


REVIEW

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# Global research trends in mind body therapies: a bibliometric analysis

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## Abstract

**Objectives** Mind-body therapies are a group of treatments based on the theory of mind-body medicine, which are effective for a wide range of illnesses. However, there are no bibliometric papers that have examined the topic of mind-body therapies. Therefore, it is necessary to review and sort out the current status, hotspots and frontiers of mind-body therapies.

**Methods** Studies related to mind-body therapies during the period of Web of Science 1999-01/2024-07 were searched, and R language was applied to analyze the data and CiteSpace, Vosviewer software, was used to generate visualization maps.

**Results** A total of 29,710 relevant articles were included in the study. The country with the highest number of publications was the United States, followed by China and the United Kingdom, and the prolific author was Wang Yuan. Common keywords were acupuncture, quality of life, depression, and pain. The current study focuses on the promotion and application of mind-body therapies in various diseases, the main applicable diseases and the application in special groups.

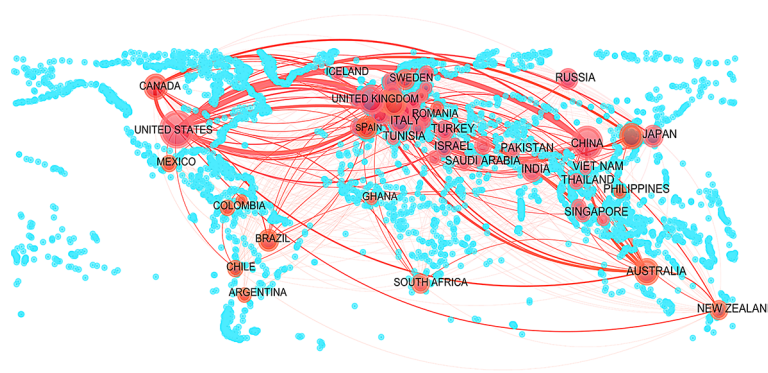
**Conclusion** This study presents the current status and trend of research on mind-body therapies, and inflammatory interventions and higher-level research assessment methods are potential hotspots, which can help researchers to clarify hotspots and explore new directions.

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**Graphical Abstract****Global research trends in Mind body therapies :  
A Bibliometric Analysis**

MBT are widely used for various systemic diseases such as cancer.

Acupuncture, meditation, and psychology are now mainstream MBT.

MBT are effective for illnesses in special groups such as women, the elderly, adolescents and children.

Overview of the state of global research

Research focus

**Keywords** Bibliometric analysis, CiteSpace, VOSviewer, Mind-body therapies, Visualization

**Introduction**

Mind body therapies (MBT) are a group of therapies based on theories such as psychosomatic medicine, which emphasize the combined use of the brain and body, and the use of a variety of therapies to promote physical and mental health. Most of these therapies are based on ancient practices such as yoga, tai chi, meditation, and acupuncture, and have similar concepts and applications to MBT in traditional medicine in different regions. Contemporary MBT encompass three core modalities: (1) Cognitive Optimization Therapies (e.g., meditation, positive psychology), utilizing neuroplasticity-enhancing training to improve executive function through cognitive reframing and attentional control; (2) Dynamic Somatic Therapies (yoga, tai chi, qigong), achieving psychophysiological equilibrium via biomechanical alignment and synchronized breath-energy modulation; (3) Deep Relaxation Modalities (breathwork, hypnotherapy), attenuating stress biomarkers through targeted parasympathetic nervous system activation. Meditation is used to improve an individual's core mental abilities through mental exercises such as those related to attention and emotional self-regulation. These exercises lead to neuroplastic changes in the structure and function of brain regions involved in the regulation of attention, emotion, and self-awareness [1]. Therapies such as yoga and qigong are used to improve physical and mental health and quality of life (QoL) by combining muscular activity, respiratory regulation, and the training of concentration [2–4]. Positive psychology is considered an interdisciplinary field linking psychology and neuroscience, which combines

humanistic philosophy with the principles of neuroplasticity to improve cognition and thus increase positive feelings and behaviors [5–7]. This means that the application of positive psychology can not only be used for disease intervention, but also improve people's mental toughness, promote mental health, adjust physical and mental state, and prevent disease [8]. In addition, therapies such as acupuncture and Chinese herbal medicine, which are mind-body regulating therapies that are based on the theories of traditional Chinese medicine, can directly or indirectly They can adjust the patient's physical and mental state and relieve the patient's pain and perceived stress [9]. A study in the United States surveyed the use of MBT in middle-aged adults three times between 1995 and 2015, and the results showed that 17–20% of adults participated in the practice of MBT. Since special populations are not included, the proportion of MBT used in the clinic may be higher [10]. Increasingly, healthy people or patients are using MBT to promote their health or to improve their clinical symptoms.

With the rapid advancement of science and technology, medical research continues to advance. However, there are still many clinical challenges to be overcome. Psychosocial factors, such as anxiety, depression, and psychosocial stress, can directly affect the body's physiological functioning and health outcomes, and the body's discomfort also has a direct impact on psychological states. Since George Engel (1977) proposed the Biopsychosocial Model (BPSM), it has gained increasing acceptance and use in medicine. However, some researchers have criticized the BPSM as lacking meaningful scientific

content and as being vague, lacking scientific validity and philosophical coherence [11]. In actual clinical practice, psychosocial factors have been overlooked or ignored in many clinical situations [12–14]. MBT are specific treatments under the BPSM, which as a form of complementary and alternative medicine, can achieve medical cures, but their scientific validity is likewise not recognized to a certain extent [15–17]. Long before the 20th century, there was a wealth of research demonstrating the significant positive impact of a variety of mind-body therapies in treating coronary artery disease, headaches, insomnia, incontinence, chronic low back pain, cancer, and other disorders in terms of therapeutic efficacy and improved post-surgical outcomes. However, due to the subjective nature of how MBT are evaluated and the unknown mechanisms of action, there is an urgent need to increase clinical efficacy studies, neurobiological studies, and methodological studies in this field to identify new ways to evaluate the effectiveness of MBT and to clarify the mechanisms of action [18]. The lack of evaluation methods and criteria appropriate for MBT, and the lack of high-grade, well-designed experiments and evidence support have objectively affected research on MBT and are not conducive to paradigm shifts and advances in medicine [19]. In the past 20 years, the application of MBT has been expanding, and the increase in studies with higher levels of evidence has led to a deeper understanding of the mechanisms of action and efficacy of MBT. Researchers have gained a deeper understanding of the neurobiological, physiological, and genomic changes associated with MBT, including activation of specific brain regions, increased heart rate variability, inhibition of stress-induced inflammatory pathways, and increased telomerase expression [20]. At the same time, MBT have the advantages of clinical urgency, easy public access, relatively high social acceptance, and low cost, and can play a dominant role in many disorders, especially when interventions such as drugs are not appropriate. Therefore, research on MBT is of great significance for the development of medicine and the improvement of the efficiency of clinical diagnosis and treatment as well as the saving of treatment costs, and helps to cultivate a healthy mind and increase the sense of well-being. At the same time, the literature on this topic has been increasing in recent years, and it is necessary to conduct in-depth bibliometrics research on publications, countries, institutions, journals, authors and keywords in this field. Bibliometric analysis is a research method that uses statistical methods to quantitatively analyze various aspects of a publication. It is mainly used to quantitatively analyze the progress and dynamic changes in a particular field of study, and has the characteristics and advantages of being convenient, comprehensive, and accurate. Bibliometric analysis allows visualization of content in the form of

graphs and charts to obtain the history of development, research progress and emerging topics in a particular discipline and to highlight the contribution of various research teams/institutions/countries. Academic gaps can be identified from bibliometric findings, facilitating the breakthrough of disciplinary bottlenecks. To sort out the development history and research status of MBT, we will use CiteSpace and VOSviewer software to conduct the bibliometric analysis and present the research trends and hotspots in the form of graphs and charts in a comprehensive, scientific and visual way, which will provide the basis for future academic trends.

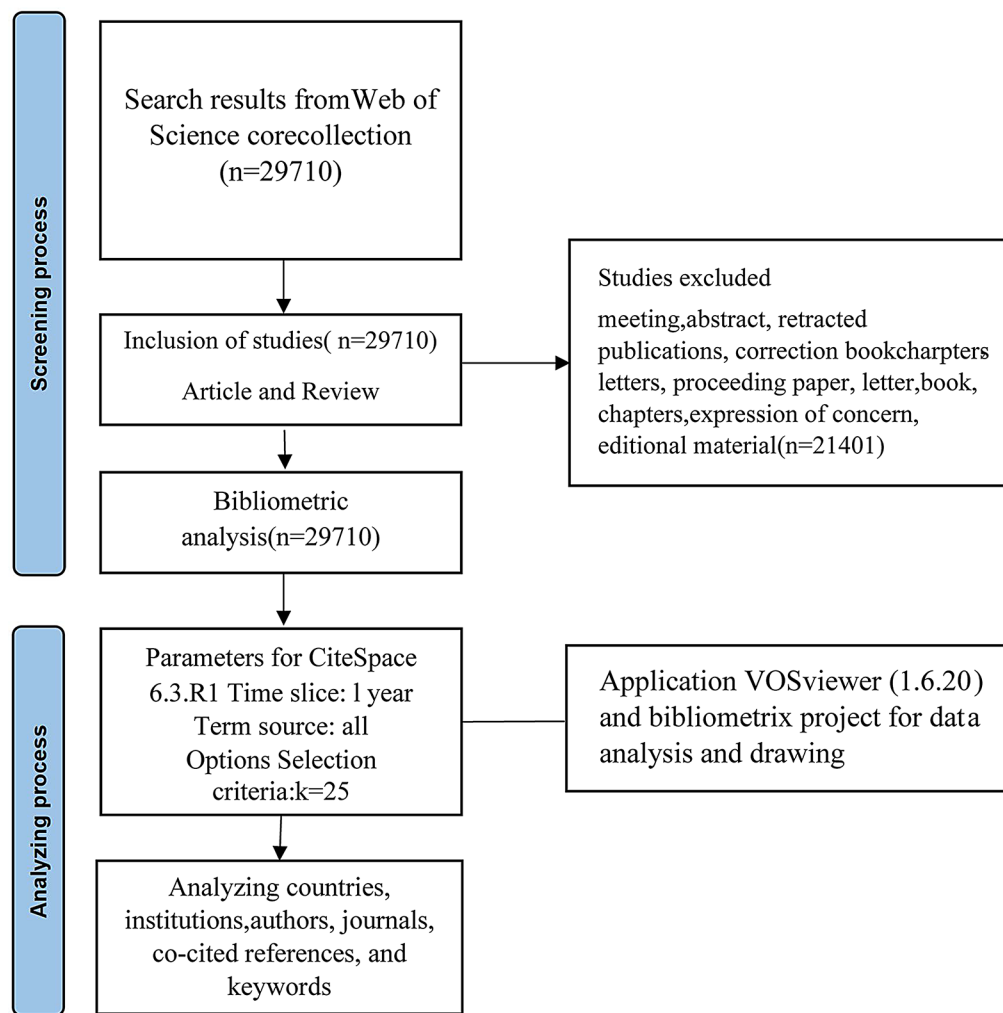
## Methods and materials

### Data sources and search strategy

Data were collected from the Web of Science (WoS) Core Collection database, the search terms were as follows: Title="MBT" OR "Mind Body Therapies" OR "MBT" OR "therapies, Mind-Body" OR "therapy, Mind-Body" OR "MBT" OR "Mind Body Medicine" OR "Yoga" OR "meditation" OR "Tai Chi" OR "Relaxation Therapy" OR "imagery, Psychotherapy" OR "Hypnosis" OR "Biofeedback" OR "Psychology" OR "acupuncture". The search was restricted to English-language "Articles" and "Review Articles". Editorial materials, conference abstracts, correspondence, and book chapters were excluded. The literature screening process is presented in Fig. 1. The search covered from the database's establishment to April 17, 2024. Two researchers independently collected data. Discrepancies in the results were resolved through consensus-building via negotiation or consultation with experts. Finally, a total of 29,710 articles matched the inclusion criteria of the research.

### Bibliometric analysis

The retrieved literature was exported from the database in text file format, and the exported catalog mainly contains the title, abstract, keywords, author, country, institution, publication year, journal and other information. The data were imported into the R package "Bibliometrix", CiteSpace(v6.3.R1) and VOSviewer (v1.6.20) for subsequent bibliometric analysis. VOSviewer is a software tool for visualizing and analyzing scholarly citation networks. Using VOSviewer, researchers can explore relationships between research hotspots and identify domain hotspots [21]. Similar to VOSviewer, CiteSpace not only supports visual analysis based on literature citation network but also offers a series of analysis methods, including cluster analysis, co-occurrence analysis, burst word analysis, time graph analysis and co-citation analysis. These methods can comprehensively demonstrate important research topics, hot spots and their evolution in the academic field, and highlight influential papers and their citations [22]. In the network diagram generated



**Fig. 1** Article selection process

by VOSviewer and CiteSpace, nodes can represent different countries, institutions, authors, or keywords. The size of a node reflects the number of publications associated with it, while different colors indicate different clusters or years. Lines between nodes show collaboration or reference relationships. Bibliometrix is a package that must be used in the R software environment, with more powerful and general literature analysis capabilities, primarily for quantitative analysis, and enables a greater degree of customization [23]. This paper uses R package “Bibliometrix”, to conduct quantitative statistics of data of countries, authors and institutions, and draw Sankey diagrams and thematic words diagrams; VOSviewer is used to create co-occurrence and density maps for authors, institutions, and keywords; CiteSpace is used for keyword cluster analysis, keyword time zone map, burst word analysis and reference co-citation analysis. In addition, Bibliometrix is combined with VOSviewer for global geographic visualization of publications. Subject visualizations generated on the scientific WOS database

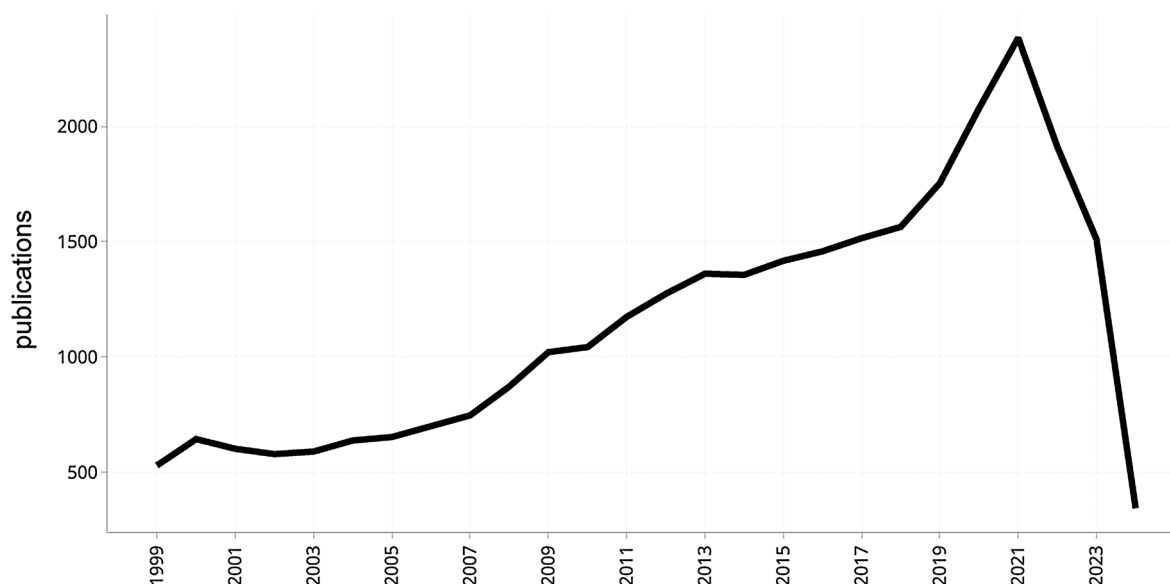
website are also incorporated with a view to a comprehensive analysis of the MBT.3. Results.

#### Overview of publication status

According to the search strategy, 29,710 articles were screened from the WoSCC database from 1999 to 2024 (Fig. 2). The average number of citations per paper was 25.80, including 10 articles with more than 1500 citations. Overall, 64,012 authors from 102 regions and countries have published literature on MBT in 3,867 journals worldwide.

Publications on MBT have increased significantly over the past 24 years, with the highest number of related articles published in 2021, accounting for about 8% of all original articles on MBT. This study conducted a statistical analysis on the publication time and citation volume of the 29,717 literatures included. The trend of annual publications is shown in Fig. 2. The annual publication volume in this field has been generally increasing. In the initial stage of the study (1999–2007), the number





**Fig. 2** Annual publication volumes and average citations per year in the field of MBT

of publications increased slowly, while in the later stage (2008–2021), it increased rapidly and reached its peak in 2021. Since 2021, the publication volume has shown a slight decline, but the number of publications remains high.

#### Countries and institutions analysis

Since 1999, a total of 102 countries have published articles related to MBT, of which 9 have published more than a hundred. In the top 10 countries are the United States, China, United Kingdom, Germany, Australia, South Korea, Canada, Spain, Italy, India. It shows that these countries have invested more attention in the field of psychosomatic medical research. The countries with high centrality ( $>0.10$ ) are United States, Spain, United Kingdom, Australia, indicating that these four countries occupy an important position in international cooperation. United States provided a total of 10,448 articles, accounting for 35.2% of the total number of publications (Fig. 3 A, B).

A total of 8,418 research institutions participated in the research of MBT, of which 150 institutions published more than 100 relevant papers. The top 10 research institutions by a number of publications are Harvard University, the University of California System, Kyung Hee University, Harvard Medicine School, China Medical university Taiwan, Guangzhou University of Chinese Medicine, Beijing University of Chinese Medicine, Chengdu University of Chinese Medicine, China Academy of Chinese Medical Sciences and the University of California Los Angeles. (Fig. 3C). Harvard University is the most prolific institution, with 1051 publications. Institutions with high centrality include Harvard

University, the University of California System, and the University of London.

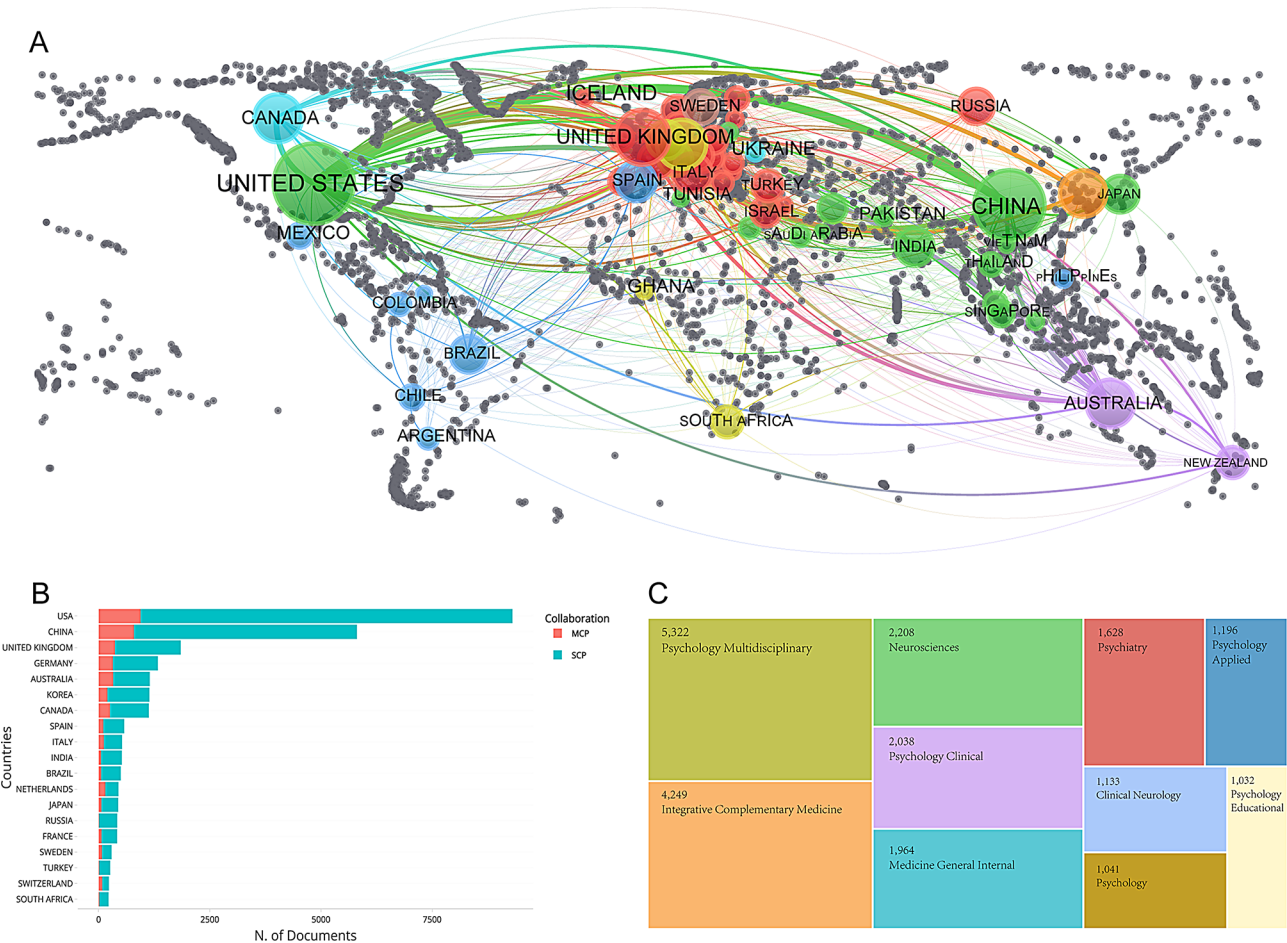
#### Authors analysis

64,012 authors contributed to publications in the field of psychosomatic medicine, of which 69 published more than 50 articles. The top 10 authors for both publications and citations are from China, South Korea, the United Kingdom, the United States, and Germany. WANG Y published the most articles (200), followed by LI Y(163) and Kim E. Innes (157). Similarly, the number of citations is also an important indicator to measure the quality and influence of an article. Hugh MacPherson, Klaus Linde, and Claudia Witt are the authors who have published articles with more than 2100 citations (Table 1).

The cooperative network diagram is in a dispersed state, and the author centrality is low, indicating that the current academic community has not yet formed a good cooperative relationship and the scientific research power is relatively dispersed (Fig. 4).

#### Journal analysis

A total of 3867 journals have published articles related to MBT, of which 47 journals have published more than 100 articles. Identification magazine is Evidence - most-based Complementary and Alternative Medicine, Medicine, Journal Of Alternative and Complementary Medicine, Acupuncture in Medicine, Teaching Of Psychology, Frontiers In Psychology, Complementary Therapies In Medicine, Plos One, American Psychologist, Trials. The top 10 journals were dominated by those in the JCRQ1 and Q3 regions (Table 2).



**Fig. 3** Country collaboration network (A) and Number of national publications (B), single country publication (SCP) means that the authors of the article are all from the same country, and multiple country publication (MCP) means that the authors of the article are from more than one country. Top 10 disciplines related to physical and mental medicine (C) in the field of MBT

**Keyword analysis**

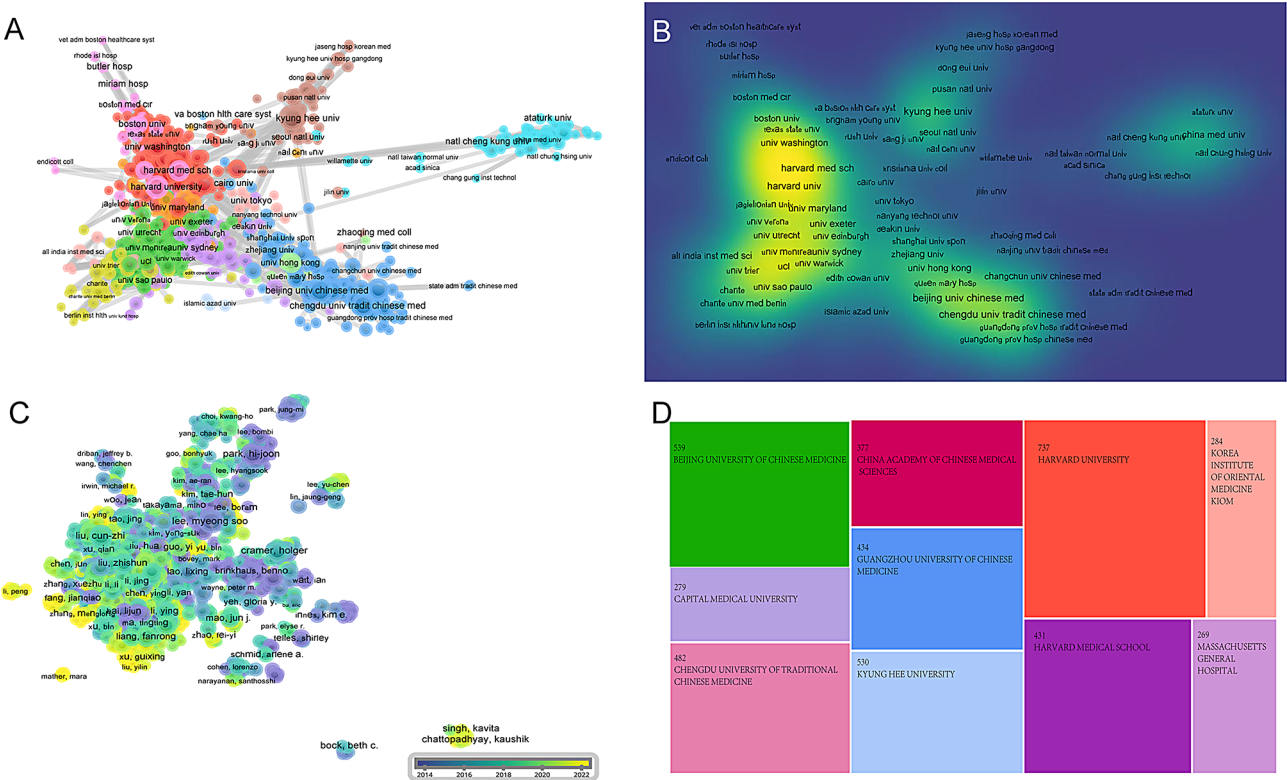
Through the analysis of the keywords of the literature, the research hotspots and core contents of this field can be discovered. This paper conducted a keyword co-occurrence analysis of the literature on MBT through VOSviewer, and a total of 54,542 keywords were identified. As shown in Fig. 6A, the co-occurrence of keywords in the field and the 6266 keywords based on more than 5 occurrences are listed based on the keyword mediation centrality ( $>0.1$ ) and frequency of occurrence. Nodes in the graph said keywords, the same color of the nodes represent the connection between the keywords closely, the size of the node with the keyword frequency is proportional to the centrality, lines represent the links between nodes, the thickness of line and representative keywords co-occurrence frequency. Keywords in this field mainly included acupuncture, QoL, depression, pain, management, electroacupuncture, randomized controlled trials, exercise, systematic review, anxiety, stress, meta-analysis, prevalence, women, mindfulness, among which QoL, management, and electroacupuncture had

better centrality (Table 3). Figure 6D shows the top 50 frequency-ranked keywords and their proportion, clearly demonstrating the research focus in this field.

Based on the co-occurrence clustering of keywords, the keywords are divided into six clusters: Cluster #0 (green), acupuncture; Cluster #1 (blue), electroacupuncture; Cluster #2 (purple), meditation group; Cluster #3 (red), psychology group; Cluster #4 (yellow), yoga and tai chi group; Cluster #5 (light blue), women's group. Among them, Cluster #0 mainly includes keywords such as acupuncture, management, breast cancer, QoL, and effectiveness, while Cluster #1 includes keywords such as brain, magnetic resonance imaging, cancer pain, chronic pain, asthma, rhinitis, mainly related to cognitive disorders and pain. Cluster #2 mainly includes keywords such as meditation, emotion regulation, anxiety, depression, heart rate variability, and cognitive behavioral therapy. Cluster #3 mainly includes keywords such as positive psychology, health, education, and happiness, focusing on children, especially adolescents. Cluster #4 has the main keywords of yoga, tai chi, physical activity, and

**Table 1** The top 10 authors by number of publications and citations

Rank	Authors	Articles	Country	Institution	Author	Local Citations	Country	Institution
1	Yuan Wang	200	China	Chengdu University of Traditional Chinese Medicine	Hugh MacPherson	2789	United Kingdom	University of York
2	LI Y	163	China	Zhongshan School of Medicine	Klaus Linde	2652	Germany	Technical University Munich
3	LEE H	157	South Korea	College of Korean Medicine	Claudia Witt	2141	Germany	Charite University Medical Centre
4	Yong Zhang	154	china	Shenyang Coloproctology Hospital	Benno Brinkhaus	2136	Germany	Charite University Medical Centre
5	LEE MS	150	South Korea	Korea Institute of Oriental Medicine	Edzard Ernst	2086	United Kingdom	University of Exeter
6	Fan-rong Liang	141	china	Chengdu University of Traditional Chinese Medicine	LEE H	1967	South Korea	College of Korean Medicine
7	PARK HJ	138	South Korea	College of Korean Medicine	Holger Cramer	1953	Germany	University of Duisburg-Essen
8	jiang Wang	135	china	Tianjin University,	Karen J Sherman	1819	United States	Washington Health Research Institute
9	Jun Li	131	china	Suzhou Hospital of Traditional Chinese Medicine	Li Xing Lao	1809	china	The University of Hong Kong
10	Lin Wang	127	China	The First Affiliated Hospital of Guangzhou University of Chinese Medicine	Stefan N Willich	1754	Germany	Charité University of Berlin



**Fig. 4** The network of co-authors (A), The co-occurrence density map of research institutions (B), timeline Chart of (C), The color represents the time when the keyword appears, from blue to yellow, the closer the color is to blue, the earlier the keyword appears, the closer the color is to yellow, the later the keyword appears. Top 10 countries (D) in the field of MBT

**Table 2** Top 10 most published and top 10 cited magazines

Rank	Sources	Articles	IF(JCR 2023)	JCR quartile	Sources	Articles	IF(JCR 2023)	JCR quartile
1	EVIDENCE-BASED COMPLEMENTARY AND ALTERNATIVE MEDICINE	815	2.65	Q3	AMERICAN PSYCHOLOGIST	13,079	16.4	Q1
2	MEDICINE	704	1.6	Q3	J PERS SOC PSYCHOL	12,270	7.6	Q1
3	JOURNAL OF ALTERNATIVE AND COMPLEMENTARY MEDICINE	540	2.6	Q3	J ALTERN COMPLEM MED	10,332	2.6	Q3
4	ACUPUNCTURE IN MEDICINE	497	2.5	Q3	EVID-BASED COMPL ALT	9119	2.65	Q3
5	TEACHING OF PSYCHOLOGY	443	0.9	Q4	PAIN	8973	7.4	Q1
6	FRONTIERS IN PSYCHOLOGY	380	3.8	Q1	PLOS ONE	8310	3.7	Q2
7	COMPLEMENTARY THERAPIES IN MEDICINE	369	3.6	Q2	ACUPUNCT MED	6905	2.5	Q3
8	PLOS ONE	302	3.7	Q2	PSYCHOL BULL	6427	22.4	Q1
9	AMERICAN PSYCHOLOGIST	286	16.4	Q1	JAMA-J AM MED ASSOC	6268	120.7	Q1
10	TRIALS	277	2.5	Q4	LANCET	6011	168.9	Q1

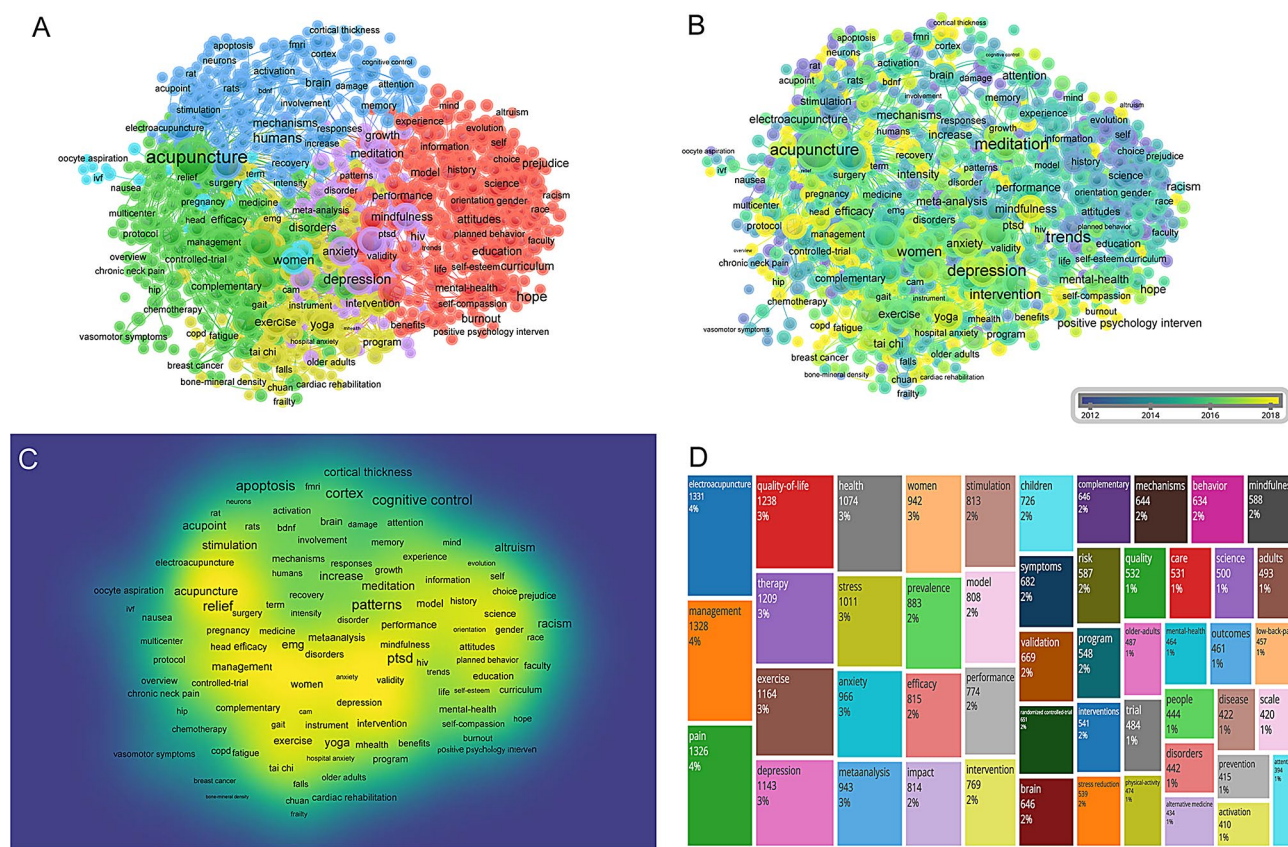
**Table 3** Top 10 keywords in frequency and top 10 keywords in centrality on Mind-Body therapies

Rank	Frequency	Keywords	Centrality	Keywords
1	1119	quality of life	0.03	community
2	972	management	0.03	bibliometric analysis
3	895	electroacupuncture	0.03	associations
4	879	therapy	0.02	electroacupuncture
5	873	randomized controlled trial	0.02	physical-activity
6	869	depression	0.02	predictors
7	825	exercise	0.02	strategy
8	790	pain	0.02	depressive symptoms
9	783	health	0.02	distress
10	761	systematic review	0.02	history

stroke, and its main research object is the elderly. Cluster #5, the female group, has the core keywords of women, pregnancy, childbirth, pain relief, infertility, labor, and physical exercise. From the keyword clustering labels, it can be seen that holistic therapy is more often viewed as an alternative therapy, relying on the guidance of clinical doctors and social support, through various therapies to improve the QoL of patients with various diseases and alleviate symptoms. From the time chart (Fig. 6B) and time zone chart (Fig. 7D), we can infer that academic research on holistic therapy emerged in the 1990s or even earlier. Research on holistic therapy related to anxiety, cancer, pregnancy, etc. has attracted researchers' attention in 1999 or earlier. Research themes such as cancer, QoL, tai chi, meditation, etc. appeared in 2001–2007, and high-level research methods such as randomized controlled trials also began to be used in this research field. Furthermore, by analyzing the sudden keywords, we can explore the overall trend changes and current research hotspots of holistic therapy. As shown in Fig. 5D, the “Year” column indicates the year when the keyword

first appeared, and “Strength” represents the emergence strength of the keyword. The larger the numerical value, the greater the keyword's influence. The blue line represents the time axis, and the red part represents the sudden duration of the keywords. In addition, “Start” and “End” indicate the starting and ending years of the outbreak. The main outbreak words in the field of MBT from 1999 to 2003 are behavior, children, analgesia, issue, relaxation, pain, science, psychotherapy, memory, placebo, humans, information Stimulation, and evolutionary psychology. The outbreak words in this stage have higher intensity and longer duration. This indicates that the main research content of MBT in this stage is focused on the research of the mechanisms of MBT, the research object of MBT, and the theoretical discussion on the relationship between MBT and psychology. The application of MBT in pain relief and relaxation also attracted people's attention. From 2004 to 2018, 4 keywords broke out: placebo needle, osteoarthritis, knee, human brain, and fmri. This shows that at this stage, the research focus of MBT mainly includes the following aspects. First, it aims to address psychological issues such as mental breakdowns through the application of cognitive behavioral therapy and other treatments. The second is to provide objective evidence for MBT intervention in diseases such as cognitive impairment through magnetic resonance imaging and other detection methods. In addition, research has focused more on the use of MBT in specific diseases such as osteoarthritis and the psychological effects of placebo. The emerging keywords for MBT from 2019 to 2024 are systematic review, network meta-analysis, inflammation, bibliometric analysis, and case report. These four keywords appeared later and have continued to the present day, and are the frontier of research in MBT. The burst words are mostly related to systematic reviews and case reports, showing that research on MBT has become relatively mature, moving from basic research to clinical trials and aiming for higher evidence levels.





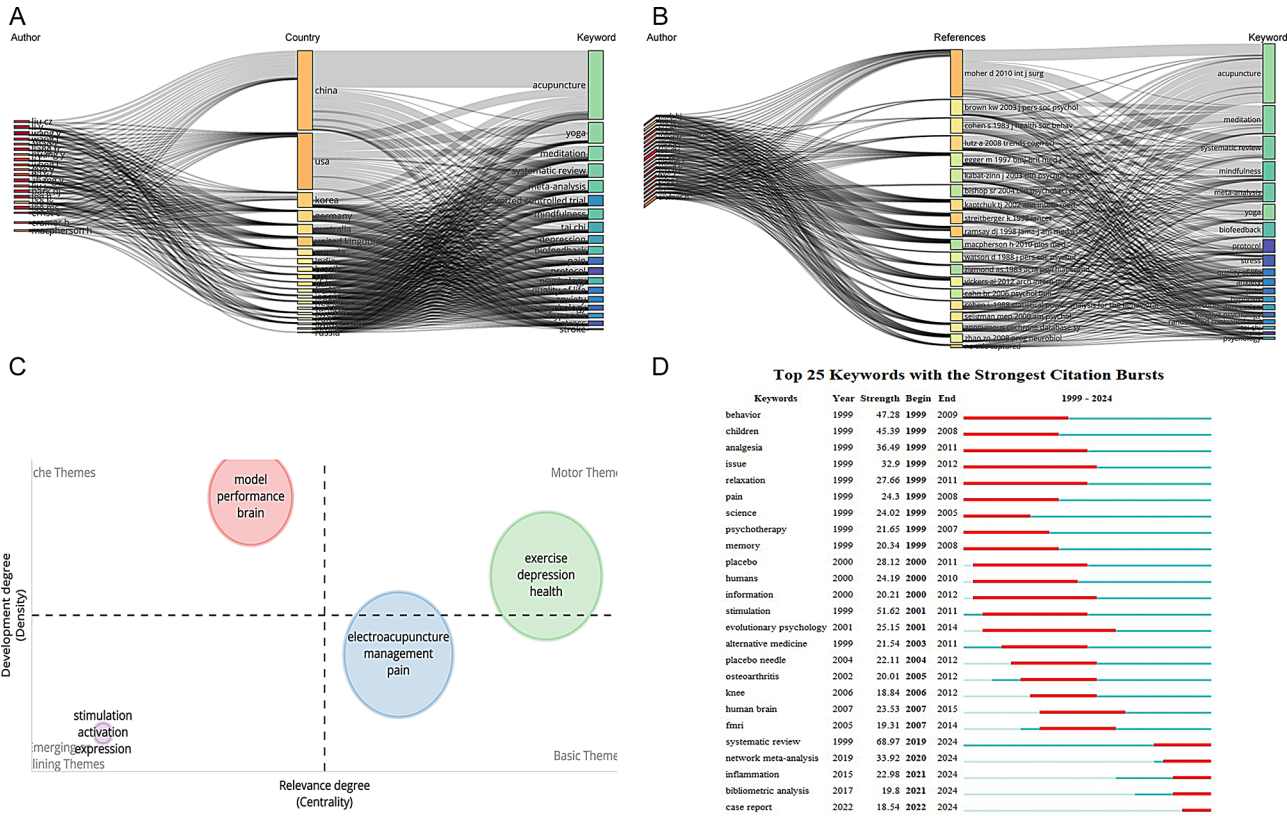
**Fig. 5** Keyword analysis of literature in the field of mind-body therapy. The network of co-occurring keywords (A), Different colors represent different clusters, timeline Chart of Keywords (B), The co-occurrence density map of keywords (C) and Top 50 keywords (D)

### Co-cited reference literature analysis

Co-cited reference literature refers to two or more articles that are cited in the same or multiple articles, which can be used to analyze the relevance between articles. In addition, the prominent analysis of co-cited reference literature can identify the core articles with significant contributions and influence in the research field. The relevance between articles can be shown by the size of the node representing the article and the number of links connecting the nodes in the co-cited reference literature network map based on CiteSpace. Figure 7A shows the co-occurrence of co-cited reference literature, with different colors representing different research periods. Deep purple represents earlier research, and the color gradually changes to deeper red, indicating that the later the article is published, the later its publication date. In addition, the intensity of centrality is proportional to the size of the node. There are a total of 2,528 cited reference articles and 11,751 co-cited links in the figure. Based on this, we conducted a cluster analysis on the co-cited literature to explore common research themes in the field of MBT and summarize the research content of the literature. Figure 7B shows six clusters, including #0 acupuncture, #1 yoga, #2 complementary therapies,

#3 meditation, #4 mindfulness, and #5 post-traumatic stress disorder (PTSD). The literature with the highest bursting strength (strength=75.24) comes from Cluster #0, which is a systematic review of acupuncture for chronic pain published in 2012 (Andrew J. Vickers et al., 2012). The review examined back and neck pain, osteoarthritis, chronic headache, and shoulder pain, and the results showed that acupuncture was superior to every pain condition under the control of sham surgery and non-acupuncture controls in all eligible randomized controlled trials. The literature with the most representative of Cluster #1 is the neuroscience of mindfulness meditation (Tang YY et al., 2015). It summarizes psychological and neuroscientific research on meditation in the field of mindfulness from 1995 to 2015, suggesting that mindfulness meditation may lead to structural and functional neural plasticity changes in brain regions involved in attentional, emotional, and self-regulatory processes, however, longitudinal, randomized, and active-controlled research designs and larger sample sizes are needed to promote a deeper understanding of the mindfulness meditation mechanisms involving complex brain network interactions. The results of literature studies indicate that acupuncture, yoga, meditation, imagery, hypnosis, and





**Fig. 6** Sankey diagrams for authors (A), Sankey diagrams for countries (B), Analysis of thematic words and keywords (C) and Top 25 keywords with the strongest citation bursts (D)

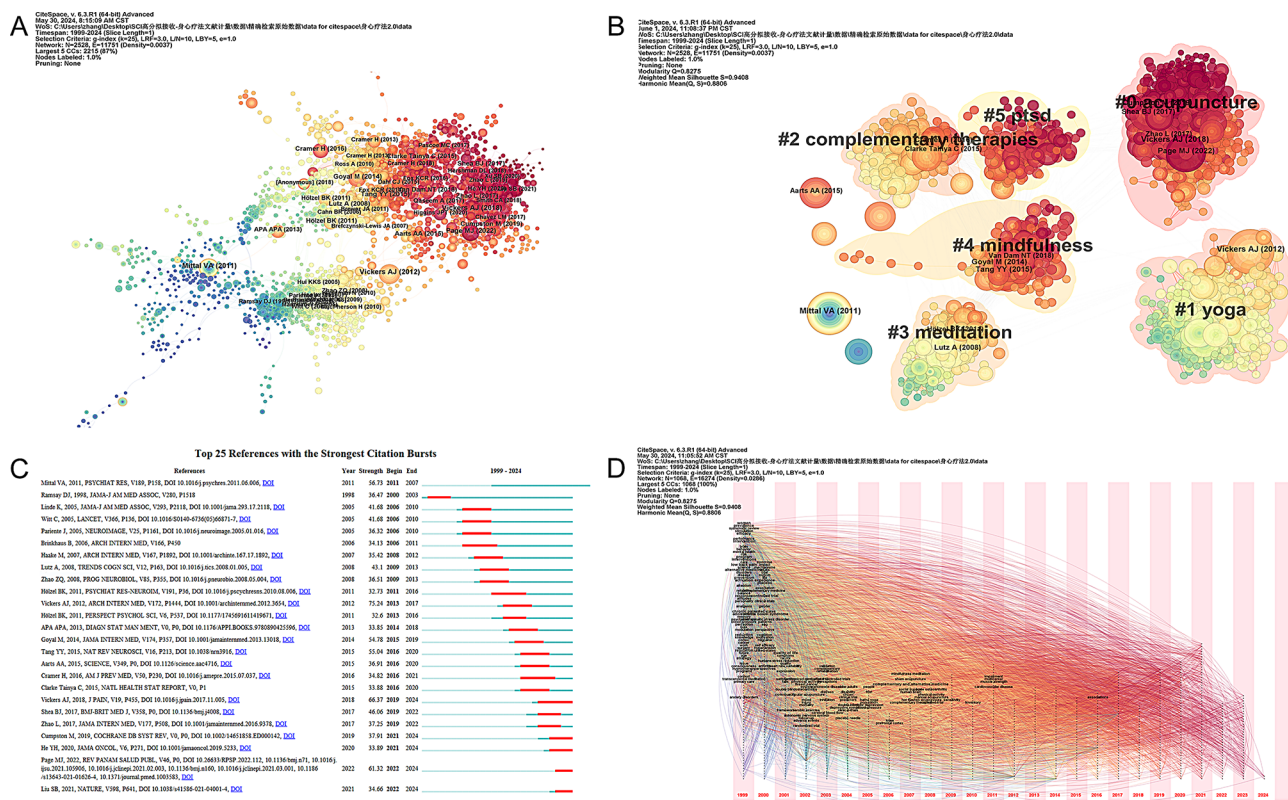
biofeedback, among other MBT, have proven effective in treating PTSD, anxiety, depression, various types of pain, cancer, coronary artery disease, arthritis, insomnia, and menopausal syndrome, as well as in improving prognosis. In addition, we have listed the top 10 most frequently cited jointly cited references (Table 4) in the field, which mainly describe the current status of the use of MBT and the research status of the diseases being treated. There is now substantial evidence to suggest that a range of MBT can serve as effective alternatives to traditional medical treatments.

**Recent trends in research**

The core issues in the field of MBT were explored using a topic analysis. Figure 5C shows that the current areas of good development are mainly concentrated in research related to maintaining physical and mental health, with research types mainly being experimental, clinical trials, and reviews, and keywords including “exercise, depression, health, model, brain, performance.” In emerging areas such as electroacupuncture, management, and pain, researchers are exploring the effects of acupuncture, meditation, and other therapies on pain, anxiety, cancer, arthritis, menopause, dementia, frailty, and other diseases through clinical trials and other methods. However,

the mechanisms of MBT still need to be further verified to determine their effects. In addition, “prevalence, alternative medicine, and stimulation therapy” have also received considerable attention.

Using Sankey diagrams to visualize the flow of research power within this field, we analyzed the relationships between research topics, authors, and source data such as countries. Figure 5A and B examined the relationships between authors, keywords, and countries and literature, respectively. As shown in Fig. 5B, the 25 most influential authors in the field of holistic medicine flowed toward the most influential articles, indicating that core authors have tight collaborative relationships and have made outstanding contributions to holistic medicine research. The research topics flowing toward the influential articles mainly included acupuncture, meditation, yoga, tai chi, and biofeedback, with the research subjects mainly being anxiety, stress, stroke, and pain. At the same time, the Sankey diagram (Fig. 5A) showing the core authors’ flow of contributions to the field showed that the main contributing countries were China, the United States, South Korea, Germany, and Australia, with the research topics being consistent with the main research topics in the field, indicating that the research priorities and frontiers



**Fig. 7** Reference co-occurrence map (A), reference clustering map (B), reference outbreak map (C) and Burst strength and time duration of the top 25 keywords with the strongest citation bursts (D)

**Table 4** The top 10 references in terms of citations

Rank	Citations	Journal	Title	Author	Year	DOI
1	561	ANNALS OF INTERNAL MEDICINE	Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement	MOHER D	2009	<a href="https://doi.org/10.7326/0003-4819-151-4-200908180-00135">https://doi.org/10.7326/0003-4819-151-4-200908180-00135</a>
2	447	JAMA	NIH Consensus Conference. Acupuncture	RAMSAY DJ	1998	absence
3	402	LANCET	Introducing a placebo needle into acupuncture research	STREIT-BERGER K	1998	<a href="https://doi.org/10.1016/S0140-6736(97)10471-8">https://doi.org/10.1016/S0140-6736(97)10471-8</a>
4	393	TRENDS COGN SCI	Attention regulation and monitoring in meditation.	LUTZ A.	2008	<a href="https://doi.org/10.1016/j.tics.2008.01.005">https://doi.org/10.1016/j.tics.2008.01.005</a>
5	376	LAWRENCE ERLBAUM ASSOCIATES	Statistical Power Analysis for the Behavioral Sciences	COHEN J.	1988	absence
6	373	J HEALTH SOC BEHAV	A Global Measure of Perceived Stress	COHEN S	1983	<a href="https://doi.org/10.2307/2136404">https://doi.org/10.2307/2136404</a>
7	363	J PERS SOC PSYCHOL	The Benefits of Being Present: Mindfulness and Its Role in Psychological Well-Being	BROWN KW	2003	<a href="https://doi.org/10.1037/0022-3514.84.4.822">https://doi.org/10.1037/0022-3514.84.4.822</a>
8	328	AMERICAN PSYCHOLOGIST	"Positive Psychology: An Introduction."	SELIGMAN MEP	2000	<a href="https://doi.org/10.1037/0003-066X.55.1.5">https://doi.org/10.1037/0003-066X.55.1.5</a>
9	319	COCHRANE DB SYST REV	Behavioural treatment for chronic low-back pain	Henschke N	2010	<a href="https://doi.org/10.1002/14651858.CD002014">https://doi.org/10.1002/14651858.CD002014</a>
10	319	COMPLEMENTARYANDALTERNATIVEMEDICINESERIES	Acupuncture: Theory, Efficacy, and Practice	KAPTCHUK TJ	2002	<a href="https://doi.org/10.7326/0003-4819-136-5-200203050-00010">https://doi.org/10.7326/0003-4819-136-5-200203050-00010</a>

in this field are mainly driven by China and the United States.

## Discussion

MBT have been widely defined as a group of therapies that are based on psychosomatic medicine and emphasize the interaction between the brain and the body. In this study, we applied VOSviewer, bibliometrix and CiteSpace software to conduct an in-depth bibliometric analysis of the country, institution, journal, author, and keywords of the published articles on MBT research to explore the knowledge structure, research hotspots, and emerging trends in the field, to clarify the current state of research on MBT and to provide a basis for the subsequent MBT applications and further research. Our findings show that from 1999 to 2024, an increasing number of articles have examined the relevant aspects of MBT, indicating that the field has attracted heated discussions and widespread attention in recent years. The increasing pace of life and social pressure in modern society may be the reason for the growing interest in MBT, and in addition, the application of MBT may reduce healthcare utilization and be cost-effective [20]. The United States, Germany and China are the largest contributors to the number of publications, and most of the 20 articles with the highest impact are from the United States, China and the United Kingdom, which indicates that these countries play an important role in this field, and there is a relatively strong partnership between the core countries, but there is still a need to further strengthen the cooperation between countries and regions in order to conduct better research. Psychosocial factors can directly influence physiologic functioning and health outcomes, and symptoms of organic discomfort can trigger or exacerbate psychosomatic health problems. After the biopsychosocial medicine model was proposed, mainstream medicine has so far failed to move beyond the biomedicine-dominated model, partly due to the lack of support from a high-level evidence base [19]. In addition, most MBT are characterised by precision medicine, with more pronounced individual differences in their efficacy [24]. Therefore, the efficacy of MBT needs to be assessed by taking into account the placebo effect, self-reported biases, and cultural context. Because it is difficult to conduct double-blind experiments, and the expectation effect is more pronounced in MBT, the true effect of mind-body therapies is often confused with the placebo effect [24, 25]. Patients also encounter subjectivity and memory bias in self-reporting of efficacy [26]. Cultural differences may cause cognitive biases, such as the greater acceptance of practices such as meditation and qigong among people from Eastern cultural backgrounds. All of these factors limit the stability of the efficacy of MBT and the reliability of their evaluation. From the top 25 burst keywords

and references in the Citesspace software, we obtained the following four research categories:

## The popularization and application of MBT in various diseases

Randomized controlled trials have shown that a wide range of physical and mental health conditions related to or exacerbated by stress have achieved improved health outcomes and QoL through the application of MBT [20]. This study found MBT to be widely used in various systemic conditions including, but not limited to, cancer, acute and chronic pain, osteoarthritis, menopause, Alzheimer's disease, irritable bowel syndrome (IBS), and more. It was found that relaxation and visualization, hypnosis, yoga, meditation, tai chi and qigong, and art therapies showed effectiveness in treating common cancer-related side effects including nausea and vomiting, pain, fatigue, anxiety, depressive symptoms, and improved overall QoL [27]. Breast cancer is the disease with more application of MBT in cancer, with 25.2% of breast cancer patients having used MBM in the past 12 months, dominated by spiritual meditation (14.3%), followed by yoga (9.6%) and positive thinking meditation (4.3%) [28]. Relevant guidelines recommend early integration of evidence-based multimodal interventions and programs, particularly acupuncture and relaxation techniques and other mind-body-based approaches, to maintain QoL in oncology patients [29, 30]. In interventions for heart disease, about 24% of patients use MBT [31]. Yoga training has been shown to lower blood pressure, improve physical performance, and enable oxygen uptake [32, 33]. Qigong and tai chi enhance the quality of life of patients with coronary artery disease and heart failure and have a positive impact on cardiovascular risk factors such as hypertension [34, 35]. It has been found that MBT, such as yoga, relaxation, tai chi, and music, can improve sleep and that cognitive behavioral therapy seems to be the most effective mind-body intervention and a better intervention than medication for insomnia [36]. In addition, MBT have been better used in stress management and in addressing psychological and psychiatric disorders and can address both psychological and physical discomfort. Studies on chronic pain have found that pain changes can send afferent injurious signals to the brain, while cognitive and emotional factors can endogenously activate the downstream modulation system, which would allow the organism to feel pain while having an impact on cognitive and emotional functioning. Changes in anatomical integrity and functioning of brain regions involved in pain control and cognitive or emotional functioning. As a result, patients with long-term chronic pain can develop cognitive deficits as well as anxiety and depression, and therapies such as cognitive-behavioral therapy (CBT), yoga, meditation,



hypnosis, and relaxation can alleviate pain and alleviate cognitive and psychological deficits by modulating attention and mood [37]. IBS is a common functional gastrointestinal disorder, and stress and anxiety can exacerbate IBS symptoms [38], yet almost half of IBS patients have mental disorders [39]. This makes psychosomatic medicine an attractive approach to treating IBS. A meta-analysis from China showed that hypnotherapy, CBT, and progressive muscle relaxation improved gastrointestinal symptoms in Chinese patients with IBS, accompanied by improvements in a variety of outcomes including depression, anxiety, and QoL [40], which is consistent with effects observed in other national and regional populations [41–44]. A systematic evaluation reviewing studies of interventions using MBT for stress among healthcare workers during the epidemic of coronavirus disease 2019 (COVID-19) between 2019 and 2021 showed that interventions such as meditation and positive thinking reduced stress among healthcare workers and had an impact on their psychological trauma, burnout, insomnia, anxiety, QoL and well-being, and other psychological traumas with significant positive effects [45].

#### **Dominant diseases in mainstream MBT**

In the keyword analysis, we found that acupuncture, electroacupuncture, meditation, psychology, yoga, and tai chi are the MBT that have received the most attention from researchers so far and have their dominant disease types. From the keyword analysis, it is clear that acupuncture is significant in treating pain and QoL in cancer patients and is effective in managing a variety of acute and chronic pain and other conditions. Acupuncture has been shown to benefit cancer survivors with cancer-related pain, fatigue, insomnia, improved QoL, nausea and vomiting, myelosuppression, and menopause [46]. A meta-analysis in 2020 showed that acupuncture was significantly associated with the reduction of pain in cancer and reduced the use of analgesics [47]. A recent evidence-based guideline strongly recommends that patients with cancer pain receive acupuncture treatment to reduce pain intensity alleviate opioid-related side effects and relieve joint pain caused by aromatase inhibitors [48]. Electroacupuncture stimulation, a modern neuromodulation technique that combines traditional Chinese acupuncture therapy with modern electrical stimulation, has been widely used to treat a variety of neurological disorders, including epilepsy, stroke, Parkinson's disease, and Alzheimer's disease [49], which is consistent with the findings of this article. Electroacupuncture stimulation can regulate neural oscillations and correct abnormal electroencephalographic activity, thus promoting brain function and helping neurological rehabilitation, as well as effectively improving motor function [50]. Keyword clustering analysis shows that meditation is more often used in psychological

disorders such as anxiety and depression, as well as relieving physical discomfort such as pain. In recent studies, the practice of meditation has been found to have beneficial therapeutic effects on stress and many other physical and mental conditions [51, 52]. Literature on meditation in neuroscience suggests that the brain is plastic and can be calmed by meditative practices to prevent neurological commotion [53, 54]. Yoga and tai chi have been studied mainly in the treatment of stroke, heart failure and its prognosis, and psychosomatic disorders. Yoga has been found to be an effective measure to improve cardiac function in heart failure patients, however, different types of yoga have shown different improvements in heart failure symptoms, such as pranayama, which can help heart failure patients to control their breathing patterns and reduce shortness of breath [55]. NIDRA yoga promotes physical, mental, and emotional relaxation through deep relaxation exercises [56], which can help heart failure patients to fall asleep and reduce fatigue Symptoms. Asana improves physical function and enhances muscle relaxation [57], so more detailed research and systematic treatment protocols are needed in the future. Yoga interventions are more effective than other MBT in reducing symptoms of schizophrenia, and a systematic evaluation showed that yoga improved PANSS-positive symptom scores (SUCRA: 74.8%) and PANSS-negative symptom scores (SUCRA: 80.4%) [58]. Tai Chi has shown beneficial effects at different ages and in different health conditions, including lowering blood lipid and blood pressure levels, improving balance, preventing falls, improving mobility, and improving overall QoL [59, 60]. A recent systematic evaluation showed that tai chi can promote recovery of balance and activities of daily living Z after stroke [61]. In addition, biofeedback therapy, hypnotherapy, and cognitive behavioral therapy. In addition, hypnotherapy, as a beneficial mind-body intervention for IBS, has the strongest supporting evidence in the intervention of IBS to improve gastrointestinal symptoms, anxiety, depression, and QoL in patients with IBS [62]. In addition to showing good therapeutic effects in the current dominant diseases, MBT are constantly trying to be applied to a variety of physical and mental disorders, obtaining good clinical results, and the research in this field is increasingly shifting to high-level clinical research and evidence-based medical research, and the mechanisms of MBT interventions are also constantly being explored, showing a trend toward the integrated treatment of diseases with multiple therapies [63].

#### **Application of MBT in special groups**

MBT focuses on the interaction between the mind and the body, aiming to promote the physical and mental health of the organism by adjusting the condition of one of them. In this paper, it is found that there is an increasing number of

studies on MBT in women, the elderly, adolescents, and children, with women being one of the core keywords for MBT, and “children” being a keyword that exploded during the period of 1999–2008, and diseases related to the elderly such as dementia and stroke being a major focus of the studies. This suggests that MBT have an important potential role to play in special groups such as women, children, and the elderly and that they can make up for the shortcomings of current mainstream medicine, improve clinical efficacy, and promote health, which deserves further attention from researchers. Currently, MBT are mostly applied to pregnant women, perimenopausal syndrome, and breast cancer patients. Pregnant women may experience stress, anxiety, insomnia, and pain during pregnancy, and because there is a particular need for non-pharmacological types of treatments during pregnancy that do not harm the fetus, MBT can improve the discomforts of pregnancy while protecting the fetus. A recent meta-analysis showed that yoga during pregnancy had a positive effect on anxiety, depression, perceived stress, mode of delivery, and labor [64]. Yoga also has a positive role in intervening in menopause, promoting positive psychophysiological changes in postmenopausal women, and helping to reduce menopausal symptoms [49, 50]. Current core research in MBT in child and adolescent populations includes focusing attention, reducing pain, and reducing anxiety [65–67]. Current research has found that children are very capable of learning and manipulating self-care skills such as MBT [68] and can learn and apply many mind-body skills throughout their lives [69]. There is evidence that biofeedback, clinical hypnosis, guided imaging, meditation, and yoga have a positive impact in intervening in children’s physical and mental health. As we age, the structure and function of the nerves, the brain’s cognitive fluency declines and the resulting cognitive impairment problems are common in old age. Patients applying MBT such as yoga and positivism have been shown to have slower age-related declines in fluid intelligence than the conventional group of patients, and these practitioners have more effective and resilient brain networks [70]. Overall, MBT have a positive impact on interventions for physical and mental disorders in specific groups such as women, older adults, and children, but are still being explored and need to be supported by more evidence.

As well as 2 potential research hotspots for the future:

#### **Intervention of MBT on inflammatory processes**

Altered inflammatory processes are thought to be responsible for the role of many mind-body therapies in pathologies, including fatigue, depression, pain, and heart disease, to name a few [71]. During stressful events, the hypothalamic-pituitary-adrenal axis is activated within a few minutes, leading to the activation of the cortical axis is activated within minutes, leading to cortisol release and catabolism. In addition, HPA can work with the autonomic

nervous system to cause hemodynamic changes, hypercoagulability, and immune and inflammatory activation, which can amplify the inflammatory response during acute stress, thus contributing to the occurrence of adverse events [72–74]. Mind-body therapies such as tai chi, qigong, meditation, and yoga interventions can have an impact on inflammatory cytokine activity. Currently, relevant research in this field has focused on exploring three areas: circulating markers of inflammation, cellular markers of inflammation, and gene expression of inflammatory pathways [75]. C-reactive protein (CRP) is a well-recognized marker of inflammatory activity. A study meta-analyzed 34 trials looking at inflammatory markers before and after mind-body therapies to treat disease and found that there was a moderate reduction in CRP and a small reduction in interleukin-6 levels after 7 to 16 weeks of mind-body interventions [76]. However, studies have shown that the presence or absence of disease, baseline levels of inflammatory factors, and differences in the type of mind-body therapy and the method of delivery can produce differential changes in inflammatory factors, resulting in inconsistent findings (79–81). Mind-body therapies have been shown to reduce inflammatory markers, decrease inflammatory gene expression, and decrease pro-inflammatory transcription factor nuclear factor NF- $\kappa$ B activity [73], but there are still many unknown aspects regarding the effects of mind-body therapies on immune function, and further methodological rigor is needed to determine the relationship between inflammation and mind-body therapeutic interventions, which is the current research hotspot and lack of research in this field.

#### **Methods of research and evaluation for higher levels of evidence**

By analyzing the bibliometric analysis of the last two decades within the field of mind-body therapies, we found that the types of research in this field include basic research, clinical trials, social surveys, and reviews. In the keyword analysis, “systematic review”, “network meta-analysis”, “bibliometric analysis”, and “case report” are the exploding keywords appearing in 2019–2022 and the heat continues to this day. As the application of MBT is expanding, with its diverse *modus operandi*, and is still in the stage of continuous exploration in many disorders, there are still a large number of case reports emerging. Meanwhile, therapies and disorders with more mature research are entering an evidence-based phase, where findings are integrated through methods such as meta-analysis and systematic evaluation. Bibliometrics has also been used to assess the progress of research on different therapies for diseases. MBT emphasize mind-body interactions; however, the lack of evidence has made the efficacy of MBT somewhat unrecognized. Enhancing the research methodology of MBT, innovating evaluation



criteria and systems suitable for MBT, and seeking better-designed trials and higher levels of research evidence are instrumental to the advancement of the medical model. In addition, adverse events of MBT interventions for diseases are less reported, there are fewer relevant studies, and most of the existing studies lack important information and evidence for meaningful evaluation [79].

## Conclusion

MBT have been globally proven to be effective in a wide range of disease interventions, and their presence in the medical system has been increasingly emphasized and incorporated into health services, especially in the intervention of chronic diseases, anxiety and depression, and cancer. In the last two decades, better-designed studies have emerged and the mechanisms of action of MBT have been discovered, yet the field is in dire need of high-quality evidence and a better understanding of the role of MBT.

## Abbreviations

MBT	Mind-Body Therapies
BPSM	Biopsychosocial Model
PTSD	Post-traumatic stress disorder
WOS	Web of Science
CBT	Cognitive-behavioral therapy
IBS	Irritable bowel syndrome
CRP	C-reactive protein
QoL	Quality of life

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None.

## Author contributions

CSQ participated in the research design. ZYX, LWW and SZH conducted a literature search and screened data extraction. ZYX, LWW and LSD analyzed the data and wrote a manuscript. ZYX, XS and ZYY participated in the revision of the paper. All authors read and approved the final version of the manuscript.

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## Data availability

The datasets analyzed during the current study are available from the corresponding author upon reasonable request.

## Declarations

### Ethics approval and consent to participate

No original clinical data was used in this study, so ethical approval is not required.

### Consent for publication

The Author confirms: that the work described has not been published before (except in the form of an abstract or as part of a published lecture, review, or

thesis); that it is not under consideration for publication elsewhere; that its publication has been approved by all co-authors, if any; that its publication has been approved (tacitly or explicitly) by the responsible authorities at the institution where the work is carried out. The Author transfers to the Founder of the journal the exclusive right to the presented paper, including the right to publish the paper in the English language. The copyright is transferred when the article is accepted for publication.

## Competing interests

The authors declare no conflict of interest.

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## References

1. Tang YY, Hölzel BK, Posner MI. The neuroscience of mindfulness meditation. *Nat Rev Neurosci*. 2015;16(4):213–25.
2. Wang YT, Huang G, Duke G, et al. Evid Based Complement Alternat Med. 2017;2017:8763915.
3. Nanthakumar C. Yoga for anxiety and depression-a literature review. *J Mental Health Train Educ Pract*. 2020;15(3):157–69.
4. Chow YWY, Dorcas, et al. The effects of qigong on reducing stress and anxiety and enhancing Body–Mind Well-being. *Mindfulness*. 2012;3:51–9.
5. Haslam N, Vylomova E, Murphy SC, et al. The neuroscientification of psychology: the rising prevalence of neuroscientific concepts in psychology from 1965 to 2016. *Perspect Psychol Sci*. 2022;17(2):519–29.
6. Ryff CD. Positive psychology: looking back and looking forward. *Front Psychol*. 2022;13:840062.
7. Wang F, Guo J, Yang G. Study on positive psychology from 1999 to 2021: A bibliometric analysis. *Front Psychol*. 2023;14:1101157.
8. Allen JG, Romate J, Rajkumar E. Mindfulness-based positive psychology interventions: a systematic review. *BMC Psychol*. 2021;9(1):116.
9. Briggs JP, Shurtleff D. Acupuncture and the complex connections between the Mind and the body. *JAMA*. 2017;317(24):2489–90.
10. Bhattacharyya KK, Hueluer G, Meng H, et al. Mind-body practices in U.S. Adults: prevalence and correlates. *Complement Ther Med*. 2020;52:102501.
11. Bolton D. A revitalized biopsychosocial model: core theory, research paradigms, and clinical implications. *Psychol Med*. 2023;53(16):7504–11.
12. Singer M, Bulled N, Ostrach B, et al. Syndemics and the biosocial conception of health. *Lancet*. 2017;389(10072):941–50.
13. Sensky T. Practical application of the biopsychosocial model to medical care—Are we nearly there yet? *Acta Psychiatr Scand*. 2024;149(5):365–7.
14. Pontes-Silva A, Fibromyalgia. Are we using the biopsychosocial model? *Autoimmun Rev*. 2023;22(1):103235.
15. Shual JT, Averbuch E. Complementary and alternative healthcare in Israel. *Isr J Health Policy Res*. 2012;1:7.
16. Yakoot M. Bridging the gap between alternative medicine and evidence-based medicine. *J Pharmacol Pharmacother*. 2013;4:83–5.
17. Aßmann L, Betsch T. Medical decision making beyond evidence: correlates of belief in complementary and alternative medicine (CAM) and homeopathy. *PLoS ONE*. 2023;18(4):e0284383.
18. Lauche R, Cramer H. Mind-body therapies: connecting the parts and embracing diversity. *Complement Ther Med*. 2018;40:214.
19. Kucukosmanoglu HS, Cramer H, Tavakoly R, et al. Mind-Body medicine in the treatment of depression: A narrative review of efficacy, safety and mechanisms. *Curr Psychiatry Rep*. 2024;26(12):729–40.
20. Dossett ML, Fricchione GL, Benson H. A new era for Mind-Body medicine. *N Engl J Med*. 2020;382(15):1390–1.
21. van Eck NJ, Waltman L. Citation-based clustering of publications using CitNet-Explorer and VOSviewer. *Scientometrics*. 2017;111(2):1053–70.
22. Sun W, Zhou T, Ding P, et al. Bibliometric analysis of intestinal microbiota and lung diseases. *Front Cell Infect Microbiol*. 2024;14:1347110.
23. Arruda H, Silva ER, Lessa M, et al. VOSviewer and bibliometrix. *J Med Libr Assoc*. 2022;110(3):392–5.

24. Penrod NM, Moore JH. Why mind-body medicine is poised to set a new standard for clinical research. *J Clin Epidemiol*. 2019;116:167–70.
25. Wahbeh H, Elsas SM, Oken BS. Mind-body interventions: applications in neurology. *Neurology*. 2008;70(24):2321–8.
26. Adam TC, Epel ES. Stress, eating and the reward system. *Physiol Behav*. 2007;91:449–58.
27. Carlson LE, Zelinski E, Toivonen K, et al. Mind-Body therapies in cancer: what is the latest evidence?? *Curr Oncol Rep*. 2017;19(10):67.
28. Voříš P, Höxtermann MD, Dobos G, et al. Mind-body medicine use by women diagnosed with breast cancer: results of a nationally representative survey. *Support Care Cancer*. 2020;28(3):1077–82.
29. Greenlee H, DuPont-Reyes MJ, Balneaves LG, et al. Clinical practice guidelines on the evidence-based use of integrative therapies during and after breast cancer treatment. *CA Cancer J Clin*. 2017;67:194–232.
30. Ge L, Wang Q, He Y, et al. International trustworthy traditional Chinese medicine recommendations (TCM Recs) working group. Acupuncture for cancer pain: an evidence-based clinical practice guideline. *Chin Med*. 2022;17(1):8.
31. Prasad K, Sharma, Amit, et al. Use of complementary therapies in cardiovascular disease. *Am J Cardiol*. 2013;111(3):339–45.
32. Prabhakaran D, Chandrasekaran AM, Singh K, Chathurvedi N, et al. Yoga-CaRe trial investigators. Yoga-Based cardiac rehabilitation after acute myocardial infarction: A randomized trial. *J Am Coll Cardiol*. 2020;75(13):1551–61.
33. Manchanda SC, Madan K. Yoga and meditation in cardiovascular disease. *Clin Res Cardiol*. 2014;103(9):675–80.
34. Tao S, Li Z. Effects of qigong exercise on cardiovascular risk factors in patients with metabolic syndrome: A systematic review and meta-analysis. *Front Physiol*. 2023;14:1092480.
35. Danilov ABA, Frishman WHMD. Complementary Therapies: Tai Chi in the Prevention and Management of Cardiovascular Disease. *Cardiology in Review*. 2025 January/February; 33(1):p 54–57.
36. Kozasa EH, Hachul H, Monson C, et al. Mind-body interventions for the treatment of insomnia: a review. *Braz J Psychiatry*. 2010;32(4):437–43.
37. Bushnell M, Catherine; Čeko M, Low, et al. Cognitive and emotional control of pain and its disruption in chronic pain. *Nat Rev Neurosci*. 2013;14(7):502–11.
38. Rey E, Talley NJ. Irritable bowel syndrome: novel views on the epidemiology and potential risk factors. *Dig Liver Dis*. 2009;41:772–80.
39. Hayee B, Forgacs I. Psychological approach to managing irritable bowel syndrome. *BMJ*. 2007;334(7603):1105–9.
40. Wang W, Wang F, Fan F, et al. Mind-Body interventions for irritable bowel syndrome patients in the Chinese population: a systematic review and Meta-Analysis. *Int J Behav Med*. 2017;24(2):191–204.
41. Lee HH, Choi YY, Choi MG. The efficacy of hypnotherapy in the treatment of irritable bowel syndrome: a systematic review and meta-analysis. *J Neurogastroenterol Motil*. 2014;30(2):152–62.
42. Aucoin M, Lalonde-Parsi MJ, Cooley K. Mindfulness-based therapies in the treatment of functional Gastrointestinal disorders: a meta-analysis. *Evid Based Complement Alternat Med*. 2014.
43. Lakhan SE, Schofield KL. Mindfulness-based therapies in the treatment of somatization disorders: a systematic review and meta-analysis. *PLoS ONE*. 2013;8(8):e71834.
44. Altayar O, Sharma V, Prokop LJ et al. Murad MH. Psychological therapies in patients with irritable bowel syndrome: a systematic review and meta-analysis of randomized controlled trials. *Gastroenterol Res Pract*. 2015:549308.
45. Kwon CY, Lee B. Systematic review of Mind-Body modalities to manage the mental health of healthcare workers during the COVID-19 era. *Healthc (Basel)*. 2022;10(6):1027.
46. Zhang XW, Hou WB, Pu FL, et al. Acupuncture for cancer-related conditions: an overview of systematic reviews. *Phytomedicine*. 2022;106:154430.
47. He YH, Guo XF, May BH, et al. Clinical evidence for association of acupuncture and acupressure with improved cancer pain: a systematic review and meta-analysis. *JAMA Oncol*. 2020;6(2):271–8.
48. Chang SJ, Kwak EY, Hahm BJ, et al. Effects of a meditation program on nurses' power and quality of life. *Nurs Sci Q*. 2016;29(3):227–34.
49. Susanti HD, Sonko I, Chang PC, et al. Effects of yoga on menopausal symptoms and sleep quality across menopause statuses: A randomized controlled trial. *Nurs Health Sci*. 2022;24(2):368–79.
50. Jorge MP, Santaella DF, Pontes IM, et al. Hatha yoga practice decreases menopause symptoms and improves quality of life: A randomized controlled trial. *Complement Ther Med*. 2016;26:128–35.
51. Holden S, O'Connell KA. Using meditation to reduce stress, anxiety, and depression in nursing students. *J Nurs Educ*. 2023;62(8):443–9.
52. Baer RA. Mindfulness-Based treatment approaches: clinician's guide to evidence base and applications. 2nd ed. San Diego, CA: Academic; 2014.
53. Segal ZV, Williams JMG, Teasdale JD. Mindfulness-Based cognitive therapy for depression. 2nd ed. London, England: Guilford Press; 2013.
54. Zeidan F, Vago DR. Mindfulness meditation-based pain relief: a mechanistic account. *Ann NY Acad Sci*. 2016;1373(1):114–27.
55. Sengupta P. Health impacts Of yoga and Pranayama: A state-of-the-art review. *Int J Prev Medicine*. 2012;3(7):444–58.
56. Parker S, Bharati SV, Fernandez M. Defining yoga-Nidra: traditional accounts, physiological research, and future directions. *Int J Yoga Therapy*. 2013;23(1):11–6.
57. Taneja DK. Yoga and health. *Indian J Community Med*. 2014;39(2):68.
58. Su Y, Pan X, Li H, et al. Effects of mind-body therapies on schizophrenia: A systematic review and network meta-analysis. *Schizophr Res*. 2024;264:236–47.
59. Lee SH, Jeon Y, Huang CW, et al. Qigong and Tai Chi on human health: an overview of systematic reviews. *Am J Chin Med*. 2022;50(8):1995–2010.
60. Zhong D, Xiao Q, Xiao X, et al. Tai Chi for improving balance and reducing falls: an overview of 14 systematic reviews. *Ann Phys Rehabil Med*. 2020;63(6):505–17.
61. Feng F, Luo XC, Chen YJ, et al. Effects of Tai Chi Yunshou on upper-limb function and balance in stroke survivors: A systematic review and meta-analysis. *Complement Ther Clin Pract*. 2023;51:101741.
62. Kearney DJ, Brown-Chang J. Complementary and alternative medicine for IBS in adults: mind-body interventions. *Nat Clin Pract Gastroenterol Hepatol*. 2008;5(11):624–36.
63. Deuel LM, Seeberger LC. Complementary therapies in Parkinson disease: a review of acupuncture, Tai Chi, Qi Gong, yoga, and cannabis. *Neurotherapeutics*. 2020;17(4):1434–55.
64. Corrigan L, Moran P, McGrath N, et al. The characteristics and effectiveness of pregnancy yoga interventions: a systematic review and meta-analysis. *BMC Pregnancy Childbirth*. 2022;22(1):250.
65. Britton WB, Lepp NE, Niles HF, et al. A randomized controlled pilot trial of classroom-based mindfulness meditation compared to an active control condition in sixth-grade children. *J Sch Psychol*. 2014;52(3):263–78.
66. Sibinga EM, Perry-Parrish C, Thorpe K, et al. A small mixed-method RCT of mindfulness instruction for urban youth. *Explore (NY)*. 2014;10(3):180–6.
67. Sibinga EM, Webb L, Ghazarian SR, et al. School-based mindfulness instruction: an RCT. *Pediatrics*. 2016;137(1):e20152532.
68. Section on integrative medicine. Mind-Body Ther Child Youth Pediatr. 2016;138(3):e20161896.
69. Kohen DP. A pediatric perspective on mind-body medicine. In: Culbert T, Olness K, editors *Integrative pediatrics*. New York, NY: Oxford University Press; 2009:267–301.
70. Gard T, Taquet M, Dixit R, et al. Fluid intelligence and brain functional organization in aging yoga and meditation practitioners. *Front Aging Neurosci*. 2014;6:76.
71. Irwin MR, Cole SW. Reciprocal regulation of the neural and innate immune systems. *Nat Rev Immunol*. 2011;11(9):625–32.
72. Hinterdobler J, Schott S, Jin H, et al. Acute mental stress drives vascular inflammation and promotes plaque destabilization in mouse atherosclerosis. *Eur Heart J*. 2021;42:e371.
73. Kivimäki M. Steptoe A (2018) Effects of stress on the development and progression of cardiovascular disease. *Nat Rev Cardiol* 15:215–29.
74. Tawakol A, Ishai A, Takx RA, et al. Relation between resting amygdala activity and cardiovascular events: a longitudinal and cohort study. *Lancet*. 2017;389:834–45.
75. Bower JE, Irwin MR. Mind-body therapies and control of inflammatory biology: A descriptive review. *Brain Behav Immun*. 2016;51:1–11.
76. (78) Morgan N, Irwin MR, Chung M, et al. The effects of mind-body therapies on the immune system: meta-analysis. *PLoS ONE*. 2014;9(7):e100903.
77. Bower JE, Greendale G, Crosswell AD, et al. Yoga reduces inflammatory signaling in fatigued breast cancer survivors: A randomized controlled trial. *Psychoneuroendocrinology*. 2014;43:20–9.
78. Irwin MR, Olmstead R, Breen EC et al. Tai Chi, Cellular Inflammation, and Transcriptome Dynamics in Breast Cancer Survivors With Insomnia: A Randomized Controlled Trial. *JNCI Monographs*. 2014; 2014(50):295–301.
79. Lyszczyk M, Karkhaneh M, Gladwin KK, et al. Adverse events of Mind-Body interventions in children: A systematic review. *Child (Basel)*. 2021;8(5):358.

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