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# A Bibliometric Analysis of Research Trends in Neck Pain from 2000 to 2025

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**Abstract:** *Objective:* This paper conducts a bibliometric analysis of the literature on neck pain research from 2000 to 2025, aiming to comprehensively and systematically understand the research landscape, hotspots, and frontier trends in this field, providing a reference for future research directions. *Methods:* Data were sourced from the Web of Science Core Collection, with the search term TI = "neck pain," covering the time span from 2000 to 2025, resulting in 2746 articles. Software such as CiteSpace V6.3.R1 and VOSviewer 1.6.20 was used to analyze publication volume, countries, authors, institutions, keywords, and co-citation networks. *Results:* The number of publications in neck pain research has been increasing year by year, indicating a rising level of research activity. Authors like Falla, D, Jull, G, and institutions such as Univ Queensland and Univ Toronto have significant influence in this field. Co-occurrence analysis of keywords shows that "neck pain," "low back pain," and "disability index" are high-frequency keywords, reflecting research hotspots such as the characteristics and treatment of neck pain and its interrelation with pain in other regions. Timeline analysis and keyword emergence analysis reveal the frontiers and development trends in this field, such as the growing attention on emerging therapeutic methods like "exercise therapy" and "dry needling," while keywords like "intensity," "individuals," and "quality" indicate an increasing emphasis on personalization, precision, and quality control in the treatment process. *Conclusion:* The field of neck pain research is continuously expanding and deepening. Future research should further investigate the pathogenesis of neck pain, its associations with other conditions, the refinement of assessment methods, and the development of innovative rehabilitation strategies. Emphasis should also be placed on interdisciplinary collaboration to provide more robust theoretical foundations and practical guidance for the clinical treatment and rehabilitation management of neck pain.

**Keywords:** Neck pain; CiteSpace; VOSviewer; Bibliometrics; Research Trends

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## 1. Introduction

Neck pain, as one of the common pain conditions in clinical practice, severely affects the quality of life and

work efficiency of modern people and brings a heavy burden to society [1]. With the increasing demand for health and the rapid development of medical technology, research on neck pain has attracted widespread attention. Relevant studies cover multiple aspects, including pathogenesis, diagnostic methods, therapeutic strategies, and rehabilitation management, and have achieved many results [2]. However, research on neck pain still faces some challenges, such as insufficient understanding of the pathogenesis, the need to optimize evaluation methods, and significant individual differences in therapeutic effects [3]. Against this background, this paper uses bibliometric methods to conduct a quantitative analysis of the relevant literature in the field of neck pain research from 2000 to 2025, aiming to comprehensively and systematically understand the research trends, hotspots, and cutting-edge trends in this field, provide references for future research directions, promote further development of neck pain research, and provide more scientific and effective theoretical support and technical guidance for clinical practice.

## 2. Methods

### 2.1. Data source and search strategy

The data in this paper are from the Web of Science Core Collection. The citation index selected is "Science Citation Index Expanded (SCI-EXPANDED)–1900 to present". The search formula is: TI = "neck pain", time span: 2000–2025, and the search date is March 13, 2025. The document type is limited to articles and review articles, excluding conference proceedings papers, online publications, letters, review materials, etc. At the same time, to ensure the quality and representativeness of the source data, two members of the research group screened the literature based on the titles and abstracts, excluded completely irrelevant literature, checked and compared it, and removed duplicates. Finally, 2746 articles are retained.

### 2.2. Data analysis tools

Bibliometric analysis software, such as CiteSpace V6.3.R and VOSviewer1.6.20, are used to conduct bibliometric analysis on the number of publications, countries, authors, institutions, keywords, and co-citation networks.

## 3. Results

### 3.1. Top 10 authors by publication output

**Table 1** shows the relevant data of the top 10 authors by publication output in the field of neck pain research.

**Table 1.** Top 10 authors by publication output

| Author name | Total number of articles | Total citations | Average citations | First author citations | First author average citations | Corresponding author count | Corresponding author citations |
|---|---|---|---|---|---|---|---|
| Falla, D | 56 | 953 | 17.02 | 566 | 37.73 | 32 | 602 |
| Jull, G | 50 | 1078 | 21.56 | 94 | 31.33 | 3 | 94 |
| Côté, P | 50 | 1013 | 20.26 | 326 | 46.57 | 9 | 267 |
| Treleaven, J | 42 | 420 | 10 | 154 | 19.25 | 15 | 228 |
| Carroll, LJ | 36 | 835 | 23.19 | 240 | 34.29 | 7 | 240 |
| Fernández-de-las-Peñas, C | 32 | 321 | 10.03 | 24 | 12 | 16 | 262 |

**Table 1 (Continued)**

| Author name | Total number of articles | Total citations | Average citations | First author citations | First author average citations | Corresponding author count | Corresponding author citations |
|---|---|---|---|---|---|---|---|
| Cleland, JA | 31 | 822 | 26.52 | 391 | 48.88 | 7 | 337 |
| Cassidy, JD | 31 | 764 | 24.65 | 4 | 4 | 1 | 4 |
| Holm, LW | 31 | 594 | 19.16 | 1 | 0.33 | 2 | 0 |
| Cagnie, B | 30 | 334 | 11.13 | 122 | 24.4 | 5 | 122 |

In terms of publication output, Falla ranks first with 56 publications, indicating the richest research output and high research activity in this field. Jull and Côté both published 50 articles, following closely behind, showing their continuous investment and contribution to neck pain research. Regarding citation situations, Jull has the highest total citation count, reaching 1,078 times, with an average citation count of 21.56 times, which means that her research findings have been widely concerned and cited in the academic community and have high academic influence. Cleland's average citation count is 26.52 times, and his corresponding author's articles have been cited 337 times, indicating that his research work as a corresponding author has high quality and influence. Fernández-de-las-Peñas's first-author average citation is 12 times, and his corresponding author's articles have been cited 262 times, showing his influence in different research roles. These authors have high publication output and citation counts in the field of neck pain research and have played an important role in promoting the development of this field. Their research findings provide important theoretical basis and practical guidance for the prevention, diagnosis, and treatment of neck pain and offer rich reference resources for relevant researchers.

## 3.2. Top 10 institutions by publication output

**Table 2** shows the relevant data of the top 10 institutions by publication output in the field of neck pain research.

**Table 2.** Top 10 institutions by publication output

| Institution name | Total number of articles | Total citations | Average citations | Total first author articles | First author citations | First author average citations |
|---|---|---|---|---|---|---|
| Univ Queensland | 161 | 2746 | 17.06 | 75 | 1607 | 21.43 |
| Univ Toronto | 112 | 2003 | 17.88 | 10 | 74 | 7.4 |
| Univ Rey Juan Carlos | 100 | 950 | 9.5 | 27 | 327 | 12.11 |
| Vrije Univ Amsterdam | 99 | 872 | 8.81 | 18 | 102 | 5.67 |
| Univ Alberta | 95 | 2075 | 21.84 | 12 | 365 | 30.42 |
| Karolinska Inst | 84 | 874 | 10.4 | 35 | 181 | 5.17 |
| NYU | 74 | 1366 | 18.46 | 6 | 47 | 7.83 |
| McMaster Univ | 66 | 1249 | 18.92 | 21 | 472 | 22.48 |
| Univ Sydney | 64 | 1242 | 19.41 | 21 | 286 | 13.62 |
| Canadian Mem Chiropract Coll | 60 | 781 | 13.02 | 10 | 117 | 11.7 |

In terms of publication output, Univ Queensland ranks first with 161 articles, indicating the richest research output and high research activity in this field. Institutions such as Univ Toronto and Univ Rey Juan Carlos also have relatively high publication outputs, showing their continuous investment and contribution to neck pain research. Regarding citation situations, Univ Alberta has the highest average citation count, reaching 21.84 times, with a first-author average citation count of 30.42 times, which means that its research findings have been widely cited and highly recognized in the academic community and have high academic influence. McMaster Univ has an average citation count of 18.92 times, with a first-author average citation count of 22.48 times, showing the high quality and influence of its research. Although Univ Rey Juan Carlos has a relatively low average citation count of 9.5 times, its first-author average citation count is 12.11 times, indicating that it has a certain influence in some specific research areas.

## 3.3. Top 10 journals by publication output

**Table 3** shows the relevant quantitative indicators of the top 10 journals by publication output in the field of neck pain research.

**Table 3.** Top 10 journals by publication output

| Journal name | Total number of articles | Total citations | Average citations |
|---|---|---|---|
| Journal of Manipulative and Physiological Therapeutics | 121 | 781 | 6.45 |
| Spine | 114 | 2226 | 19.53 |
| Manual Therapy | 91 | 1683 | 18.49 |
| European Spine Journal | 81 | 904 | 11.16 |
| BMC Musculoskeletal Disorders | 80 | 586 | 7.33 |
| Musculoskeletal Science and Practice | 61 | 167 | 2.74 |
| Journal of Orthopaedic & Sports Physical Therapy | 49 | 1025 | 20.92 |
| Journal of Back and Musculoskeletal Rehabilitation | 43 | 144 | 3.35 |
| Physical Therapy | 40 | 495 | 12.38 |
| Pain Medicine | 39 | 151 | 3.87 |

In terms of the number of publications, the journal “Spine” ranks first with 114 articles, reflecting its high output rate in the field of neck pain research and its status as an important platform for publishing relevant academic achievements. Journals such as “Manual Therapy” and “European Spine Journal” are also significant. Focusing on the key indicator of citation situations, “Spine” has a total of 2,226 citations, with an average citation count of 19.53 times, which fully demonstrates the wide influence and high recognition of the articles published in this journal in the academic community, meaning that its published research findings have become important references for many subsequent studies. The average citation count of “Journal of Orthopaedic & Sports Physical Therapy” has reached 20.92 times, indicating that it also has an undeniable influence and academic value in the professional field. Overall, these 10 journals, with their high publication and citation counts, constitute important academic carriers in the field of neck pain research and have played a key role in promoting the continuous development of this field, as well as in promoting the accumulation and innovation of knowledge.

## 3.4. Co-occurrence analysis of keywords

The co-occurrence network of keywords helps to discover the knowledge network relationships in research content, mine the core knowledge points in the research field, and also displays the current knowledge structure, research themes, and hotspots in the field **(Figure 1)**.

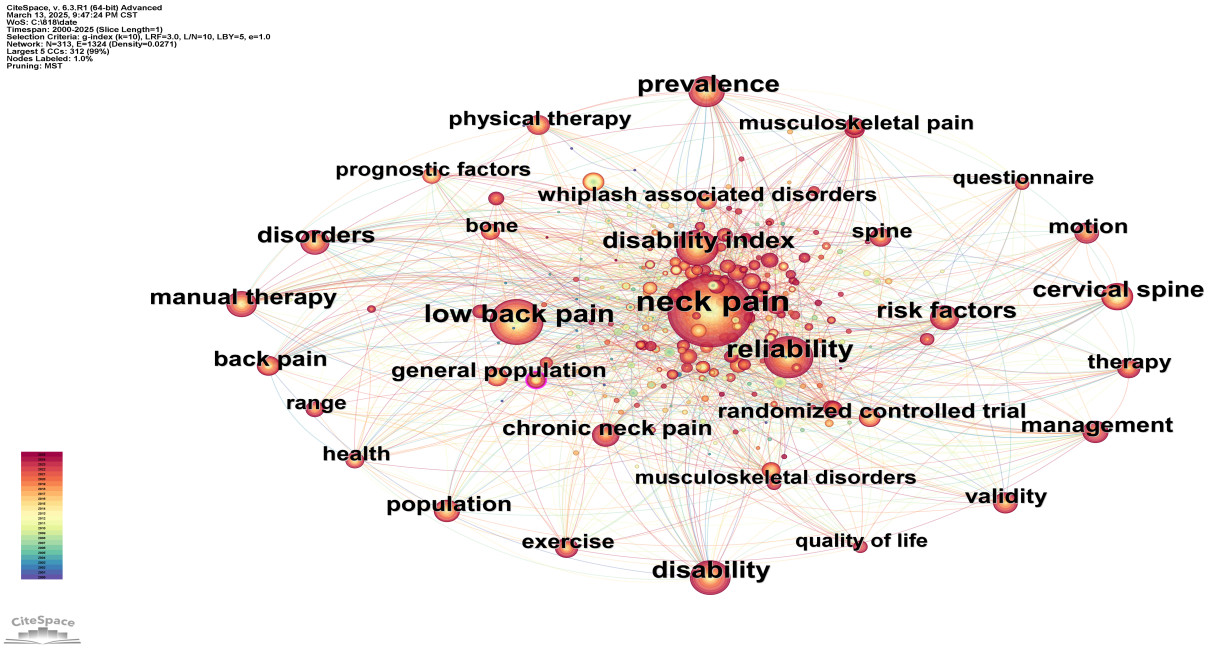


**Figure 1.** Co-occurrence network of keywords

**Table 4** shows the relevant data of the top 10 keywords by co-occurrence frequency. According to the results of the co-occurrence map of keywords and the frequency statistics of keywords, there are 1,324 connections between keywords, 313 nodes, and the network density of the map is 0.0271.

**Table 4.** Top 10 keywords by co-occurrence frequency

| Rank | Frequency | Centrality | Time | Keyword |
|---|---|---|---|---|
| 1 | 1325 | 0.05 | 2000 | neck pain |
| 2 | 523 | 0.06 | 2000 | low back pain |
| 3 | 489 | 0.08 | 2000 | reliability |
| 4 | 394 | 0.09 | 2000 | disability |
| 5 | 363 | 0.08 | 2000 | prevalence |
| 6 | 317 | 0.08 | 2004 | disability index |
| 7 | 281 | 0.08 | 2000 | disorders |
| 8 | 277 | 0.07 | 2001 | risk factors |
| 9 | 273 | 0.08 | 2000 | cervical spine |
| 10 | 250 | 0.02 | 2009 | 2000 2010 task force |

The hotspots in the field of neck pain are mainly focused on the following aspects. First, the characteristics and treatment of neck pain are the core themes of this field. The high-frequency appearance of keywords such as "neck pain," "low back pain," and "disability index" indicates that researchers are highly concerned with the characteristics, treatment methods, and rehabilitation effects of these pain conditions, understanding their manifestations and impacts in clinical medicine, including symptoms, pathogenesis, and therapeutic approaches. They study how these conditions recover and regain function under different treatment conditions and the impact of such treatments on patients' quality of life and functional recovery. Second, the interrelationship between neck pain and other types of pain is one of the current research hotspots. The frequent occurrence of keywords such as "back pain," "musculoskeletal pain," and "chronic neck pain" shows that the field is committed to studying the interactions between neck pain and other body pains, such as how back pain affects the treatment outcomes and rehabilitation process of neck pain and how neck pain, in turn, impacts patients' overall musculoskeletal health.

In addition, the integration of diagnostic and assessment methods is a key research direction in this field. The frequent appearance of keywords, such as "questionnaire" and "disability index", indicates that research not only focuses on traditional clinical examination methods but also combines modern assessment tools, such as questionnaires and disability index evaluations, to more accurately study the severity and functional impairment of neck pain. In addition, the occurrence of keywords such as "randomized controlled trial" and "management" also reflects researchers' efforts in the treatment and management of neck pain, understanding the effectiveness of different therapeutic approaches to develop more effective treatment and management strategies. Finally, the impact of rehabilitation therapy on neck pain is an emerging research hotspot in this field. The appearance of keywords, such as "physical therapy" and "reliability", indicates that researchers are beginning to focus on the reliability and effectiveness of rehabilitation therapies, such as the actual effects of physical therapy in relieving neck pain and restoring function, and how to improve the reliability and stability of rehabilitation therapies to better promote patient recovery and enhance quality of life.

## 3.5. Timeline analysis

The research frontiers in the field of neck pain can reflect the innovations and future research trends in this area. The timeline view focuses on depicting the relationships between clusters and the historical span of a cluster's literature. The timeline map of keyword clusters has the cluster name labels on the vertical axis and the publication years of the literature on the horizontal axis. The time zone where a node appears is the time when the keyword first emerged. By clustering the keywords and controlling the number of clusters to be 7, the top 7 frontier timeline threads can be obtained. Moreover, the top 7 keywords in terms of research are subjected to burst analysis to explore the development history and research frontiers of this field.

Based on the keyword timeline map show in **Figure 2**, the research on neck pain can be divided into three time periods for analysis: The first stage is basic theory and core concepts. In this stage, the research mainly focuses on the basic theory and core concepts of neck pain. Keywords such as "neck pain," "low back pain," and "disability index" frequently appear, indicating that researchers are exploring the basic principles and mechanisms of neck pain, emphasizing the causes of pain, symptoms, and their impact on patients' quality of life. The second stage is technological application and deepening. Over time, more technological means and treatment methods, such as "questionnaire" and "randomized controlled trial," are introduced to more accurately assess and treat neck pain. Keywords in this period also include "physical therapy" and "manual

therapy," showing that researchers are paying more attention to the effects and applications of different treatment methods. The third stage is comprehensive management and emerging therapies. Recent research trends show that comprehensive management and emerging therapies for neck pain have become new focal points. Keywords, such as "acupuncture," "exercise therapy," and "central sensitization", reflect the attention to multidimensional treatment and management strategies for neck pain and how to improve treatment outcomes and patient recovery quality through comprehensive intervention measures.

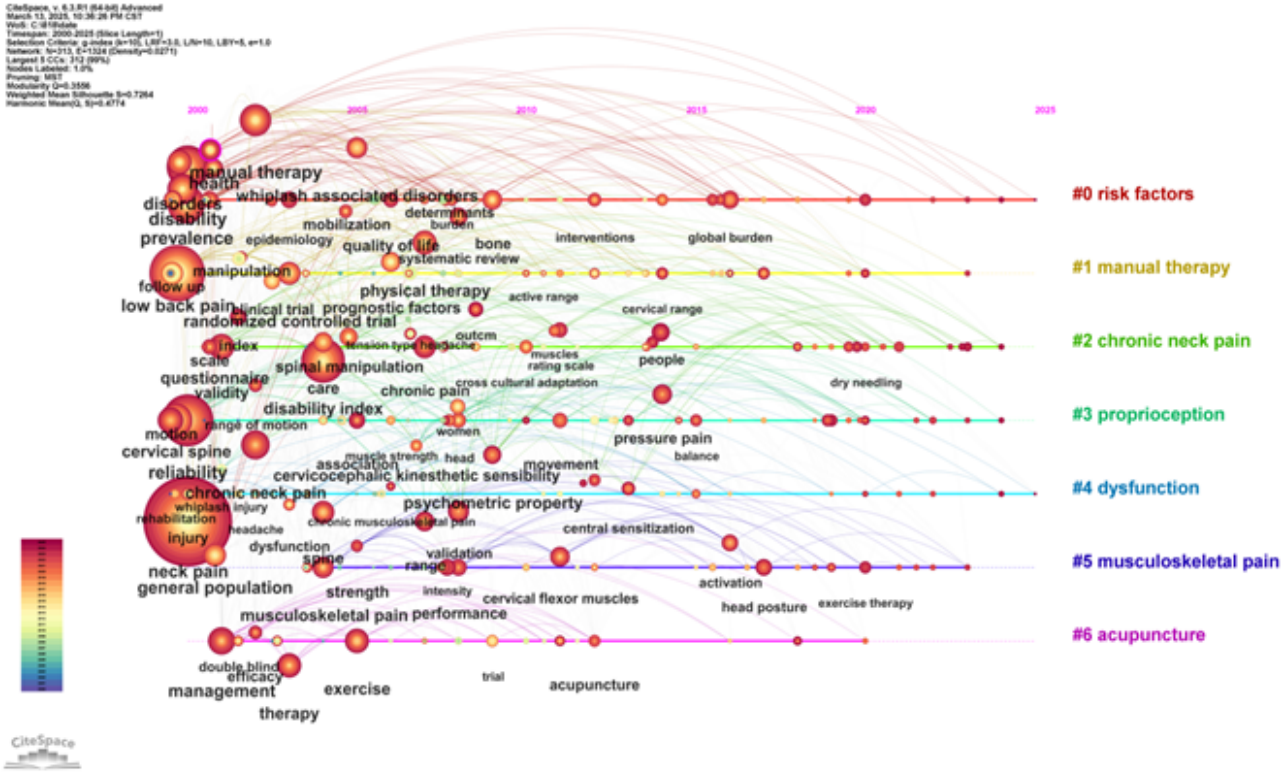


**Figure 2. Keyword timeline**

## 3.6. Keyword burst analysis

**Figure 3** shows the keyword burst map. Keyword burstiness is considered an indicator of highly active research areas in visualized research. It refers to keywords that have a rapid increase in growth or high frequency of use within a short period of time. This dynamic feature can be used to explore research hotspots and emerging trends in a research field.

Trend analysis in recent years has shown that the keyword "exercise therapy" first emerged in 2020 and reached its peak between 2020 and 2025. This indicates a significant increase in researchers' attention to exercise therapy for neck pain. This trend reflects the emphasis on conservative treatment methods in the field of neck pain treatment, as well as the focus on cultivating patients' self-recovery abilities.

The keyword "dry needling" first emerged in 2020 and reached its peak between 2020 and 2022. This shows that researchers have paid more attention to the application of this emerging physical treatment method in neck pain treatment. This trend reflects the diversification of neck pain treatment techniques and the exploration of precise and efficient treatment methods. The keyword "intensity" first emerged in 2021 and maintained a high citation intensity between 2021 and 2025. This reflects an increased focus by researchers on

the control and optimization of treatment intensity in neck pain treatment. It indicates a greater emphasis on personalization and scientific approach in the formulation of treatment plans. The keyword “individuals” first emerged in 2022 and reached its peak between 2022 and 2025. This further highlights the in-depth development of patient-centered treatment concepts in neck pain research.

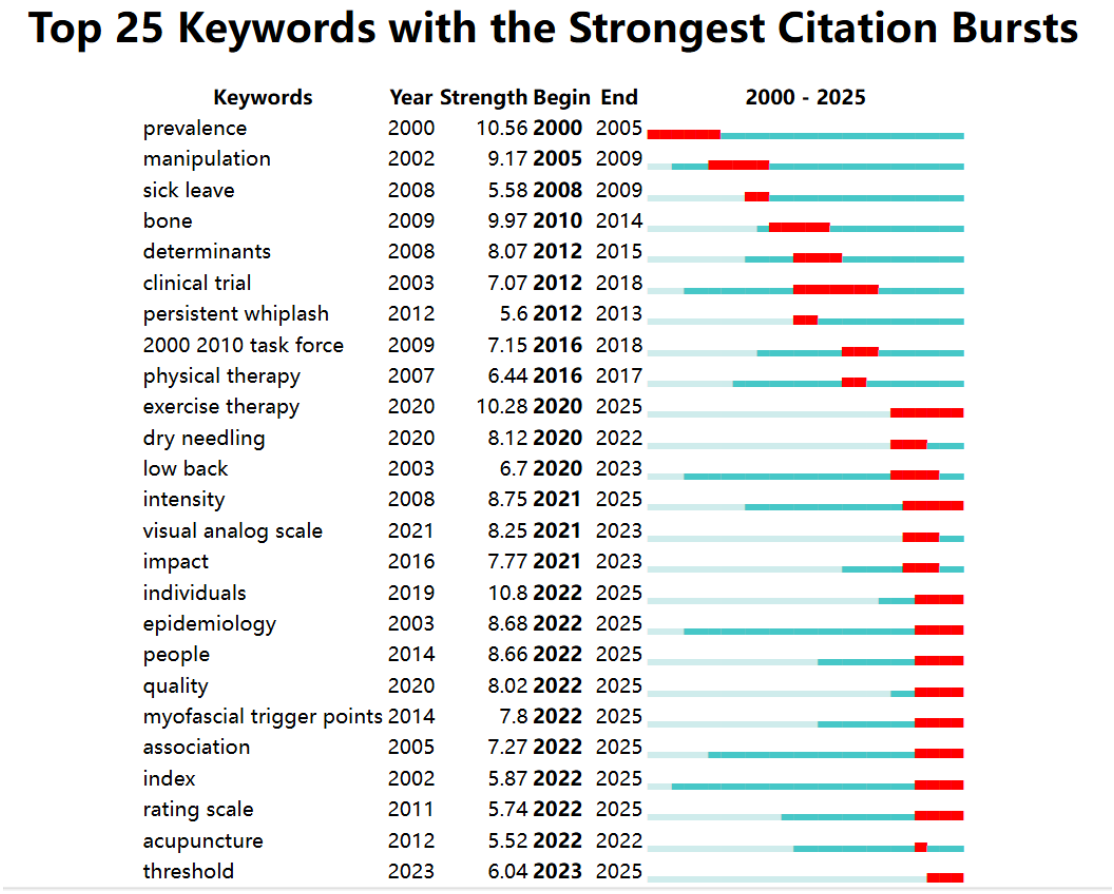


**Figure 3.** Keyword burst map

Researchers are paying more attention to the impact of individual differences on treatment outcomes, providing a basis for formulating more precise treatment plans. The keyword “quality” first emerged in 2022 and reached its peak between 2022 and 2025. This indicates an increased focus by researchers on the overall quality control and effectiveness evaluation of neck pain treatment. It reflects a shift from the exploration of treatment methods alone to the optimization of the entire treatment process quality.

## 4. Discussion

Based on an in-depth bibliometric analysis, this study systematically combs through and analyzes various aspects of the neck pain research field from 2000 to 2025, including publication output, authors, institutions, and keywords. The aim is to fully grasp the research trends and development directions in this field, providing references and directions for future research.

In terms of publication output, the research output in this field has increased year by year, indicating that neck pain, as a common clinical disease, has attracted widespread attention and importance in research [4].

Authors and institutions with high publication output have a high influence and research strength in this field. Their research results provide an important basis for the clinical diagnosis, treatment, and rehabilitation of neck pain. For example, the high publication output and citation counts of authors such as Falla and Jull indicate their profound academic achievements and practical experience in neck pain research. Their research may cover multiple aspects of neck pain, including pathogenesis, assessment methods, and treatment strategies, playing a key role in promoting the development of this field. Institutions like the University of Queensland and the University of Toronto, with their strong research teams and rich resources, hold important positions in neck pain research. Their research results are not only of great academic value but may also have a positive impact on clinical practice [5].

The co-occurrence analysis of keywords reveals the core themes and hotspots in neck pain research. High-frequency keywords such as "neck pain," "low back pain," and "disability index" reflect researchers' high attention to the characteristics of neck pain, treatment methods, and rehabilitation outcomes [6]. The relationship between neck pain and other types of pain, in particular, suggests that in clinical practice, neck pain often coexists with other pain conditions. It is necessary to consider their mutual influence comprehensively and develop a holistic treatment and rehabilitation plan. In addition, the frequent appearance of keywords, such as "questionnaire" and "disability index", indicates that modern assessment methods are becoming increasingly important in neck pain research. Through multidimensional assessment methods, a more accurate understanding of the patient's pain level, functional impairment, and quality of life can be obtained, providing a basis for precise treatment.

Timeline analysis and keyword burst analysis further demonstrate the evolution and frontier trends in neck pain research. From basic theoretical research to technological application, and then to comprehensive management and the exploration of emerging therapies, this evolution reflects the continuous deepening and expansion of research in this field. In recent years, the emergence of keywords, such as "exercise therapy" and "dry needling", indicates that conservative treatments and emerging physical therapy methods are gaining increasing attention in neck pain treatment. This not only enriches the treatment options but also provides more choices for patients. At the same time, the emergence of keywords such as "intensity," "individuals," and "quality" reflects the growing emphasis by researchers on personalization, precision, and quality control in the treatment process, which will help improve treatment outcomes and patient satisfaction.

Future research can be carried out in the following aspects: First, further deepen the understanding of the pathogenesis of neck pain, especially through in-depth research at the molecular and neurobiological levels, to provide a theoretical basis for the development of new treatment methods and drugs. Second, strengthen the research on the relationship between neck pain and other diseases, exploring their mechanisms of interaction and influence, to provide a theoretical basis for comprehensive treatment. In addition, optimize assessment methods by combining more advanced technological means, such as biosensors and artificial intelligence, to improve the accuracy and efficiency of assessments. Furthermore, explore more effective rehabilitation treatment methods and strategies, focusing on personalization and precision, to improve patients' rehabilitation and quality of life [7]. Finally, enhance interdisciplinary collaboration, integrating knowledge and technologies from multiple disciplines such as medicine, biology, and psychology, to jointly promote the in-depth development of neck pain research [8].

## 5. Conclusion

In summary, bibliometric analysis of research trends in neck pain offers a clear understanding of the current status and key focus areas in the field. It also provides valuable insights and guidance for future research directions, with the goal of supporting more scientific and effective approaches to the clinical treatment and rehabilitation management of neck pain.


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## Disclosure statement

The authors declare no conflict of interest.

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