2021	2022	
ANN INTERN MED	2021	269	2021	2022	
SCI REP-UK	2022	403.06	2022	2024	
BMJ OPEN	2022	345.34	2022	2024	

B



C



(caption on next page)

**Fig. 5.** Analysis of anxiety-related journals. (A) The analysis of citation burst of top 25 journals. The stronger citation burst refers higher attention to the journals in the period. (B) The tree ring history map of most cited journals. The rings represent the citation history of the keywords. The diameter of the annual ring reflects the number of citations of the journals, the color of the citation annual ring represents the corresponding citation time, and the thickness of each ring is proportional to the number of citations in the corresponding time. (C) The double-overlay map of journals. The left clusters show the citing journals which is called the research frontiers, while the right clusters show the cited journals, which is called knowledge base. The vertical axis of the ellipse is proportional to the number of publications published by the journal, and the horizontal axis is proportional to the number of authors.

anxiety. The findings show that the United States has not only contributed many influential studies but has also been active in cooperation with other countries, making it pivotal in anxiety research.

Analysis of institutions can help identify influential institutions within related fields and foster interdisciplinary collaboration. Seven of the top 10 institutions are based in the United States, with two in the United Kingdom. In particular, Harvard University not only published a substantial number of articles but also exhibited relative centrality (0.28).

The number of published articles and the frequency of citations may indicate an author's involvement and contribution. In Tables 3A and 3B, Brenda W. J. H. Penninx leads in the number of publications with 9106 citations. The most frequently co-cited author was Ronald C. Kessler (9,175), who had the highest total link strength. "Lifetime Prevalence and Age-of-Onset Distributions of DSM-IV Disorders in the National Comorbidity Survey Replication" by Kessler (2005) is the author's most cited article, experiencing a citation burst from 2006 to 2010, with a burst strength of up to 174.

Analysis of journals and keywords help identify hotspots in the study of anxiety disorders. According to the analysis of journals, JAMA Psychiatry is the most cited and influential journal, covering psychiatry, psychology, behavior, and related fields, and stands out among the top journals in the field. Fig. 4C shows that topics on anxiety include molecular medicine, genetics, and pharmacology. The extraction and analysis of keywords in an article provides a visual representation of the research direction and hotspots. As shown in Table 6 and Fig. 7A, B, and 7C, the most commonly used keywords were "COVID-19", "adolescents", "mechanisms" and "comorbidity". Fig. 7C shows a cluster and timeline analysis of similar topics, categorizing publications into 18 clusters and trending topics in recent years include COVID-19, virtual reality, and Mendelian randomization.

#### 4.2. Current clinical progress of anxiety disorders

In the analysis of keywords in Fig. 6A and B, "scale", "prevalence", "fluoxetine", "population", "primary care" and "mental health" were identified, which showed the crucial role of diagnosis and treatment in the field of anxiety disorders. Considering the significant impact of anxiety disorders on the global population, it is necessary to review the current clinical diagnosis and therapy of anxiety disorders, which is beneficial for the following discussion on frontiers and hotspots.

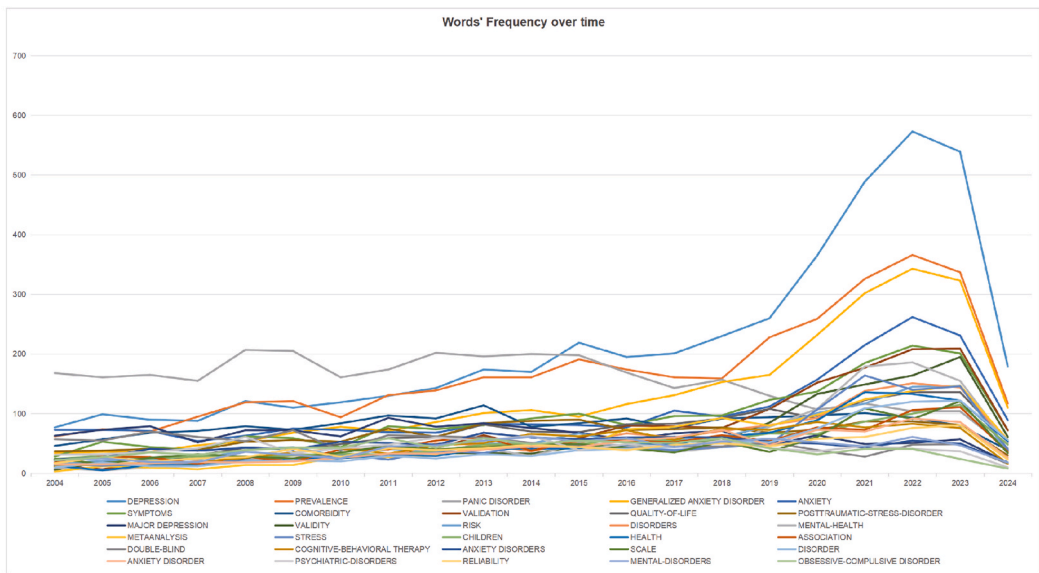
In our analysis of keywords, a large number of keywords related to the diagnosis of anxiety disorders were retrieved, including "phq-9", "dsm-5" and "questionnaire". This suggests that scales and questionnaires are the main methods for diagnosing anxiety disorders today. Scales used for the assessment of the anxiety disorders include Hamilton Anxiety Scale, Beck Anxiety Inventory, the Fear Questionnaire, and the Penn State Worry Questionnaire [3,19]. Besides, the keyword "version" suggested that the diagnostic standard had been updating and improving in the past decades. For example, the DSM published by APA is now updated to the latest version in 2022, DSM-5 TR, which is a significant update since the DSM-5 published in 2013 [20]. Except DSM by APA and ICD by WHO, the Research Domain Criteria (RDoC) was proposed by the National Institute of Mental Health (NIMH) in 2010 as a supplement to the traditional classification system of mental illness [21]. The continuous updating of old standards and the emergence of new standards indicate that the research in the field of anxiety disorders is advancing and thriving.

Besides, the occurrence of terms such as "fluvoxamine", "fluoxetine" and "cognitive-behavioral therapy" indicates the extreme attention to the treatment of anxiety disorders. The treatment of anxiety disorders encompasses two primary modalities: pharmacotherapy and psychotherapy. Pharmacotherapy is considered to be the primary choice in the treatment of anxiety disorders. Pharmacological treatments include selective serotonin reuptake inhibitors (SSRIs) and serotonin norepinephrine reuptake inhibitors (SNRIs), most antidepressants, several benzodiazepines, pregabalin, and buspirone [1,2,11]. For psychotherapy, cognitive-behavioral therapy (CBT) has emerged as the predominant empirically supported treatment for anxiety disorders and used increasing in combination with pharmacotherapy, owing to its demonstrated clinical efficacy and practicality [2,22].

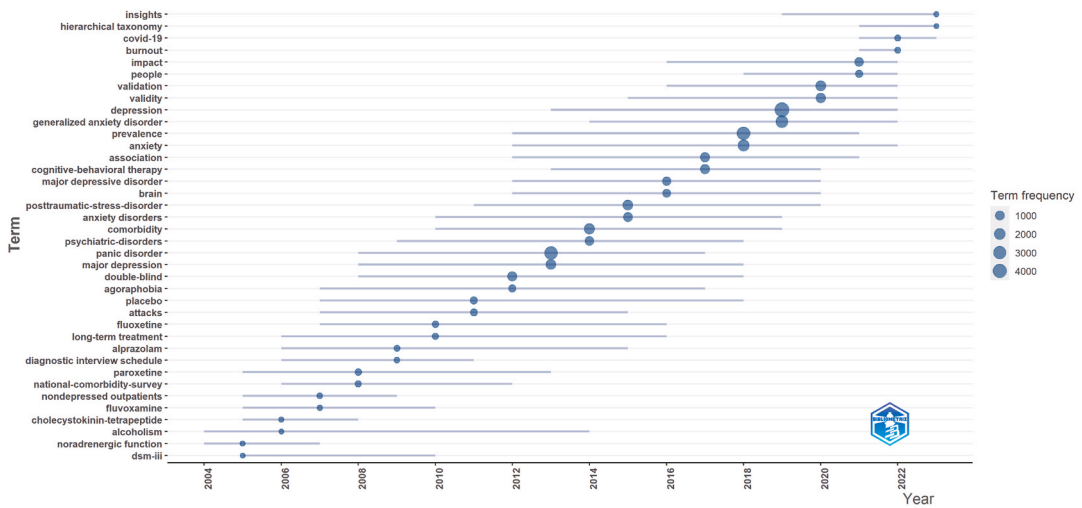
Especially, the keyword "internet" reveals the emergence and advancement of internet-based therapies and digital interventions for anxiety disorders, which have marked a significant advancement in mental health care. The development of the novel treatment is particularly accelerated by the COVID-19 pandemic due to the shortage of offline medical resources [23–25]. Several systematic review and meta-analysis have assessed the curative effect of internet-based psychological therapy in comparison with traditional cognitive behavioral therapy and come to the conclusion that both of them could achieve nearly equally significant effects on depression and anxiety [26–28]. Otherwise, internet-based psychological therapy shows added benefits of convenience, reduced stigma, and personalized care [29]. Globally, anxiety disorders remain underdiagnosed and undertreated. Therefore, further research on the combination of pharmacotherapy and psychotherapy and the extended application of new internet-based psychological therapy is necessary and meaningful.

Through the timeline analysis of references in Fig. 7C and keyword analysis in Fig. 6C, it can be noticed that topics such as "virtual reality", "fmri" have been emerging recently, manifesting the application of technological advancements in the field of anxiety disorders, especially for the treatment and diagnosis. For example, virtual reality (VR) has been applied to the diagnosis and treatment of mental health disorders, especially effective for anxiety disorders and posttraumatic stress disorder [30,31]. Functional magnetic

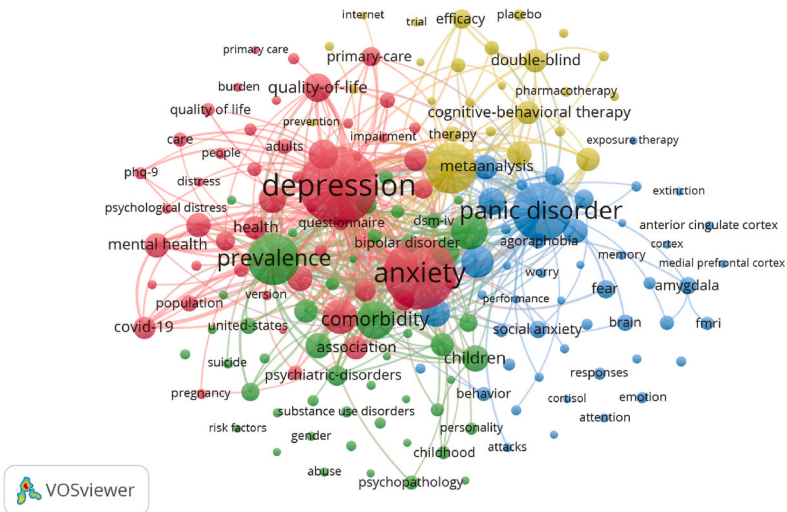
A



B



C



(caption on next page)

**Fig. 6.** Analysis of anxiety-related keywords. (A) The analysis of frequency of words with most occurrences over time in the past 20 years. (B) The visualization of occurrence of words over 30 frequencies annually. The nodes represent the year in which the words occur most frequently. (C) The network of co-occurrence of keywords over 200 frequencies annually.

**Table 6**

The analysis of top 20 keywords in terms of occurrences and total link strength.

Rank	Keyword	Occurrences	Total Link Strength
1	Depression	7280	58616
2	Anxiety	6431	50947
3	Prevalence	3822	32087
4	Comorbidity	2336	20856
5	Quality-of-life	1477	12198
6	Metaanalysis	1167	9940
7	Cognitive-behavioral therapy	1122	9885
8	Epidemiology	1114	9433
9	Adolescents	1103	9299
10	Covid-19	1041	7410
11	Scale	1008	8136
12	Amygdala	706	6161
13	Psychotherapy	526	4484
14	Psychopathology	525	4399
15	Follow-up	489	3976
16	Prefrontal cortex	480	3933
17	fMRI	442	4014
18	Functional connectivity	323	2639
19	Placebo-controlled trial	318	2576
20	Genetics	133	1123

**Table 7**

The top 10 references in terms of frequency of citations.

Rank	Article Title	Source Title	Author	Year	Cited	DOI
1	A brief measure for assessing generalized anxiety disorder - The GAD-7	ARCHIVES OF INTERNAL MEDICINE	Spitzer, Robert L.	2006	16574	10.1001/archinte.166.10.1092
2	Factors Associated with Mental Health Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019	JAMA NETWORK OPEN	Lai, Jianbo	2020	4345	10.1001/jamanetworkopen.2020.3976
3	The psychological impact of the COVID-19 epidemic on college students in China	PSYCHIATRY RESEARCH	Cao, Wenjun	2020	2904	10.1016/j.psychres.2020.112934
4	Anxiety disorders in primary care: Prevalence, impairment, comorbidity, and detection	ANNALS OF INTERNAL MEDICINE	Kroenke, Kurt	2007	2784	10.7326/0003-4819-146-5-200703060-00004
5	Threat-related attentional bias in anxious and nonanxious individuals: A meta-analytic study	PSYCHOLOGICAL BULLETIN	Bar-Haim, Yair	2007	2678	10.1037/0033-2909.133.1.1
6	Validation and standardization of the generalized anxiety disorder screener (GAD-7) in the general population	MEDICAL CARE	LOWE B	2008	2613	10.1097/MLR.0b013e318160d093
7	The Patient Health Questionnaire Somatic, Anxiety, and Depressive Symptom Scales: a systematic review	GENERAL HOSPITAL PSYCHIATRY	Kroenke, Kurt	2010	2577	10.1016/j.genhosppsy.2010.03.006
8	The size and burden of mental disorders and other disorders of the brain in Europe 2010	EUROPEAN NEUROPSYCHOPHARMACOLOGY	Wittchen, H. U.	2011	2474	10.1016/j.euroneuro.2011.07.018
9	Functional neuroimaging of anxiety: A meta-analysis of emotional processing in PTSD, social anxiety disorder, and specific phobia	AMERICAN JOURNAL OF PSYCHIATRY	Etkin, Amit	2007	2302	10.1176/appi.ajp.2007.07030504
10	Psychiatric Disorders in Children With Autism Spectrum Disorders: Prevalence, Comorbidity, and Associated Factors in a Population-Derived Sample	JOURNAL OF THE AMERICAN ACADEMY OF CHILD AND ADOLESCENT PSYCHIATRY	Simonoff, Emily	2008	2194	<a href="https://doi.org/10.1097/CHI.0b013e318179964f">https://doi.org/10.1097/CHI.0b013e318179964f</a>

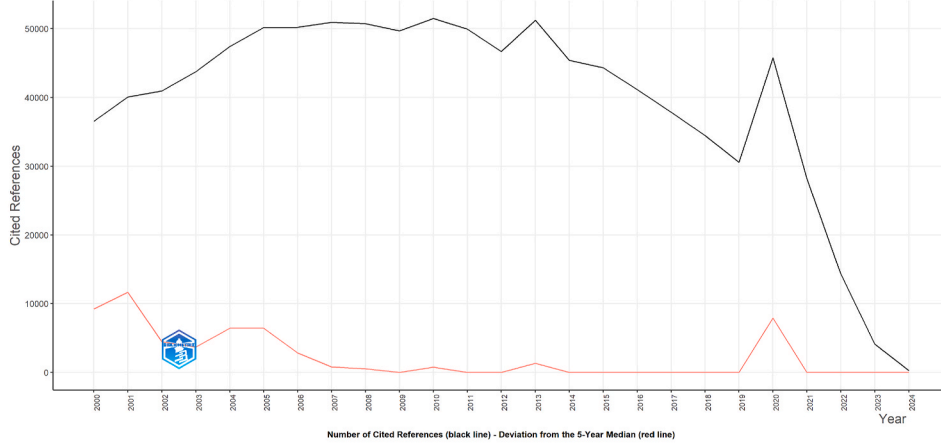
A

### Top 25 References with the Strongest Citation Bursts

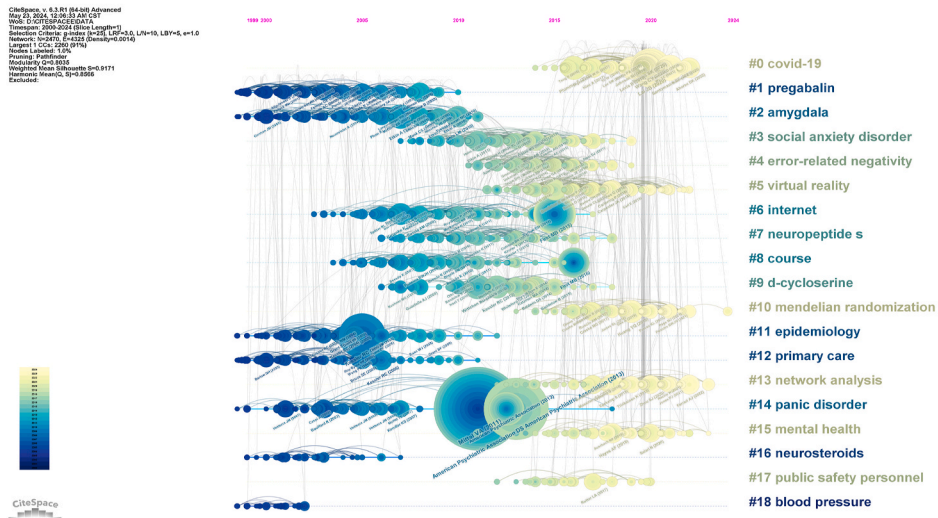
References	Year	Strength	Begin	End	2000 - 2024
Mittal VA, 2011, PSYCHIAT RES, V189, P158, DOI 10.1016/j.psychres.2011.06.006, <a href="#">DOI</a>	2011	237.24	2011	2013	
Kessler RC, 2005, ARCH GEN PSYCHIAT, V62, P593, DOI 10.1001/archpsyc.62.6.593, <a href="#">DOI</a>	2005	174	2006	2010	
Kessler RC, 2006, ARCH GEN PSYCHIAT, V63, P415, DOI 10.1001/archpsyc.63.4.415, <a href="#">DOI</a>	2006	43.82	2007	2011	
Kronke K, 2007, ANN INTERN MED, V146, P317, DOI 10.7326/0003-4819-146-5-200703060-00004, <a href="#">DOI</a>	2007	44.44	2008	2012	
American Psychiatric Association, 2013, DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS, V5th, P0	2013	43.36	2013	2018	
Etkin A, 2007, AM J PSYCHIAT, V164, P1476, DOI 10.1176/appi.ajp.2007.07030504, <a href="#">DOI</a>	2007	57.42	2009	2012	
Bandelow B, 2008, WORLD J BIOL PSYCHIA, V9, P248, DOI 10.1080/15622970802465807, <a href="#">DOI</a>	2008	40.67	2009	2013	
Shin LM, 2010, NEUROPSYCHOPHARMACOL, V35, P169, DOI 10.1038/npp.2009.83, <a href="#">DOI</a>	2010	45.31	2011	2015	
Wittchen HU, 2011, EUR NEUROPSYCHOPHARM, V21, P655, DOI 10.1016/j.euroneuro.2011.07.018, <a href="#">DOI</a>	2011	56.03	2012	2016	
American Psychiatric Association DS American Psychiatric Association, 2013, DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS, V0, P0	2013	330.46	2014	2018	
Kessler RC, 2012, INT J METH PSYCH RES, V21, P169, DOI 10.1002/mpr.1359, <a href="#">DOI</a>	2012	51.51	2014	2017	
Baldwin DS, 2014, J PSYCHOPHARMACOL, V28, P403, DOI 10.1177/0269881114525674, <a href="#">DOI</a>	2014	43.8	2015	2019	
Brühl AB, 2014, NEUROSCI BIOBEHAV R, V47, P260, DOI 10.1016/j.neubiorev.2014.08.003, <a href="#">DOI</a>	2014	40.35	2015	2019	
Bandelow B, 2015, DIALOGUES CLIN NEURO, V17, P327	2015	43.24	2016	2020	
Plummer F, 2016, GEN HOSP PSYCHIAT, V39, P24, DOI 10.1016/j.genhosppsych.2015.11.005, <a href="#">DOI</a>	2016	48.21	2018	2021	
Lai JB, 2020, JAMA NETW OPEN, V3, P0, DOI 10.1001/jamanetworkopen.2020.3976, <a href="#">DOI</a>	2020	95.84	2020	2024	
Wang CY, 2020, INT J ENV RES PUB HE, V17, P0, DOI 10.3390/ijerph17051729, <a href="#">DOI</a>	2020	83.06	2020	2024	
Brooks SK, 2020, LANCET, V395, P912, DOI 10.1016/S0140-6736(20)30460-8, <a href="#">DOI</a>	2020	66.76	2020	2024	
Huang YE, 2020, PSYCHIAT RES, V288, P0, DOI 10.1016/j.psychres.2020.112954, <a href="#">DOI</a>	2020	58.63	2020	2024	
Cao WJ, 2020, PSYCHIAT RES, V287, P0, DOI 10.1016/j.psychres.2020.112934, <a href="#">DOI</a>	2020	52.63	2020	2024	
Holmes EA, 2020, LANCET PSYCHIAT, V7, P547, DOI 10.1016/S2215-0366(20)30168-1, <a href="#">DOI</a>	2020	49.81	2020	2024	
Qiu JY, 2020, GEN PSYCHIAT, V33, P0, DOI 10.1136/gpsych-2020-100213, <a href="#">DOI</a>	2020	39.6	2020	2024	
Xiong JQ, 2020, J AFFECT DISORDERS, V277, P55, DOI 10.1016/j.jad.2020.08.001, <a href="#">DOI</a>	2020	57.86	2021	2024	
Pappa S, 2020, BRAIN BEHAV IMMUN, V88, P901, DOI 10.1016/j.bbi.2020.05.026, <a href="#">DOI</a>	2020	54.61	2021	2024	
Santomauro DF, 2021, LANCET, V398, P1700, DOI 10.1016/S0140-6736(21)02143-7, <a href="#">DOI</a>	2021	62.73	2022	2024	

B

### Reference Publication Year Spectroscopy



C



(caption on next page)

**Fig. 7.** Analysis of anxiety-related references. (A) Analysis of references with strongest citation burst. The stronger citation burst refers higher attention to the reference in the period. (B) Analysis of number of cited references. The black line refers to the number of cited references annually and the red line is the calibration curve. (C) The timeline analysis based on the clustering of references. The cluster is processed based on the similarity between references, with cluster #0 as the most significant. The size of each node represents the citations of each reference, and the links between nodes represent citation relationship.

resonance imaging (fMRI) has allowed researchers to observe brain activity in real-time, identifying specific neural circuits involved in anxiety [32,33]. Although the emergence of new technologies is encouraging, it should be noted that further verification to the efficacy and indications of these new methods needs to be determined.

#### 4.3. Mechanisms of anxiety disorders

As is shown in Fig. 6A, B and 6C, keywords related to the physiological factors of anxiety disorders such as “brain”, “psychopathology”, “mechanism” indicates that another of the main focuses of the research of anxiety disorders is to unravel the neuro-pathophysiology of these disorders.

Based on Fig. 6C, “anterior cingulate cortex”, “medial prefrontal cortex” and “amygdala” are closely related to anxiety disorders, which demonstrates the focus on the neural circuits. For example, research show that the ventral mPFC–BMA projection implements top-down control of anxiety state [34]. Besides, chronic stress exposure selectively regulates the prefrontal cortex’s control over specific groups of neurons in the amygdala, ultimately causing excessive anxiety [35]. These interconnected structures influence each other, forming complex neural circuits that regulate emotional behaviors. Many studies have examined how specific brain regions contribute to anxiety and anxiety-like behavior, focusing on their role in promoting neuroinflammation and affecting neurotransmitter metabolism [36–38].

Furthermore, based on the keywords such as “responses”, “cortisol”, and “noradrenergic function”, it can be noticed that research on neuroendocrine function is also one of the research hotspots. Functionally, the key mechanisms in the pathogenesis of anxiety disorders include inflammation, oxidative stress, and various neurotransmitter systems. For example, the function of neuro-inflammation in the development of anxiety disorders had been demonstrated by numbers of animal models and clinical trials employing neuroimaging, optogenetics, and biochemical techniques [39]. Additionally, multiple neurotransmitters are involved in the development of anxiety disorders. Two primary neurotransmitters, GABA and glutamate, play crucial roles, along with others such as serotonin, norepinephrine, and dopamine [40–42].

The keyword “genetics” reveals the attention to the genomics research on the anxiety disorders. The field of anxiety disorders has witnessed significant advances in understanding genetic underpinnings. Recent studies have identified specific genetic markers in anxiety disorders [43,44]. For example, one pivotal study by Meier et al. revealed significant candidate gene PDE4B as a robust risk locus related to the occurrence of anxiety disorders through a large-scale genome-wide association study (GWAS) [45]. Notably, new insights of application of artificial intelligence (AI) models based on deep learning (DL) into the functional predictions in genomics research is hopeful to create remarkable achievements in the field of anxiety disorders [46]. Although it is foreseeable that the application of AI models will be increasingly adopted into the field of anxiety disorders, more validations are needed to confirm the reliability.

#### 4.4. Anxiety and COVID-19

In the timeline analysis of references, the cluster #0 is identified as covid-19, which symbolized the most important cluster. COVID-19 also frequently appears in our analysis, which proves the essential role in the field of anxiety disorders. In December 2019, a series of acute, atypical respiratory diseases was reported firstly in Wuhan, China. With the subsequent researches, the disease caused by a novel coronavirus was named coronavirus disease 2019 (COVID-19) [47,48]. Despite the subsiding of the epidemic’s peak, it remains essential to review and investigate the psychological problems, including anxiety and depression that have arisen during this crisis. Such investigations will contribute to a deeper understanding of the mechanisms underlying anxiety disorders and the development of improved treatment strategies, thus reducing the burden of illness and improving the quality of life of those affected.

The high attention of COVID-19 is multifactorial. On one hand, from the perspective of public awareness, the psychological burden caused by the COVID-19 pandemic to people all over the world is heavy and significant. Numerous studies have demonstrated that the COVID-19 pandemic has significantly increased the prevalence of various mental illnesses, particularly depression and anxiety [8, 49–51]. It can be attributed to reasons such as unemployment, social isolation, and difficulty in obtaining medicines caused by the epidemic [50,52]. What’s more, it is reasonable to believe that the sense of unsafety and fear facing the most severe public health affair aggravated anxiety symptoms so as to increase the prevalence of anxiety disorders.

On the other hand, from the perspective of pathological mechanism, the pathological reactions caused by COVID-19 may physiologically promote the occurrence of anxiety disorders. It is believed that the interaction between neural circuits and neuro-inflammation may promote the occurrence and development of neurological symptoms. Consequently, the neuroimmune response triggered by COVID-19 infection may play a pivotal role in the manifestation of anxiety and depression during pandemics [52,53]. This neuroimmunity may involve mechanisms including direct infection with COVID-19 virus, immune responses induced by viral infection such as cytokine storms and potential neurotropism of COVID-19 [54–57].

In summary, the recent increasing attention to the relationship between COVID-19 and anxiety disorders can be attributed to the

social and pathological factors. Therefore, the analysis to epidemiological factors can help researchers and policymakers understand group psychology during global health events, providing valuable experience for managing epidemics. Additionally, further exploration of the mechanisms behind COVID-19-induced anxiety and depression will enhance our understanding of anxiety and other mental disorders, offering insights to refine current theories.

#### 4.5. The comorbidity between depression and anxiety disorders

In the analysis of keywords related to anxiety disorders, the term “depression” emerges more frequently than “anxiety”, suggesting a strong relationship between the two. Some reports indicated that individuals with any form of mental disorder are at an elevated risk of developing other mental disorders [58], and among these, depression and anxiety exhibit a high degree of comorbidity [59–61]. Besides, in a study on the comorbidity of anxiety and depression in patients with epilepsy, the comorbidity rate reached to 29.1 % [62]. These studies show a strong correlation in the occurrence between anxiety and depression. Patients with anxiety and depression simultaneously show lower levels of physical and mental functioning than patients with pure anxiety or depression. These impairments include but are not limited to physical disabilities, social and interpersonal difficulties, academic challenges, and even suicide attempts [63–65]. The common comorbidity may suggest that we should pay more attention to subclinical anxiety or depression symptoms that appear before the development of identifiable anxiety disorders or depression disorders in clinical practice and provide timely intervention, through which the medical staff can prevent the patient from suffering the disease.

Through the analysis of keywords, “cortisol”, “anterior cingulate cortex” and “medial prefrontal cortex” are identified as the core keywords about mechanisms in the comorbidity of anxiety and depression disorders, which indicates that changes in the neuroendocrine system and neural structure are the main common pathogenic mechanisms of comorbidity of anxiety and depression. For example, a number of studies have suggested that the dysfunction of the hypothalamic-pituitary-adrenal axis (HPA) axis and elevated cortisol levels are the common causes of depression and anxiety [66–68]. Besides, frontal limbic changes and dysregulation of the serotonergic system in the CNS are considered to be one of the common core causes of major depressive disorder and anxiety disorders in most cases [69,70]. The overlapping of pathogenesis may be the explanation of comorbidity. However, the comorbidity may cause ambiguity in diagnosis and treatment. Further research is needed to clarify the boundary between anxiety and depression disorders, including pathological explanations and clinical manifestations, in order to provide precise and personalized treatment plans for patients.

## 5. Conclusion

In this paper, we conducted a comprehensive bibliometric and visual analysis of anxiety disorders over the past two decades, including the topics, frontiers, and hotspots in the field. The findings highlight that the most cited article is “A brief measure for assessing generalized anxiety disorder - The GAD-7” published by Robert L. Spitzer et al., in 2006, and *Jama Psychiatry (Archives of General Psychiatry)* emerges as the authoritative journal. The popular hotspots mainly focus on three aspects: advanced treatments based on pharmacotherapy, psychotherapy and digital interventions, mechanism exploration to anxiety disorders based on neurobiological and genetic basis, influence of social and environmental factors on the onset of anxiety disorders. This study aims to provide researchers with the current trending and information of the field and help them to grasp the hotspots.

## 6. Advantages and limitations

This article presents the first bibliometric analysis specifically focused on anxiety disorders, identified through a comprehensive literature search. Given the increasing incidence rate of anxiety disorders, this study holds significant implications for both clinical practice and academic discourse. The Web of Science (WoS) is among the most authoritative databases in the international academic community, with high international recognition. This study used the WoSCC database for literature retrieval, ensuring the quality of the selected articles. The research utilized three software tools for analysis: VOSviewer, CiteSpace, and Bibliometrix. By employing rich visualizations and highlighting shifts in research focus over time, this study enables researchers to gain a comprehensive understanding of the foundational knowledge and evolutionary trajectory within the field over the past 20 years. Such insights facilitate the prediction of research hotspots and frontiers, thereby offering valuable reference points for future studies.

However, this study has several limitations. First, it used data exclusively from the WoSCC database, excluding other databases such as PubMed, Cochrane Library, and Google Scholar. Although WoSCC is comprehensive and reliable, potential gaps may exist in its data coverage. Second, the study included only English-language literature. While this ensures a level of credibility and consistency, it may also introduce bias by excluding significant research published in other languages. We acknowledge this limitation and suggest that future studies should include non-English publications to provide a more comprehensive view of the research landscape. Addressing this limitation may require significant resources to translate and organize non-English publications, but it is a necessary step to reduce language bias. Lastly, some biases might persist due to variations in institution or journal names over time. Despite manual proofreading and screening to remove or merge irrelevant or duplicate data, some biases may still remain.

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### Data availability statement

The author is committed to providing all raw data essential for supporting the conclusions drawn in this article, without any reservation.

### CRediT authorship contribution statement

**Gui-Yu Liu:** Writing – original draft, Visualization, Validation, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Ming-De Yan:** Writing – original draft, Visualization, Validation, Software, Methodology, Formal analysis, Data curation. **Yi-Yin Mai:** Visualization, Validation, Software, Resources, Methodology, Formal analysis. **Fan-Jia Fu:** Validation, Supervision, Software, Methodology. **Lei Pan:** Visualization, Validation, Software, Resources. **Jun-Ming Zhu:** Visualization, Validation, Resources. **Wen-Juan Ji:** Writing – original draft. **Jiao Hu:** Writing – original draft. **Wei-Peng Li:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization. **Wei Xie:** Writing – review & editing, Funding acquisition.

### Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Wei Xie reports financial support was provided by National Natural Science Foundation of China. Wei-Peng Li reports financial support was provided by China Postdoctoral Science Foundation. Wei-Peng Li reports financial support was provided by Medical Scientific Research Foundation of Guangdong Province. Wei Xie reports financial support was provided by College Students Innovation and Entrepreneurship Training Program Project of Southern Medical University. Wei Xie reports financial support was provided by Key Discipline Construction Project of Traditional Chinese Medicine of Guangdong Province. Wei Xie reports financial support was provided by The second national famous Traditional Chinese Medicine Inheritance Studio. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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