Journal of Pain Research

Dovepress
open access to scientific and medical research

Open Access Full Text Article

REVIEW

Bibliometric Analysis of Research Trends on Tuina Manipulation for Neck Pain Treatment Over the Past 10 Years

Zhichao Gong, Yi Guo, Xiaowei Liu, Kun Ai, Wu Li, Jiangshan Li

College of Acupuncture, Massage and Rehabilitation, Hunan University of Chinese Medicine, Changsha, Hunan, People's Republic of China

Correspondence: Jiangshan Li, College of Acupuncture, Massage and Rehabilitation, Hunan University of Chinese Medicine, No. 300, Xueshi Road, Yuelu District, Changsha, Hunan Province, 410208, People's Republic of China, Tel +86 13707315642, Fax +8673188458187, Email 292463008@qq.com; Wu Li, College of Acupuncture, Massage and Rehabilitation, Hunan University of Chinese Medicine, No. 300, Xueshi Road, Yuelu District, Changsha, Hunan Province, 410208, People's Republic of China, Tel +86 13574851647, Fax +8673188458187, Email 272434694@qq.com

Abstract: Tuina is an effective treatment for neck pain (NP). However, there has been no bibliometric analysis of the global application and emerging trends of tuina performed for NP. Therefore, this study aimed to provide an overview of the current state and future trends in the field. Articles about tuina for NP, published from January 1, 2013, to January 1, 2023, were searched in the Web of Science Core Collection database. CiteSpace (6.1.R6) and VOSviewer (1.6.18) software were used to analyze annual trends in literature posts, countries, institutions, authors, cited references, and knowledge graphs of keyword co-occurrence, clustering, and burst using standard bibliometric indicators. The final analysis comprised 505 valid documents. The results demonstrate that the number of articles in the field of tuina therapy for NP has gradually increased over the years, showing the most active countries, institutions, journals, and authors. There were 323 keywords in the field, 322 research authors, and 292 research institutions, with the USA having the most publications (n = 140). The most published institution is Vrije University Amsterdam, and the most published journal is the Cochrane Database of Systematic Reviews. Peter R Blanpied is the most influential and most-cited author. Interventions (dry needling, massage therapy, and muscle energy techniques), common treatment sites for NP (upper trapezius), and complications (cervicogenic headache) are the top three frontiers mentioned in the field of tuina research for NP. The bibliometric study showed the current status and trends in clinical research on treating patients with NP using tuina, which may help researchers identify topics of interest and scope for future research in this field.

Keywords: tuina, neck pain, CiteSpace, VOSviewer, knowledge graph analysis

Plain Language Summary

This study collated and analyzed all the literature in the field of tuina for neck pain in the Web of Science Core Collection database over the past 10 years, providing an overview of the current status of research in the field and the scope for further studies. Over two-thirds of the global population has experienced neck pain, which is the fourth leading cause of disability in the United States. Tuina therapy is a recommended treatment for neck pain because of its safety, efficacy, and longevity. To the best of our knowledge, no study has compiled and analyzed the literature in the field of tuina for neck pain. Therefore, we used CiteSpace and VOSviewer to perform a quantitative analysis of the collected literature to obtain a knowledge graph of annual posting trends, country/region analysis, research institutions, authors, keyword co-occurrence, keyword clustering, keyword emergence, and co-citation.

Introduction

Neck pain (NP) is often the main symptom in the early stages of all types of cervical spondylosis because it is the first and most common symptom of neck disorders.[1] It is the fourth most common cause of disability in the United States[2] and has become one of the most expensive healthcare conditions worldwide.[3] Moreover, the age at which patients experience NP is decreasing[4,5] because of the widespread use of information technology in society, the drastic increase in study and work stress, and the concurrent heavy use of electronic devices such as mobile phones and computers.[6]

Received: 1 March 2023
Accepted: 1 June 2023
Published: 15 June 2023

To improve the quality of life of patients with NP, researchers are actively exploring new treatment options. According to the American Physical Therapists Association[7] guidelines, Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability, and Health from the Orthopedic Section of the American Physical Therapy Association, manipulative therapy is recommended for different types of NP and at different stages.

China is gaining international attention for the efficacy of traditional Chinese medicine in treating patients with NP.[8] Tuina is one kind of manual therapy based on the principles of Chinese medicine. By acting on the musculoskeletal system, tuina may lead to mechanical changes, such as improved joint flexibility and relaxation of local muscles. It has been widely used to treat NP worldwide. However, the current state and research dynamics on tuina for NP vary globally. Only a few studies have collected global data on NP research and used bibliometric methods for scientific and retrospective analysis on a large scale.

Bibliometrics is the quantitative analysis of all knowledge vectors and assessing the social and scientific importance of a given discipline over a specific period using mathematical and statistical methods.[9] Owing to its ease of operation, it is widely used in bibliometric analyses.[10] In addition, bibliometrics can be used to reveal topical and cutting-edge directions in a given field by analyzing the countries, institutions, journals, and authors of studies published in the field and the keywords describing these publications.

There is currently no specific bibliometric analysis of treatment using tuina for NP, making it difficult for researchers to comprehensively understand the current state of the field. Therefore, a bibliometric analysis is required to identify the most influential countries, institutions, journals, and authors focusing on the manipulative treatment of patients with NP. This study aimed to assess the research trends in tuina manipulation for NP, identify topics of interest and frontiers, and pave the way for researchers to comprehensively understand the subject using bibliometric analysis of relevant academic literature.

Materials and Methods

Data Sources, Search Strategies, and Coding

A bibliometric analysis was conducted using CiteSpace (6.1.R6) and VOSviewer (1.6.18) to examine the current status and research trends in the global use of tuina in treating patients with NP. All data for this study were obtained from articles from the Web of Science Core Collection (WOSCC) that were published between January 1, 2013, and January 1, 2023. The search strategy included the subject terms “tuina manipulation” and “NP”, regardless of the country or article type. The WOSCC search formula was ((((((((((TS=(Massage)) OR TS=(Chinese manipulation)) OR TS=(tuina)) OR TS=(anmo)) OR TS=(manual therapy)) OR TS=(chiropractic)) OR TS=(Manipulation)) OR TS=(manipulation therapy)) AND TS=(neck pain)) OR TS=(mechanical neck disorders)). Overall, 1769 articles were obtained, which were further analyzed using the following inclusion criteria: (a) published from January 1, 2013, to January 1, 2023; (b) written in English; and (c) with an abstract. The papers were manually selected on the basis of their titles and abstracts. In contrast, articles with multiple submissions and missing data; articles not related to the topic; or news, advertisements, and solicitation articles were excluded. Using these systematic criteria, we finally included 505 articles (Figure 1).

Data Analysis

CiteSpace (6.1.R6) and VOSviewer (1.6.18) were used to count and map the findings of the identified publications to reveal annual output numbers, prolific journals, authors, institutions, and countries, and to explore the trends and patterns. For co-occurrence analysis, we investigated collaborative relationships, such as institutions, authors, references, and keywords. The WOSCC search results were exported as “plain text - full records with cited references”. The data were converted using CiteSpace and VOSviewer software.

The following CiteSpace parameters were set: time slicing between January 2013 and January 2023; years per slice of 1 year; node types comprising institutions, authors, keywords, references, threshold (top N = 50); and pruning for pathfinder, pruning slice networks, and pruning the merged network. We set the VOSviewer analysis type to co-authorship/co-occurrence, adjusted the threshold selection to an appropriate value, and performed network visualization, density visualization, and chronology. Network visualization, density visualization, and overlay visualization were used for the visualization.

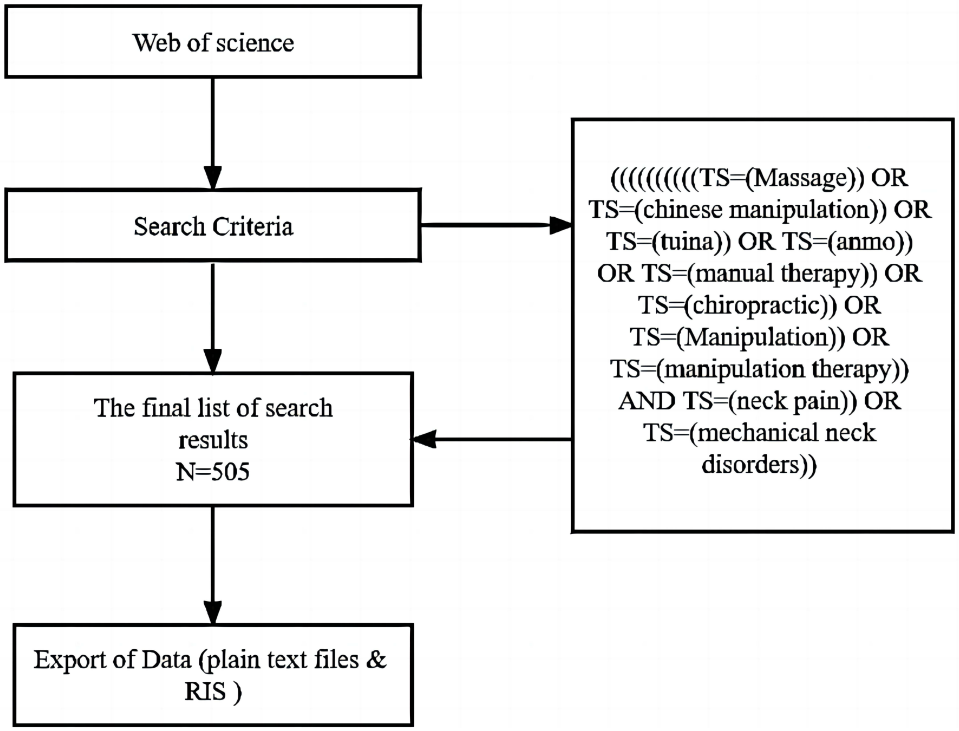

Figure 1 Search strategy in the Web of Science.

Each node in the graph represents an element, such as country, institution, or author. The larger the node area, the more frequently the element occurs. Different colors indicate different years. For example, the various colored circles indicate the years 2013–2023 from internal to external nodes. Nodes with a high betweenness centrality (BC) (≥ 0.1) are considered critical points and are denoted by purple circles.[11,12] Lines connecting nodes also indicate collaboration, co-occurrence, or co-referencing relationships.

Results

Analysis of Publication Outputs

Over the past 10 years, the distribution of publications has shown a steady but erratic upward trend. Seventy-four papers were published in 2021, which was the highest recorded number of publications in one year (Figure 2).

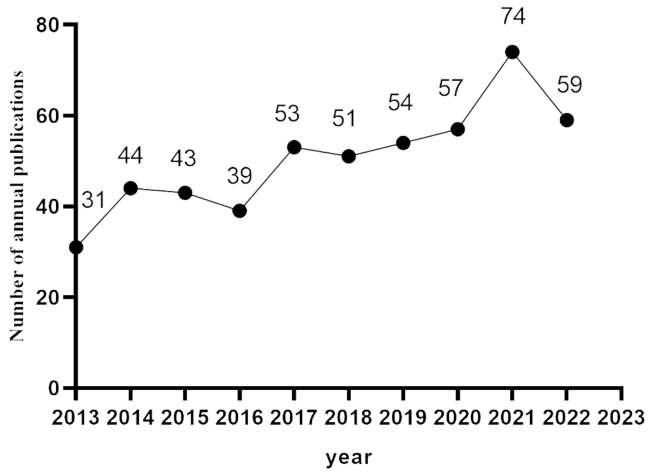

Figure 2 Annual output of tuina for NP from 2013 to 2023.

Analysis of Document Type

Overall, eight document types were identified (Table 1). Original research articles were the most common, accounting for approximately 79.48% of all documents. This was followed by reviews (16.56%) and editorials (1.13%).

Analysis of Country

Table 2 shows the top 10 countries studying NP trends; the top three countries/regions regarding the frequency of publication include the USA (30.37% of the total literature), Spain (14.10% of the total literature), and Australia (10.41% of the total literature). Figure 3 presents a map of the distribution of national collaboration networks, with 45 nodes, 103 links, and a density of 0.104. The USA had the most significant centrality, followed by Spain and Australia. According to the definition of centrality, these countries exhibited close collaboration with others and a strong academic presence.

Analysis of Author

Overall, 322 nodes (N = 322), 378 links (E = 378), and a density of 0.0073 were obtained from the WOSCC database using CiteSpace, with 22 authors publishing more than five articles. César Fernández-de-Las-Peñas and Ian D Coulter had the most publications (Figure 4), followed by Herman and Rodríguez-Sanz.

Based on centrality mapping analysis, Cote had the most significant centrality (0.01), with almost all authors having a centrality of zero. Therefore, despite the many scholars studying this topic, author collaboration is weak and requires improvement. Figure 4 illustrates the same-colored sections, which may indicate that these authors within the scope collaborated in a small group.

Table 1 Types of Literature on NP from 2013 to 2023

Ranking	Document Type	Count	Percent (%)
1	Article	1406	79.48
2	Review	293	16.56
3	Editorial	20	1.13
4	Conference paper	19	1.07
5	Letter	12	0.68
6	Chapter	10	0.57
7	Meeting abstract	7	0.40
8	Correction	2	0.11

Table 2 Top 10 Countries in the Study of Tuina for NP from 2013 to 2023

Ranking	Country	Publications	Percentage (%)	Centrality
1	USA	140	30.37	0.33
2	Spain	65	14.10	0.12
3	Australia	48	10.41	0.38
4	Canada	42	9.11	0.15
5	China	38	8.24	0.12
6	Netherlands	36	7.81	0.09
7	Denmark	24	5.21	0.11
8	United Kingdom	24	5.21	0.12
9	Turkey	22	4.77	0
10	South Korea	22	4.77	0

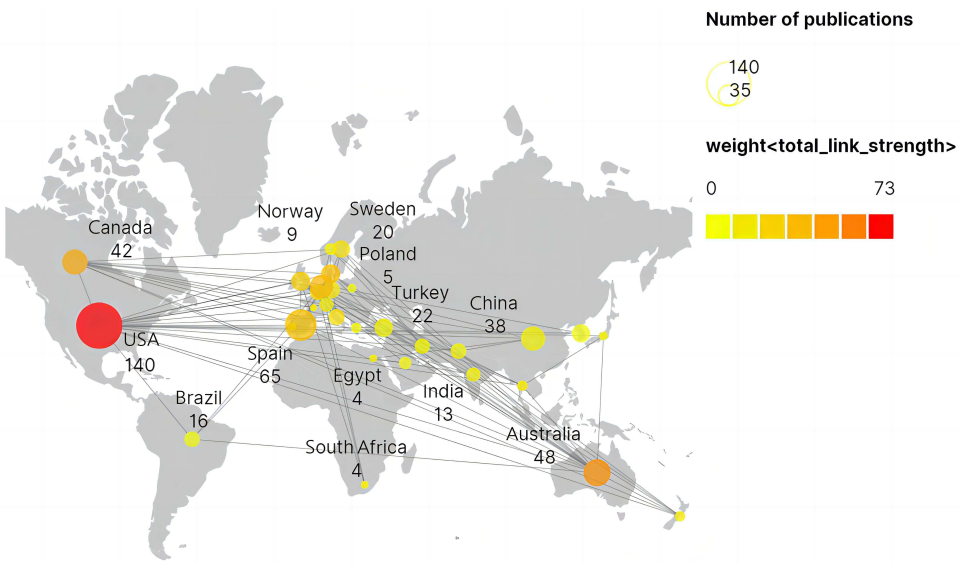

Figure 3 Analysis of the intensity of country cooperation.

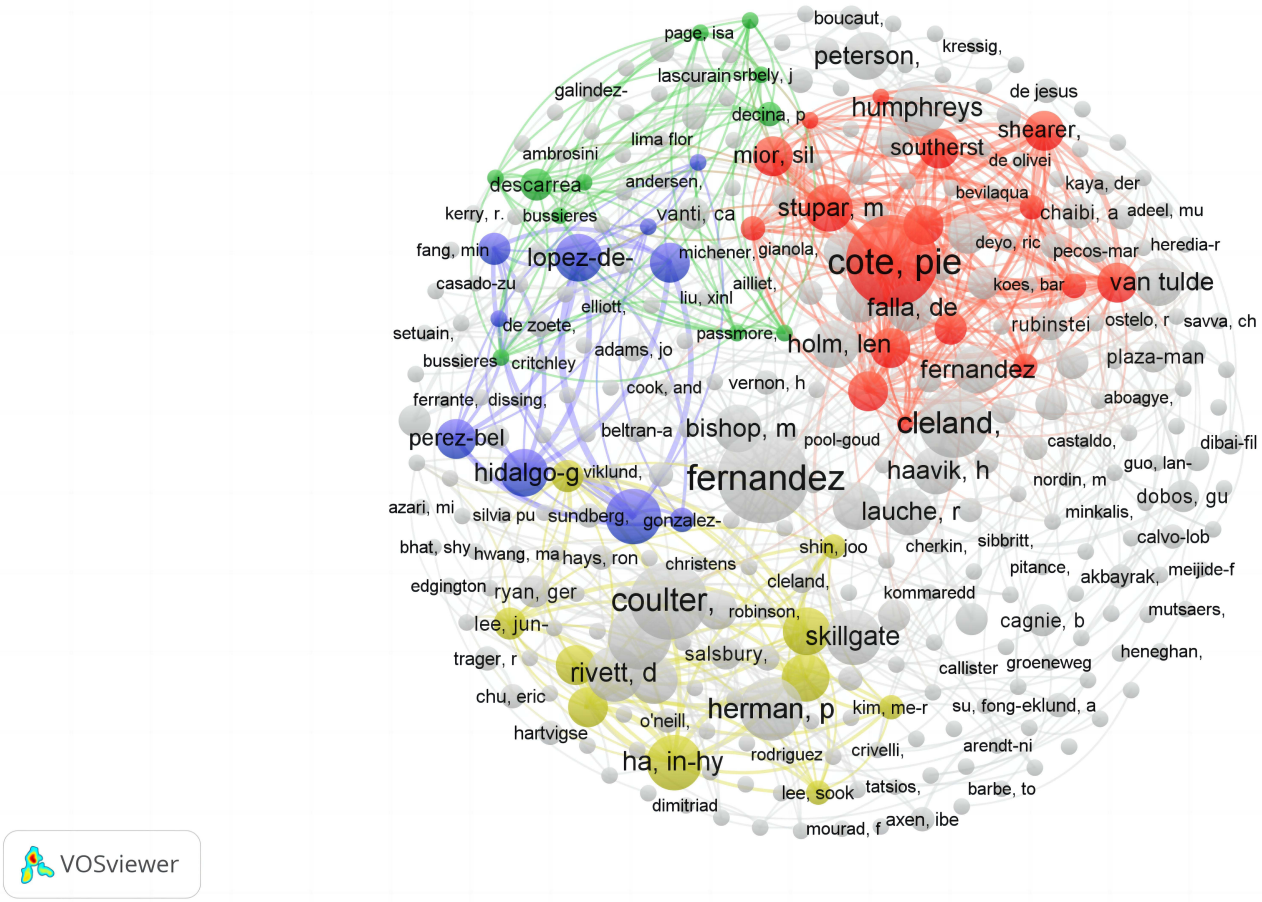

Figure 4 Analysis of the intensity of author collaboration.

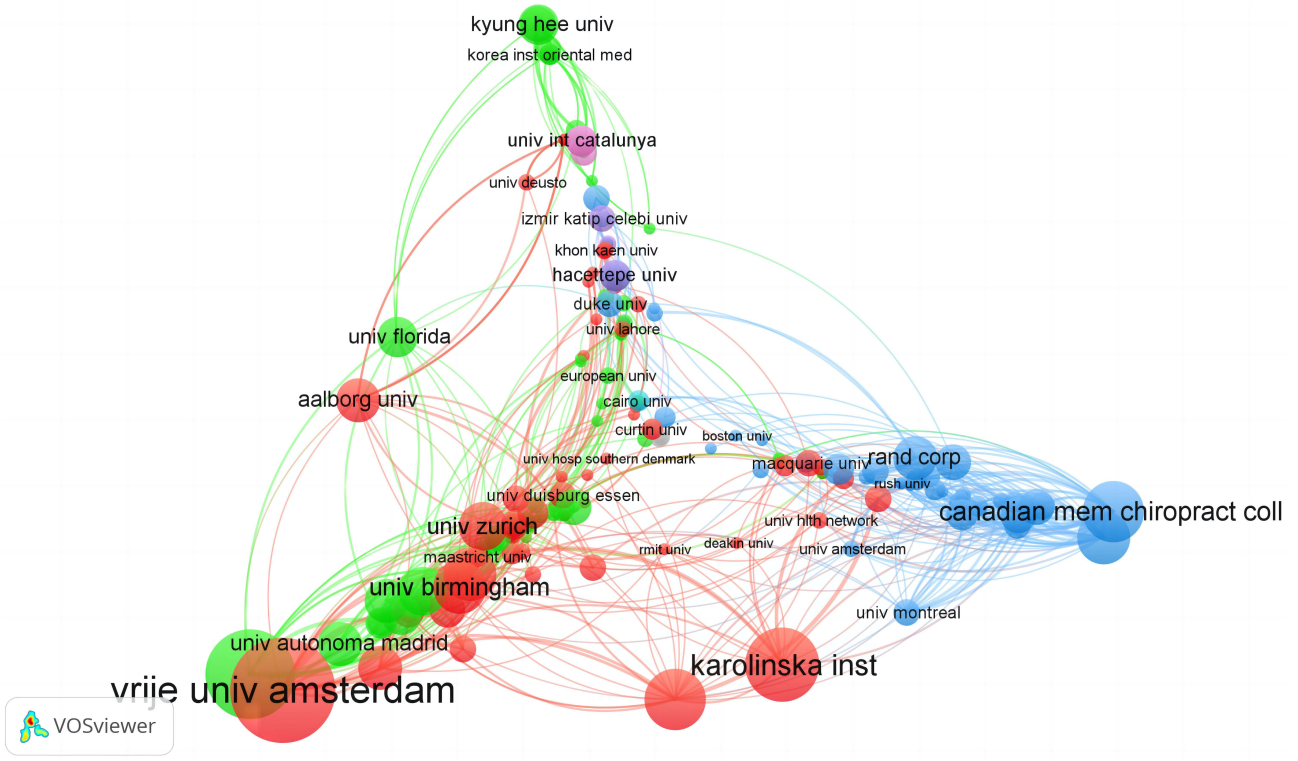

Figure 5 Analytical mapping of institutional cooperation.

Analysis of Institution

Figure 5 presents the distribution of institutions; the analysis of institutions revealed a more objective picture of their strength in developing the discipline. University Rey Juan Carlos (0.19), Vrije University Amsterdam (0.12), and Franklin Pierce University had the highest centrality (0.08).

Table 3 lists the top 10 institutions regarding the number of publications, with Vrije University Amsterdam atop the list of core publishers. Further, the top three institutions regarding the number of publications and centrality analysis were Vrije University Amsterdam, University Rey Juan Carlos, and Karolinska Inst. This indicated that they achieved relatively significant research results and advantages.

Analysis of Keyword Co-Occurrence and Burst Keywords

The node content was set as keywords in the WOSCC literature using CiteSpace. A keyword co-occurrence network knowledge graph was then generated to obtain a node count of 323 (N = 323), linkage count of 1335 (E = 1335), and

Table 3 Top 10 Institutions in the Study of Tuina for NP from 2013 to 2023

Ranking	Institutions	Publications	Percentage (%)	Centrality
1	Vrije Univ Amsterdam	20	17.09	0.12
2	Univ Rey Juan Carlos	17	14.53	0.19
3	Karolinska Inst	14	11.97	0.04
4	Canadian Mem Chiropract Coll	13	11.11	0.1
5	Univ Southern Denmark	12	10.26	0.05
6	Franklin Pierce Univ	9	7.69	0.08
7	Aalborg Univ	9	7.69	0.07
8	RAND Corp	8	6.84	0.1
9	Univ Newcastle	8	6.84	0.01
10	Univ Seville	7	5.98	0.02

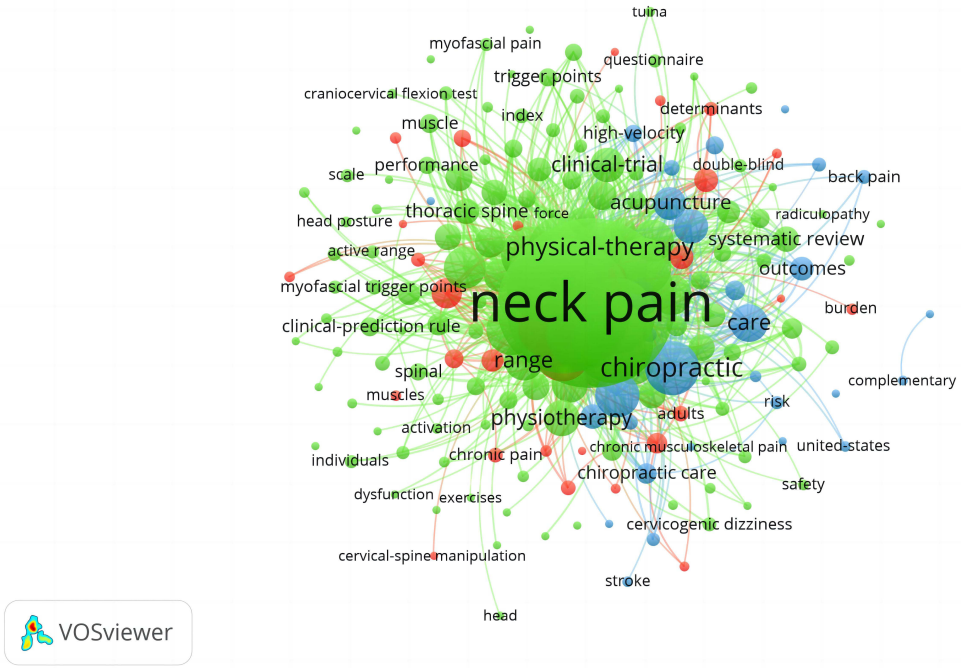

Figure 6 Keyword co-occurrence mapping.

density of 0.0257 (Figure 6). Table 4 lists the 20 keywords with the most co-counts and centralities. Popular keywords include NP, manipulative therapy, lower back pain, credence, spinal manipulation, cervical spine, physiotherapy, disability index, dysfunction, and management, which reflect the current topics of interest.

Table 4 Top 20 Keywords in Frequency and Centrality in the Study of Tuina for NP from 2013 to 2023

Ranking	Keyword	Frequency	Keyword	Centrality
1	NP	234	Validity	0.12
2	Manual therapy	184	Physiotherapy	0.1
3	Low back pain	103	Algometry	0.1
4	Reliability	95	Chronic NP	0.09
5	Spinal manipulation	87	Quality of life	0.09
6	Cervical spine	64	General population	0.09
7	Physical therapy	62	Adult	0.09
8	2000 2010 Taskforce	61	Disability index	0.08
9	Disability index	61	Outcome	0.08
10	Disorder	60	Spinal manipulative therapy	0.08
11	Management	59	Back pain	0.07
12	Mobilization	55	Guideline	0.07
13	Disability	53	Manipulative therapy	0.07
14	Motion	52	Randomized controlled trial	0.06
15	Manipulation	52	Exercise	0.06
16	Clinical trial	52	Prevalence	0.06
17	Randomized controlled trial	51	Thrust manipulation	0.06
18	Exercise	41	Muscle	0.06
19	Population	39	Musculoskeletal pain	0.06
20	Prevalence	39	Pain	0.06

(i) Treatment: Manipulative therapy is an effective rehabilitation method in high demand. Manipulative therapy is recommended for all NP stages to relieve pain, reduce disability, and improve physical function. In addition, structured treatment programs are becoming popular.
(ii) Meta-analysis: A meta-analysis was conducted to assess the differences in effectiveness between different manipulations and between manipulation and other interventions.[13–15] It was also used to evaluate the degree of pain and function improvement. The limitations of this topic include low-quality literature, heterogeneous data, and inconsistent studies.
(iii) Methods: Randomized controlled trials are often used as research methods to provide evidence of treatment efficacy.[8] Standardized and precise clinical studies are needed to obtain more valuable data.
(iv) NP-related disorders: Certain disorders (eg, headache,[16] vertigo,[17,18] neurological dysfunction-related disorders,[19] and temporomandibular joint disorders)[20] are caused by NP leading to exacerbation of symptoms, disability, and chronic conditions.

Keyword emergence refers to a significant increase in the frequency of keywords over a short period. Therefore, it is possible to obtain a clearer picture of the research topics of interest in a given period and determine the research development direction by conducting keyword emergence analysis.[21] Randomized clinical trials had the highest emergence intensity of 3.58, which increased significantly in WOSCC from 2013–2016. Therefore, the possible research trends in NP studies include dry needling, pressure pain, upper trapezius pain, massage therapy, muscle energy technique, and cervicogenic headache (Figure 7).

We can predict research frontiers based on the distribution of these keywords. For example, superior oblique muscle, tuina therapy, muscle energy technique, and cervicogenic headache will be frequently cited in the coming years, implying emerging trends (Figure 7).

(i) Superior oblique muscle: As a therapeutic target and efficacy indicator evaluation for different NP types.[22]
(ii) Tuina therapy: The most recommended treatment in the guidelines.
(iii) Muscle energy techniques: They have the advantage of increasing the angle of joint movement,[23] restoring muscle status, and promoting sleep as a treatment method.[24]
(iv) Cervicogenic headache: There is a growing interest in cervicogenic-related disorders, and cervicogenic headache is one of the classifications in the NP guidelines.[7]

Keyword Clustering

CiteSpace was used to cluster the keyword co-occurrences for cluster analysis, and cluster labels were extracted using keyword labels. The log-likelihood rate algorithm was used to cluster the keywords to obtain the cluster mapping. The modularity of the network (Q value) is a global measure of the overall structure; the higher the Q value, the better the clustering. $Q > 0.3$ indicates that the clustering structure is significant. The mean contour value (mean silhouette) is a metric used to assess network homogeneity, with values closer to 1 indicating higher homogeneity.[25] The $Q = 0.7056$ and mean silhouette value of 0.8722 in this WOSCC study indicated that the results of this clustering are significant and highly credible with a relative concentration of various research aspects. Figure 8 illustrates the cluster analysis for the top 10 categories, with the craniocervical flexion test as the largest cluster #0, followed by stabilization exercise #1 and regional supply #2, with the craniocervical flexion test as a potential assessment test to more precisely detect deep neck flexors; the cranial neck flexion test has not been promoted because of reliability issues.[26] However, it is recommended that reliability issues are addressed through version improvements and systematic training of assessors. Stability exercises have been used for a long time as a treatment method because they improve muscle strength, posture, and stability, thus relieving pain.[27,28] These keywords are partly indicative of the current research topics of interest. Based on this, researchers can predict future development trends.

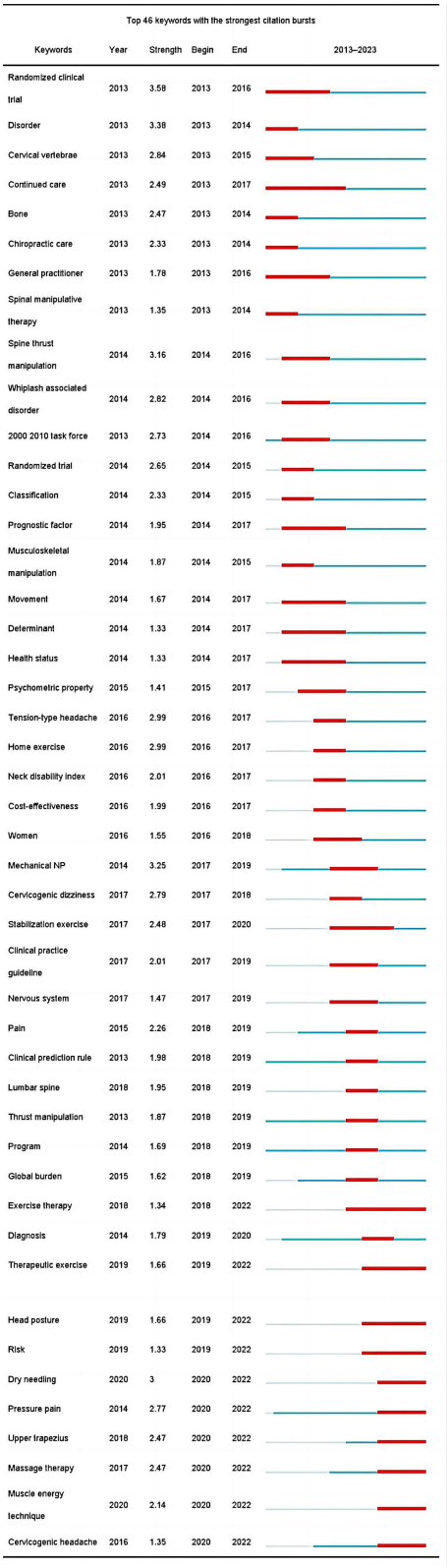

Figure 7 Top 46 keywords with the strongest citation bursts.

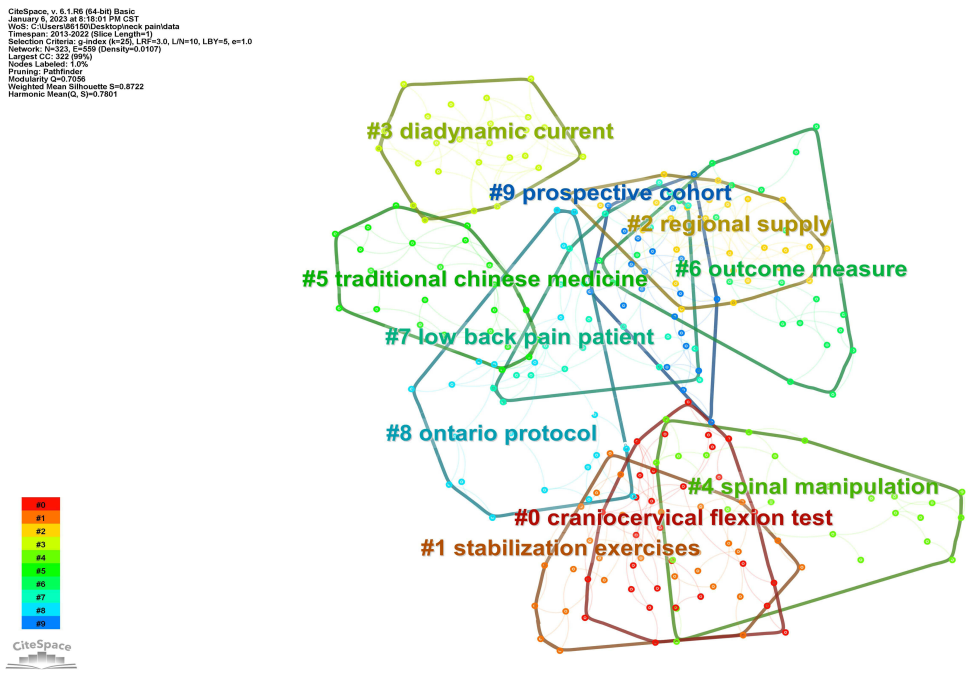

Figure 8 Keyword clustering mapping of tuina manipulation for NP.

Analysis of Co-Cited References

Analysis of references using CiteSpace in the WOSCC database yielded a knowledge graph of literature co-citations with 492 nodes, 1305 links, and a density of 0.0108 (Figure 9). This revealed the scientific relevance of the large body of literature. The highest co-citation was for spinal manipulation acting on the thoracic spine, with studies[29–31] revealing

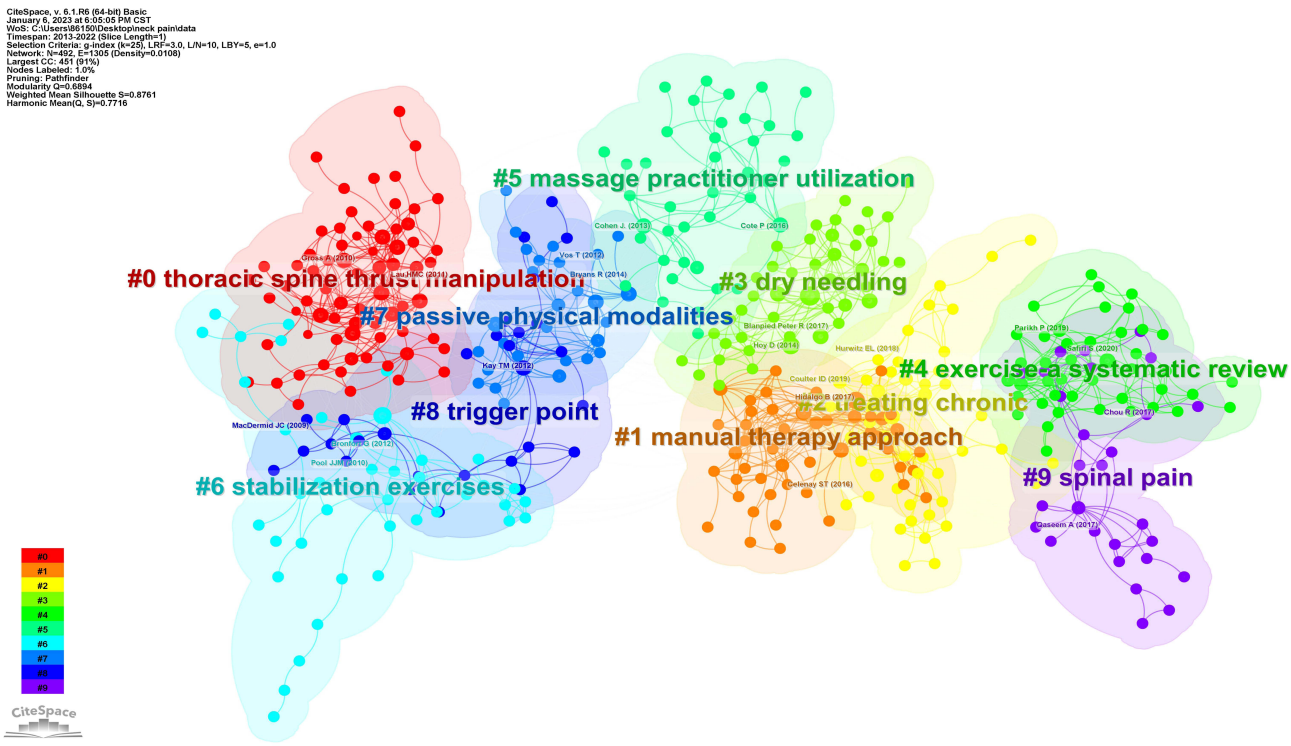

Figure 9 Co-citation clustering mapping of tuina manipulation for NP.

Table 5 Total Frequency of Citations for Tuina Manipulation for NP (Top 5)

Ranking	Cited Reference	Author	Co-Citation Counts	Publication Year
1	NP: Revision 2017	Blanpied Peter R	45	2017
2	The efficacy of manual therapy and exercise for treating non-specific NP: A systematic review	Hidalgo B	28	2017
3	The global burden of NP: estimates from the global burden of disease 2010 study	Hoy D	25	2014
4	Spinal manipulation, medication, or home exercise with advice for acute and subacute NP: a randomized trial	Bronfort G	23	2012
5	Management of NP and associated disorders: A clinical practice guideline from the Ontario Protocol for Traffic Injury Management (OPTIMa) Collaboration	Cote P	21	2016

Table 6 The Centrality of Cited Literature on Tuina Manipulation for NP (Top 5)

Ranking	Cited Reference		Centrality	Publication Year
1	Comparative short-term effects of two thoracic spinal manipulation techniques in subjects with chronic mechanical NP: a randomized controlled trial	Casanova-Mendez A	0.19	2014
2	A Comparison of the Effects of Stabilization Exercises Plus Manual Therapy with Those of Stabilization Exercises Alone in Patients with Non-specific Mechanical NP: A Randomized Clinical Trial	Celenay ST	0.18	2016
3	Dose optimization for spinal treatment effectiveness: a randomized controlled trial investigating the effects of high and low mobilization forces in patients with NP	Snodgrass SJ	0.17	2014
4	A preliminary study comparing the use of cervical/upper thoracic mobilization and manipulation for individuals with mechanical NP	Griswold D	0.15	2015
5	Management of NP and associated disorders: A clinical practice guideline from the Ontario Protocol for Traffic Injury Management (OPTIMa) Collaboration	Cote P	0.13	2016

that spinal manipulation acting on the thoracic spine improved patients' pain and neck joint mobility in the immediate and short-term time frames. However, a systematic review and meta-analysis suggested[32] that spinal manipulation of the thoracic spine was not superior to spinal manipulation of the neck. Therefore, combining these two factors may yield better results.

In addition, stabilization exercises, passive physical modalities, massage, and dry needle therapy are also widely used in the treatment of neck pain.[33–35] The trigger point is often used as the treatment site in dry needling therapy.[36]

Table 5 and Table 6 show the statistical analysis of the number of co-citations in the included literature and the frequency and centrality results of the top five co-citations.

Discussion

Upon studying the 505 selected papers, we identified the research trends on tuina manipulation for NP treatment and presented them using visual methods, including tables and figures. The number of research studies on this treatment method has increased over the last two decades, indicating that tuina manipulation is becoming more popular among researchers, clinicians, and patients.

Regarding publication outputs, the period from 2013 to 2016 can be considered the first phase, with a stable and barely growing trend and an average annual publication of 39.2 (Figure 2). The period from 2017 to 2020, can be considered the second phase, with increasing interest in NP research up until 2017, when high-scoring guidelines[2,7] emerged to guide the clinical use of tuina manipulation for treating patients with NP. Tuina therapy is gaining global popularity as a highly recommended complementary alternative treatment. In the second phase, the average number of

publications was 53.7. The number of articles in 2021 was significantly higher than that in the previous phase and approximately twice as many as the first. Furthermore, while the previous phase was primarily concerned with comparing tuina with other therapies or different modalities,[37] the 2021 phase focused more on the combined use of tuina with other therapies[38,39] and more precise treatment methods.[40–42]

The change in literature growth up until 2022 was insignificant. Nonetheless, the overall trend in this research area will continue to grow in the coming years based on the line graph analysis. Furthermore, this finding indicates that research intensity is increasing and that researchers are showing a strong interest in tuina manipulation for NP treatment. Several articles published in 2017 drew extensive research attention and provided clinical treatment guidance in this area.

Regarding publishing countries, the USA (30.37% of the total literature), Spain (14.10% of the total literature), and Australia (10.41% of the total literature) were the top three countries studying this topic. They accounted for >10% of all publications in this field, indicating that they account for a significant proportion of the research output. If the database was not limited to the English-based Web of Science database, Asian countries would have more publications because tuina manipulation is widely accepted in East Asian countries. A combined analysis of publications and centrality revealed that the USA and Australia were dominant. The USA, Canada, Australia, Spain, the UK, and New Zealand formed a strong central partnership. Some countries, such as Brazil, Turkey, and South Korea, had zero centrality values. In addition, they lacked extensive academic exchanges and collaborations with their international counterparts; therefore, they were marginalized.

Regarding authors, César Fernández-de-Las-Peñas and Ian D Coulter had the highest number of publications (Figure 3), followed by Herman and Rodríguez-Sanz. Fernández-de-Las-Peñas et al treated different types of patients with NP for pain, dysfunction, negative emotions, and their prognostic performance using various exercises or physiotherapy (eg, motor control exercises, spinal manipulative therapy, and general exercises) under different sites.[43] Cote had the most significant centrality (0.01) based on centrality mapping analysis, with almost all authors having a centrality of zero; thus, despite the many scholars studying this topic, author collaboration is weak and needs improvement. Nevertheless, close and frequent communication between these authors was poor.

Regarding document type, the article "Neck Pain: Revision 2017" was the most cited. In this study,[7] NP was first classified into four main categories based on the different NP symptoms: (1) NP with mobility deficits, (2) NP with headache, (3) NP with radiating pain, and (4) NP with movement coordination impairments. The stages were subdivided based on the duration of the disease. We recommend that the treatment be more specialized based on different NP symptom types. We also recommend combining different treatment options, such as massage and functional exercises, for subacute and chronic stages of NP with functional impairment.

Regarding keywords, there were 10 top categories in the cluster analysis, with the craniocervical flexion test as the largest cluster #0, followed by stabilization exercise #1, and regional supply #2. The craniocervical flexion test was a potential assessment to more precisely detect deep neck flexors; the cranial neck flexion test has not been promoted because of reliability issues.[26] However, we recommend that reliability issues be addressed through version improvements and systematic training of assessors. Stability exercises have been used for a long time as a treatment method because they improve muscle strength, posture, and stability, thus relieving pain.[27,28] These keywords partly indicate the current research topics of interest. Based on this, researchers can predict future developmental trends.

Regarding co-cited references, the Clinical Trial Guidelines for NP published by the American Physical Therapy Association in 2017 was the most frequently cited of the top five co-citations, while the short-term comparative effects of two thoracic spinal manipulation techniques in patients with chronic mechanical NP, a randomized controlled trial, was the most cited in the analysis of the centrality of co-citations. This indicates that most scholars now recognize the efficacy of manipulations in treating NP and which manipulation is more effective among the various types and different sites of action. A guideline study on NP and related disorders[44] ranked high regarding the frequency and centrality of high-frequency co-citations, implying a structured and varied treatment plan based on the patient's condition and emphasizing the importance of diagnosis. The increasing number of popular articles showed that NP is gaining more attention, and researchers are working hard to find effective treatments, with equal attention placed on primary care, exercise training, and combined training.

This study has some limitations. Because of the shortage of time, we could not compare the WOSCC database with those of other countries (eg, China) to investigate the differences between different countries and cultures. This study provides insights into the field of tuina to treat NP. Key research countries, institutions, core journals, key authors, overall

trends, research topics of interest, and research frontiers have been highlighted. Overall, this study fills the gap of bibliometric analysis on tuina for NP and reveals the current status and research trends in this field. The study has a strong reference value and suggests future research in this field.

Conclusion

We used the scientific knowledge mapping method to search and analyze the WOSCC database of literature on tuina manipulation for NP published between January 1, 2013, and January 1, 2023, to obtain valuable information on the increasing annual output of relevant publications in the field over the past 10 years. The overall development has been relatively slow. Studies have shown that NP is highly prevalent and negatively impacts the quality of life, causing associated disorders. According to NP guidelines, patients need various structured treatment options, and the core development area of the field is the USA, which is currently the main research force and has formed partnerships with Europe, Asia, and other countries. César Fernández-de-Las-Peñas and Ian D Coulter are the most published authors, followed by Patricia M Herman, Jacobo Rodríguez-Sanz, and others. Scholars in this field have investigated the efficacy of various exercises or physiotherapy and placebos by assessing their effectiveness, health care, and prognostic management. Nonetheless, many authors have poor research paper quality and lack communication and collaboration with other researchers. Analysis of the cited literature shows that the most frequently cited article is the 2017 clinical trial guideline on NP published by the American Physical Therapy Association, an American Physical Therapy Association Orthopedic Section evidence-based practice guideline for managing orthopedic physiotherapy for patients with musculoskeletal injuries described in the International Classification of Functioning, Disability, and Health by the World Health Organization. Researchers and practicing clinicians can study and use this guideline. Tuina therapy, muscle energy techniques, and cervicogenic headaches may be at the forefront of research, indicating new trends and future directions.

Data Sharing Statement

Raw data can be obtained directly from the WOSCC.

Funding

This work was supported by the National Natural Science Foundation of China (grant number: 82174526, 82274676), The science and technology innovation Program of Hunan Province (grant number: 2022RC1221), Hunan Provincial Education Department Postgraduate Research Innovation Program (grant number: 2022CX18), National Grand Innovation Program (grant number: S202010541023), and the Hunan Provincial Health Commission Project (grant number: 202209024063).

Disclosure

The authors declare no conflicts of interest regarding the publication of this paper.

References

1. Yang C, Lyv L, Wang W, et al. Investigation on the treatment of neck-type cervical spondylopathy based on the concept of "treat sinew-bone imbalance by treating sinews. *Chin J Traumatol*. 2019;31(04):64–69.
2. Cohen SP, Hooten WM. Advances in the diagnosis and management of neck pain. *BMJ*. 2017;358:j3221. doi:10.1136/bmj.j3221
3. Holzgreve F, Maltry L, Hänel J, et al. The office work and stretch training (OST) study: an individualized and standardized approach to improve the quality of life in office workers. *Int J Environ Res Public Health*. 2020;17(12):4522. doi:10.3390/ijerph17124522
4. Pieper C, Schröer S, Eilerts AL. Evidence of workplace interventions—a systematic review of systematic reviews. *Int J Environ Res Public Health*. 2019;16(19):3553. doi:10.3390/ijerph16193553
5. Falsiroli Maistrello L, Zanconato L, Palese A, et al. Perceptions and experiences of individuals with neck pain: a systematic critical review of qualitative studies with meta-summary and meta-synthesis. *Phys Ther*. 2022;102(8):zac080. doi:10.1093/ptj/pzac080
6. Wang Q, Sun G, Ma J, et al. Application of motion control exercise in the prevention and treatment of cervical spondylosis based on biomechanics and proprioceptive analysis. *J Tradit Chin Med*. 2020;22(11):204–209.
7. Blanpied PR, Gross AR, Elliott JM, et al. Neck pain: revision 2017. *J Orthop Sports Phys Ther*. 2017;47(7):A1–A83. doi:10.2519/jospt.2017.0302
8. Cheng Z, Zhang S, Gu Y, et al. Effectiveness of tuina therapy combined with yijinjing exercise in the treatment of non-specific chronic neck pain. *JAMA Netw Open*. 2022;5(12):e2246538. doi:10.1001/jamanetworkopen.2022.46538
9. Bougioukas KI, Vounzoulaki E, Mantsiou CD, et al. Global mapping of overviews of systematic reviews in healthcare published between 2000 and 2020: a bibliometric analysis. *J Clin Epidemiol*. 2021;137:58–72. doi:10.1016/j.jclinepi.2021.03.019
10. Chen C, Song M. Visualizing a field of research: a methodology of systematic scientometric reviews. *PLoS One*. 2019;14(10):e0223994. doi:10.1371/journal.pone.0223994

11. Wu MQ, Wu DQ, Hu CP, et al. Studies on children with developmental coordination disorder in the past 20 years: a bibliometric analysis via CiteSpace. *Front Psychiatry*. 2021;12:776883. doi:10.3389/fpsyt.2021.776883
12. Zhang Y, Li C, Ji X, et al. The knowledge domain and emerging trends in phytoremediation: a scientometric analysis with CiteSpace. *Environ Sci Pollut Res*. 2020;27(13):15515–15536. doi:10.1007/s11356-020-07646-2
13. Chaibi A, Stavem K, Russell MB. Spinal manipulative therapy for acute neck pain: a systematic review and meta-analysis of randomised controlled trials. *J Clin Med*. 2021;10(21):5011. doi:10.3390/jcm10215011
14. Coulter ID, Crawford C, Vernon H, et al. Manipulation and mobilization for treating chronic non-specific neck pain: a systematic review and meta-analysis for an appropriateness panel. *Pain Physician*. 2019;22(2):E55–E70. doi:10.36076/ppj/2019.22.E55
15. Fredin K, Lorås H. Manual therapy, exercise therapy or combined treatment in the management of adult neck pain—a systematic review and meta-analysis. *Musculoskelet Sci Pract*. 2017;31:62–71. doi:10.1016/j.msksp.2017.07.005
16. Hanson L, Haas M, Bronfort G, et al. Dose–response of spinal manipulation for cervicogenic headache: study protocol for a randomized controlled trial. *Chiropr Man Ther*. 2016;24(1):13–25. doi:10.1186/s12998-016-0105-z
17. Reid SA, Callister R, Snodgrass SJ, et al. Manual therapy for cervicogenic dizziness: long-term outcomes of a randomised trial. *Man Ther*. 2015;20(1):148–156. doi:10.1016/j.math.2014.08.003
18. Reid SA, Rivett DA, Katekar MG, et al. Comparison of mulligan sustained natural apophyseal glides and maitland mobilizations for treatment of cervicogenic dizziness: a randomized controlled trial. *Phys Ther*. 2014;94(4):466–476. doi:10.2522/ptj.20120483
19. La Touche R, París-Alemany A, Mannheimer JS, et al. Does mobilization of the upper cervical spine affect pain sensitivity and autonomic nervous system function in patients with cervico-craniofacial pain? *Clin J Pain*. 2013;29(3):205–215. doi:10.1097/AJP.0b013e318250f3cd
20. Sault JD, Emerson Kavchak AJ, Tow N, et al. Regional effects of orthopedic manual physical therapy in the successful management of chronic jaw pain. *CRANIO®*. 2016;34(2):124–132. doi:10.1179/2151090314Y.0000000039
21. Chen Y, Chen C, Liu Z, et al. The methodology function of Citespace mapping knowledge domains. *Stud Sci Sci*. 2015;33(2):242–253.
22. Alghadir AH, Iqbal A, Anwer S, et al. Efficacy of combination therapies on neck pain and muscle tenderness in male patients with upper trapezius active myofascial trigger points. *BioMed Res Int*. 2020;2020:1–9. doi:10.1155/2020/9361405
23. Sbardella S, La Russa C, Bernetti A, et al. Muscle energy technique in the rehabilitative treatment for acute and chronic non-specific neck pain: a systematic review. *Healthcare*. 2021;9(6):746. doi:10.3390/healthcare9060746
24. Hadamus A, Wojda A, Białoszewski D. Can the sleep quality of patients with chronic neck pain be improved by muscle energy techniques combined with Swedish massage? *Complement Ther Clin Pract*. 2021;44:101421. doi:10.1016/j.ctcp.2021.101421
25. Chen C. CiteSpace II: detecting and visualizing emerging trends and transient patterns in scientific literature. *J Assoc Inf Sci Technol*. 2006;57(3):359–377. doi:10.1002/asi.20317
26. Romeo A, Baccini M, Carreras G, et al. Reliability, validity, and responsiveness of the craniocervical flexion test in people who are asymptomatic and patients with non-specific neck pain: a systematic review and meta-analysis. *Phys Ther*. 2022;102(7):zac054. doi:10.1093/ptj/pzac054
27. Fathollahnejad K, Letafatkar A, Hadadnezhad M. The effect of manual therapy and stabilizing exercises on forward head and rounded shoulder postures: a six-week intervention with a one-month follow-up study. *BMC Musculoskelet Disord*. 2019;20(1):86. doi:10.1186/s12891-019-2438-y
28. Yesil H, Hepguler S, Dundar U, et al. Does the use of electrotherapies increase the effectiveness of neck stabilization exercises for improving pain, disability, mood, and quality of life in chronic neck pain? *Spine*. 2018;43(20):E1174–E1183. doi:10.1097/BRS.0000000000002663
29. Erdem EU, Ünver B, Akbas E, et al. Immediate effects of thoracic manipulation on cervical joint position sense in individuals with mechanical neck pain: a randomized controlled trial. *J Back Musculoskelet Rehabil*. 2021;34(5):735–743. doi:10.3233/BMR-191798
30. Young IA, Pozzi F, Dunning J, et al. Immediate and short-term effects of thoracic spine manipulation in patients with cervical radiculopathy: a randomized controlled trial. *J Orthop Sports Phys Ther*. 2019;49(5):299–309. doi:10.2519/jospt.2019.8150
31. Joshi S, Balthillaya G, Neelapala YVR. Immediate effects of cervicothoracic junction mobilization versus thoracic manipulation on the range of motion and pain in mechanical Neck Pain with cervicothoracic junction dysfunction: a pilot randomized controlled trial. *Chiropr Man Ther*. 2020;28(1):1–8. doi:10.1186/s12998-020-00327-4
32. Masaracchio M, Kirker K, States R, et al. Thoracic spine manipulation for the management of mechanical neck pain: a systematic review and meta-analysis. *PLoS One*. 2019;14(2):e0211877. doi:10.1371/journal.pone.0211877
33. Wu B, Yuan H, Geng D, et al. The impact of a stabilization exercise on neck pain: a systematic review and meta-analysis. *J Neurol Surg a Cent Eur Neurosurg*. 2020;81(04):342–347. doi:10.1055/s-0039-3400953
34. Shirzadi Z, Rojhani-Shirazi Z, Hemmati L. A comparison between the effects of scapulothoracic mobilization plus physical therapy with physical therapy alone in patients with mechanical neck pain: a randomized clinical trial. *J Chiropr Med*. 2018;17(4):237–243. doi:10.1016/j.jcm.2018.04.003
35. Berger A, Liu Y, Mosel L, et al. Efficacy of dry needling and acupuncture in the treatment of neck pain. *Anesth Pain Med*. 2021;11(2):154.
36. Navarro-Santana MJ, Sanchez-Infante J, Gómez-Chiguano GF, et al. Dry needling versus trigger point injection for neck pain symptoms associated with myofascial trigger points: a systematic review and meta-analysis. *Pain Med*. 2021;23(3):515–525. doi:10.1093/pm/pnab188
37. Celenay ST, Akbayrak T, Kaya DO. A comparison of the effects of stabilization exercises plus manual therapy to those of stabilization exercises alone in patients with non-specific mechanical neck pain: a randomized clinical trial. *J Orthop Sports Phys Ther*. 2016;46(2):44–55. doi:10.2519/jospt.2016.5979
38. Díaz-Pulido B, Pérez-Martín Y, Pecos-Martín D, et al. Efficacy of manual therapy and transcutaneous electrical nerve stimulation in cervical mobility and endurance in subacute and chronic neck pain: a randomized clinical trial. *J Clin Med*. 2021;10(15):3245. doi:10.3390/jcm10153245
39. Mylonas K, Angelopoulos P, Billis E, et al. Combining targeted instrument-assisted soft tissue mobilization applications and neuromuscular exercises can correct forward head posture and improve the functionality of patients with mechanical neck pain: a randomized control study. *BMC Musculoskelet Disord*. 2021;22(1):212. doi:10.1186/s12891-021-04080-4
40. Iqbal ZA, Alghadir AH, Anwer S. Efficacy of deep cervical flexor muscle training on neck pain, functional disability, and muscle endurance in school teachers: a clinical trial. *BioMed Res Int*. 2021;2021:7190808. doi:10.1155/2021/7190808
41. Liu M, Liu Y, Peng C, et al. Effects of massage and acupuncture on the range of motion and daily living ability of patients with frozen shoulder complicated with cervical spondylosis. *Am J Transl Res*. 2021;13(04):2804–2812.

42. Büyükturan B, Şaş S, Kararti C, et al. The effects of combined sternocleidomastoid muscle stretching and massage on pain, disability, endurance, kinesiophobia, and range of motion in individuals with chronic neck pain: a randomized, single-blind study. *Musculoskelet Sci Pract*. 2021;55:102417. doi:10.1016/j.msksp.2021.102417
43. Dunning JR, Butts R, Mourad F, et al. Upper cervical and upper thoracic manipulation versus mobilization and exercise in patients with cervicogenic headache: a multi-center randomized clinical trial. *BMC Musculoskelet Disord*. 2016;17(1):1–2. doi:10.1186/s12891-016-0912-3
44. Esakki S, MacDermid JC. Appraisal of: management of neck pain and associated disorders: a clinical practice guideline from the Ontario Protocol for Traffic Injury Management (OPTIMa) collaboration. *J Physiother*. 2018;64(1):62. doi:10.1016/j.jphys.2017.07.011