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Research Article

Bibliometric Analysis of Research Trends in Spinal Cord Injury Rehabilitation: Mapping the Landscape of Scientific Publication

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ABSTRACT

Background: Research trends in Spinal Cord Injury (SCI) rehabilitation remain relatively unexplored within the scientific literature. Despite increasing interest, there is a notable lack of comprehensive bibliometric analysis to map and synthesize global research trends in SCI rehabilitation, especially over the last three decades. **Materials and Methods:** We conducted a detailed bibliometric analysis using data extracted from the Web of Science (WoS) Core Collection and Scopus databases, covering the period from 1993 to 2023. The analysis employed both qualitative and quantitative approaches, utilizing bibliometric software tools such as VOSviewer to examine publication outputs, journals, authors, institutions, countries, cited references, keywords, and emerging terms in the field. Specific attention was given to identifying trends in technological interventions and research frontiers in SCI rehabilitation. **Results:** This study identified 1,377 unique articles for further analysis. The United States emerged as the leading contributor to SCI research, followed by Canada and Australia. Among institutions, the University of Toronto was the most active, with significant contributions also from the University of Groningen and the University of British Columbia. The top research fields in SCI rehabilitation were Neuroscience and Neurology, followed by Sports Science and General and Internal Medicine. Additionally, this study highlighted key thematic areas shaping the field, including recovery and function, social and psychological aspects, neurological and medical complications, assessment and measurement, and psychological well-being. **Conclusion:** This bibliometric study underscores SCI rehabilitation as a mature and expanding research field with significant global collaboration. However, there is a pressing need for higher-quality research to further advance the field. Our findings offer valuable insights for researchers to shape future research directions and enhance the impact of SCI rehabilitation studies.

Keywords: Bibliometric analysis, Spinal Cord Injury, Historical analysis, Keyword analysis, Citation analysis, Country Analysis.

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INTRODUCTION

Spinal Cord Injury (SCI) is an extremely serious condition characterized by various levels of sensory and motor impairment that typically leads to significant problems with physical function and mobility.[1] Therefore, SCI will impact a patient's psychological and social well-being and increase healthcare costs.[2] SCI can result from traumatic events such as Motor Vehicle Accidents (MVA),[3] falls,[4] sports and recreation[5] or non-traumatic events such as degenerative disc diseases,[6] tumours,[7] malignant,[8] transverse myelitis[9] and any other unknown causes. However, falling could result in an expanding public health issue due to the rise in the older population in industrialized countries. Individuals with SCI face a variety of daily challenges, including pain,[10,11] neurogenic bowel and bladder dysfunction[12] reduction in strength,[13,14] endurance,[14,15] cardiorespiratory fitness,[16] flexibility,[10,17] and functional mobility,[18] which consequently impact body function[14,19,20] participation level,[21,22] employment[23] and Quality of Life (QOL).[24] Therefore, to create

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efficient rehabilitation techniques and maximize functional results, it is crucial to identify and analyze the current trend of research on SCI rehabilitation for the mapping of scientific publications.

These emerging trends in SCI rehabilitation research are likely to have significant implications for the future of the field. As technological innovations continue to evolve, we can expect a transformation in rehabilitation practices, with a greater reliance on robotics, virtual reality, and telehealth to deliver more effective and accessible care. The varying publication intensities across different countries likely reflect differences in research funding, healthcare infrastructure, and national priorities related to SCI rehabilitation. Countries with higher publication intensities may have more robust research ecosystems that prioritize SCI rehabilitation, resulting in a greater output of innovative studies and clinical applications. Analyzing the publication intensities reveals that countries with emerging research initiatives in SCI rehabilitation are beginning to contribute more significantly to the global knowledge base. This shift suggests a democratization of research contributions, where diverse perspectives and approaches are increasingly influencing the development of the field.

Bibliometric analysis quantitatively evaluates scientific publications to identify research trends, collaborations, and thematic evolution.[25-27] Additionally, several previous bibliometric analyses have explored trends in SCI rehabilitation[28,29] highlighting the evolving focus on neurorehabilitation and assistive technologies. Despite significant advances in SCI rehabilitation, there remains a gap in understanding how these research trends translate into clinical practices. Therefore, this study not only maps the existing literature but also delves into the implications of these trends, providing a critical analysis that can guide future research and policy-making in the field.

Unlike previous study that primarily focused on general trends and only 2 decades,[30] this analysis uniquely emphasizes the evolution of technological interventions over the past three decades and their impact on patient outcomes. In addition, previous bibliometric analyses of SCI rehabilitation research exhibit several key limitations that highlight the need for a more comprehensive study. One significant gap identified in previous studies is the reliance on a single database, typically the WoS, which often excludes other valuable sources like PubMed and Scopus.[28-30]

This narrow approach risks an incomplete representation of the global research landscape, potentially overlooking relevant studies and articles indexed in these additional databases. To address this limitation, the current study will utilize both WoS and Scopus to conduct a more comprehensive search of data and publications. By incorporating these diverse sources, the study aims to provide a more accurate and extensive analysis of research trends in spinal cord injury rehabilitation. Moreover, previous bibliometric analyses have primarily focused on specific SCI topics like gait[38] and stem cell therapy.[36]

To address this, the current study aims to take a broader approach by analyzing a wider range of data on SCI rehabilitation, providing a more comprehensive understanding of the research landscape. This study aims to provide a comprehensive review of the scientific outputs related to SCI rehabilitation over the past three decades using bibliometric techniques to highlight key aspects of this field. Specifically, this study seeks to answer the following Research Questions (RQ):

RQ1: How has the volume and focus of research publications related to SCI rehabilitation evolved over the past three decades?

RQ2: Which countries and institutions are leading the research efforts in SCI rehabilitation, and what are the most frequently studied subject areas within this field?

RQ3: What are the most frequently used author keywords in SCI rehabilitation research, and how do these keywords cluster together to reveal emerging research themes and trends?

RQ4: Which research publications have had the greatest impact on the field of SCI rehabilitation, as evidenced by their citation counts?

METHODOLOGY AND DATA ANALYSIS

Data Collection

In this study, we developed a comprehensive search strategy to retrieve relevant literature on Spinal Cord Injury (SCI) and Rehabilitation using two major bibliographic databases: the Web of Science (WoS) Core Collection and Scopus. The search was conducted on July 12, 2023, without any restrictions on publication dates, allowing for an exhaustive review of available literature across years and publication types.

Search Strategy

To ensure broad coverage and inclusivity, we incorporated synonyms and related terms for the primary keywords "spinal cord injury" and "rehabilitation." This approach was designed to capture a diverse range of studies within each database.

Primary Keyword 1: Spinal Cord Injury

Synonyms included: "SCI," "spinal cord injuries," "spinal trauma," "spinal lesion," "paraplegia," and "tetraplegia."

Primary Keyword 2: Rehabilitation

Synonyms included: "rehabilitation," "recovery," "rehabilitation therapy," "rehabilitative care," "physical therapy," "rehabilitation program," "rehabilitation intervention," "functional recovery," and "motor recovery."

The search queries were tailored to align with each database's indexing system, combining keywords with Boolean operators (AND, OR) to retrieve a comprehensive and relevant set of articles. For instance, in WoS, the search string was structured as follows:

(SCI OR "spinal cord injuries" OR "spinal trauma" OR "spinal lesion" OR paraplegia OR tetraplegia) AND ("rehabilitation" OR recovery OR "rehabilitation therapy" OR "rehabilitative care" OR "physical therapy" OR "rehabilitation program" OR "rehabilitation intervention" OR "functional recovery" OR "motor recovery")

A parallel search string was constructed for Scopus to match this scope, ensuring consistency in retrieving articles across both databases. This structured and tailored approach optimized search results, ensuring that both general and specific studies on SCI rehabilitation were included.

Data Export and Pre-Processing

Upon completing the searches, the records retrieved from both WoS and Scopus were exported in CSV format. Each record contained comprehensive metadata for each publication, including the title, author names with affiliations, publication year, abstract, journal title, keywords, subject categories, and citation counts.

The next step involved data cleaning and pre-processing. To consolidate data, we merged records from WoS and Scopus by matching document titles and DOIs, which allowed us to identify and remove duplicates. Any remaining discrepancies, such as variations in citation counts, were resolved to ensure dataset consistency. After removing duplicates and filtering out irrelevant document types, we finalized a set of 1,377 unique articles for further analysis (Table 1). This structured methodology provided a robust foundation for bibliometric analysis, ensuring a comprehensive and representative sample of global SCI rehabilitation research.

The initial data consisted of 2552 loaded papers related to SCI rehabilitation. Out of these, 338 papers (13.20% of the loaded papers) were omitted based on their document type. After removing the omitted papers, 2214 papers were remaining for further analysis. The WoS database contributed 939 papers (42.40% of the total papers), while Scopus contributed 1275 papers (57.60% of the total papers).

Among the loaded papers, a total of 837 duplicates were identified. Of these, 8 duplicated papers were removed from the WoS database, and 829 duplicated papers were removed from the Scopus database. Furthermore, 546 duplicated papers had differences in the number of citations. After the removal of duplicates, there were 1377 unique papers available for analysis. Out of these, 931 papers (67.60%) were obtained from the WoS database, and 446 papers (32.40%) were obtained from the Scopus database.

A PRISMA flow diagram was used to illustrate the study selection process, showing the number of records identified, screened, and included in the analysis (Figure 1).

Data Analysis

Bibliometric and Procedural Analysis

This study employed a comprehensive bibliometric approach to analyse the research trends in SCI rehabilitation. To gain a holistic understanding of the field, we combined data from two major databases, Scopus and Web of Science (WoS). This approach, as highlighted by Azizan and Fadzil in their study on barriers and facilitators to physical activity, allows for a more comprehensive representation of the research landscape.[31]

Our analysis involved four key components. First, we conducted a historical analysis to examine the annual publication output of SCI rehabilitation research. This allowed us to identify trends in the growth of the field over time and gain insights into the evolution of research interest and the emergence of new research themes.

Second, we performed a keyword analysis using author-provided keywords extracted from the articles. To facilitate this analysis, we used ScientoPy[32] to merge and pre-process the data from Scopus and Web of Science into a CSV format suitable for use in VOSviewer 1.6.14. This open-source software allowed us to visualize the co-occurrence of keywords and identify clusters representing distinct research areas. This analysis helped us understand the intellectual structure of the field and identify emerging research themes.

Table 1: Pre-processing datasets information.

Information	Number	Percentage
Loaded papers	2552	
Omitted papers by document type	338	13.20%
Total papers after omitted papers removed	2214	
Loaded papers from WoS	939	42.40%
Loaded papers from Scopus	1275	57.60%
Duplicated removal results:		
Duplicated papers found	837	37.80%
Removed duplicated papers from WoS	8	0.90%
Removed duplicated papers from Scopus	829	65.00%
Duplicated documents with different cites by	546	65.20%
Total papers after removal.	1377	
Papers from WoS	931	67.60%
Papers from Scopus	446	32.40%

Third, we identified highly cited articles based on their citation counts. These articles represent influential publications that have significantly impacted the field of SCI rehabilitation. Finally, we analysed the geographical distribution of publications to identify the country's leading research efforts in SCI rehabilitation. This analysis provided insights into global collaboration and the relative strengths of different research communities.

To facilitate the analysis, we utilized a combination of software tools, including Microsoft Excel 2019, MyBib References, and VOSviewer 1.6.14. These tools enabled us to create tables, lists, and network maps to visualize and interpret the data effectively.

RESULTS

Bibliometric analysis

This section provides a comprehensive bibliometric analysis of social protection in the context of SCI and rehabilitation-related studies, based on publication overview, temporal, keyword, country, and citation analyses. In addition to conventional bibliometric methods, this study employs a co-citation network analysis to uncover underlying research paradigms and emerging trends within the field. This approach allows for a more nuanced understanding of the intellectual structure of SCI rehabilitation research.

Publication overview

The analysis of publication overviews reveals intriguing trends and developments in the field of SCI rehabilitation, WoS database, a total of 931 publications related to this topic were identified. This database demonstrates a positive growth rate, with an average of 73 publications per year. Moreover, the h-index of 60 highlights the significant impact of these publications, as they have received a substantial number of citations. In the Scopus database, there were 446 publications associated with SCI rehabilitation. Although the annual growth rate shows a slight decline of -2.2%, it is noteworthy that the h-index is 31, suggesting a considerable

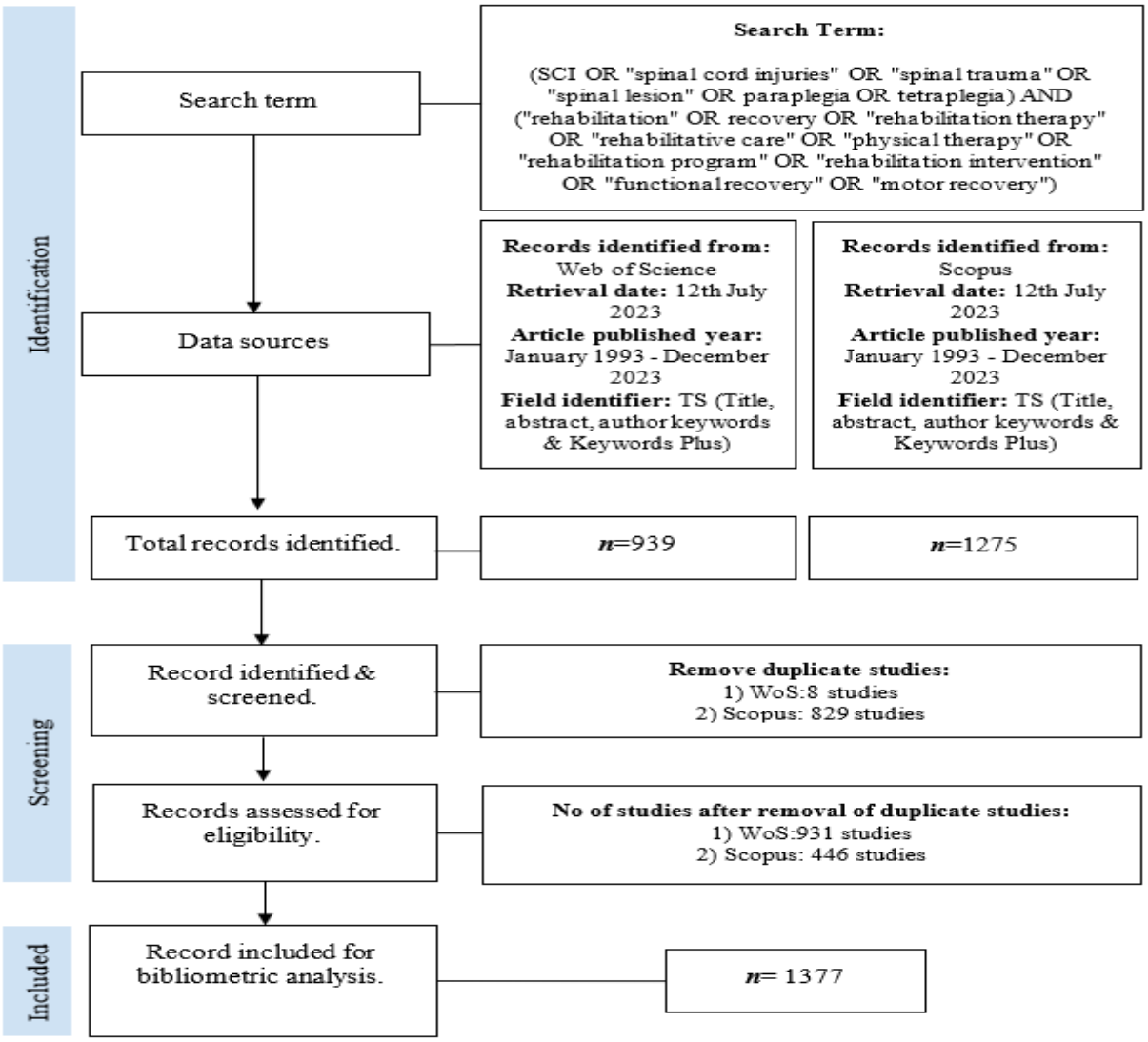

Figure 1: Methodological flowchart for the current study.

impact of these publications within the field. While the average number of publications per year is 12, the variation in publication frequency indicates fluctuations in research activity across different years (Figure 2).

Top countries

Figure 3 shows the top countries that contribute to the development of papers related to SCI in rehabilitation. The United States (US) emerges as the leader in terms of the number of publications, with 403 articles. This reflects a consistent and significant commitment to SCI rehabilitation research. Despite a slight decline in the annual growth rate, the country maintains an average of 20.6 publications per year, which is indicative of stable research output. Canada follows closely behind, with 160 publications.

Despite a similar decline in the annual growth rate, the country exhibits a higher average of 40.6 publications per year. Australia demonstrates a commendable involvement in SCI rehabilitation research, with 97 publications. While the annual growth rate remains steady, the country maintains an average of 38.1 publications per year. The Netherlands has produced 96 publications, displaying a consistent engagement in SCI rehabilitation research. Despite a relatively lower annual growth rate, the country maintains an average of 18.8 publications per year. Switzerland, with 79 publications, stands out for its noteworthy contributions to SCI rehabilitation research. Despite a minimal annual growth rate, the country maintains an impressive average of 49.4 publications per year.

Active Institutions

The University of Toronto leads the list with 54 publications, indicating its strong commitment to SCI rehabilitation research (Figure 4). The institution has shown a positive average growth rate and a notable productivity of 6.8 publications per year. The University of Groningen follows closely behind with 39 publications. Despite a slightly negative growth rate, the institution maintains a significant productivity of 2.8 publications per year.

The University of British Columbia demonstrates a strong involvement in SCI rehabilitation research with 38 publications. Though the growth rate is slightly negative, the institution maintains a notable productivity of 2.2 publications per year. The University Health Network, comprising a network of hospitals and research institutes, has produced 37 publications.

The institution exhibits a positive growth rate and a remarkable productivity of 5.2 publications per year. The Swiss Paraplegic Research and Swiss Paraplegic Center, both affiliated with the Swiss Paraplegic Foundation, contribute significantly to SCI rehabilitation research. They have produced 34 and 31 publications, respectively. Both institutions show positive growth rates and remarkable productivity of 4.6 and 4.8 publications per year.

Top Subject Areas

Figure 5 shows the most popular and commonly used subject areas in the publications related to SCI in rehabilitation. In the field of Neurosciences and neurology, which ranks first in terms of total publications with 378 articles, there is active research in SCI rehabilitation. The Average Growth Rate (AGR) of 2.6 publications per year indicates a steady increase in research output. The high h-index of 47 reflects the impact and citation count of the publications, suggesting their influence within the field. Sport Sciences, with 166 publications, focuses on the intersection of sports and SCI rehabilitation.

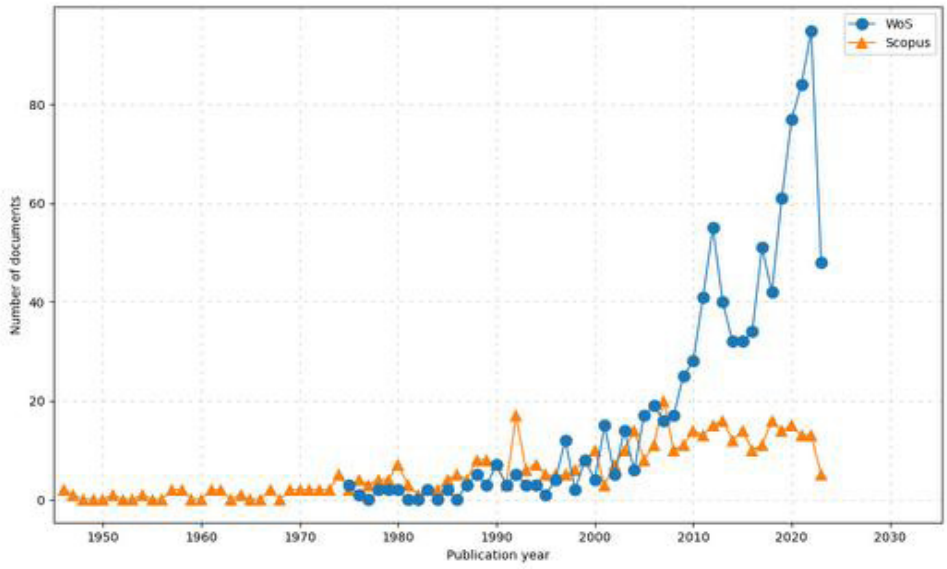

Figure 2: Publication overview from 1946 to 2023.

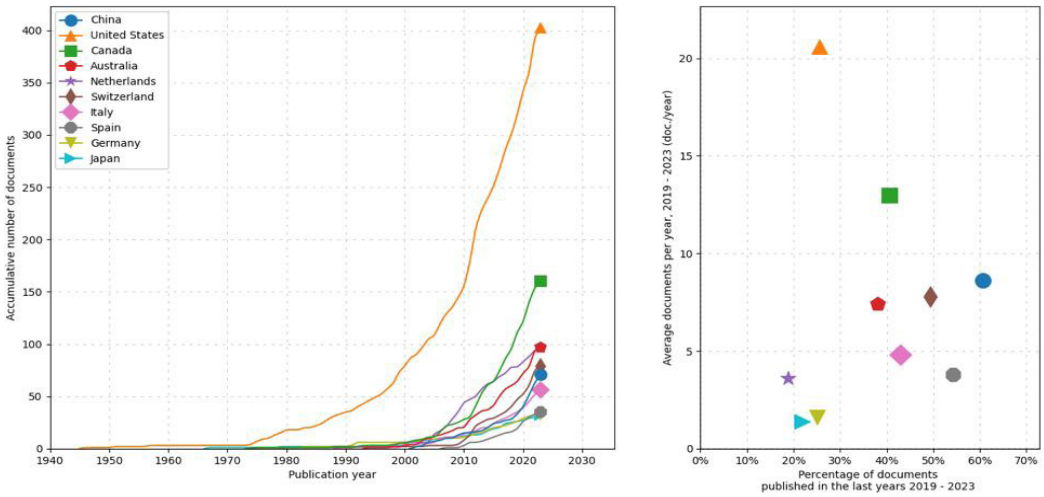

Figure 3: Top countries related to SCI in rehabilitation.

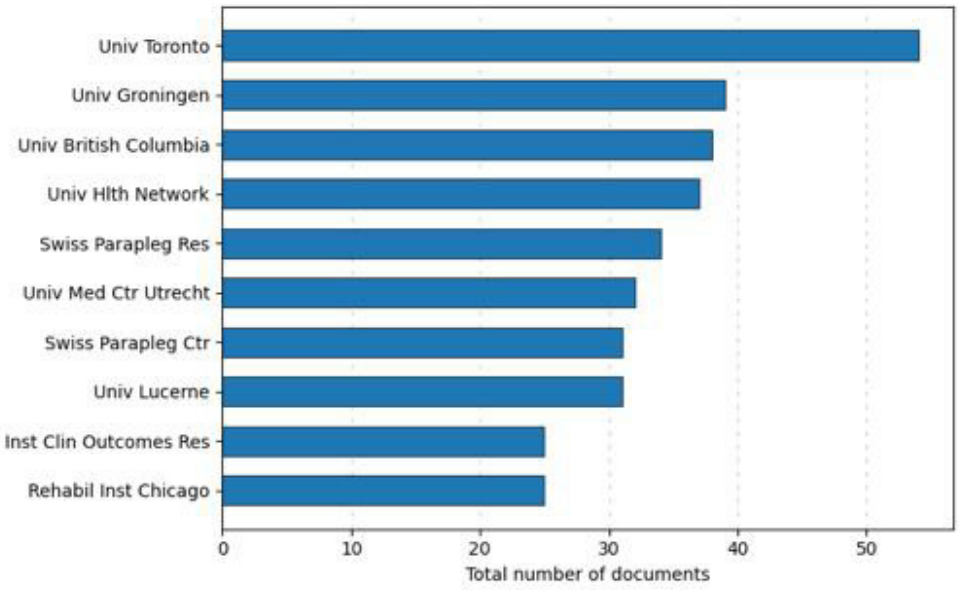

Figure 4: Active institutions related to SCI in rehabilitation.

Although the AGR is relatively low at 0.4, indicating a slower growth rate, the field demonstrates a high productivity per day (PDLY) value of 19.3. This suggests a concentrated effort in publishing research related to sports and SCI rehabilitation. The h-index of 39 indicates the impact and influence of these publications within the sports science community. General and Internal Medicine, with 58 publications, plays a significant role in SCI rehabilitation research.

The AGR of 0.8 and PDLY of 50 indicate a consistent publication output and a substantial contribution to the medical field. The h-index of 13 suggests a moderate impact of these publications, reflecting their citation count and influence within the medical community. The field of Engineering, with 49 publications, demonstrates a relatively high PDLY of 49, indicating focused research efforts in this area. However, the AGR of -0.6 suggests a slight decline in publication output over time. The h-index of 13 reflects the impact and citation count of these publications within the engineering community. Orthopaedics, with 49 publications, focuses on the orthopaedics aspects of SCI rehabilitation. The AGR of 0.6 indicates a moderate growth rate in research output.

The h-index of 19 suggests a notable impact and citation count for these publications within the field of orthopaedics. Public, Environmental and Occupational Health, with 20 publications, highlights the importance of considering public health aspects in SCI rehabilitation. The AGR of 0 and PDLY of 25 indicate a consistent publication rate. The h-index of 9 reflects the impact and influence of these publications in the field of public health. Health Care Sciences and Services encompass 19 publications related to SCI rehabilitation. The AGR of 0 and high PDLY of 68.4 indicate a concentrated effort in publishing.

The h-index of 6 suggests a moderate impact of these publications within the field of healthcare sciences and services. In the field of Robotics, with 19 publications, technological advancements in SCI rehabilitation are explored. The AGR of -0.4 suggests a slight decline in publication output over time. The h-index of 6 reflects the impact and citation count of these publications within the robotics community. Nursing, with 18 publications, contributes to SCI rehabilitation research from a nursing perspective.

The AGR of -0.2 indicates a relatively stable publication output. The h-index of 8 suggests a moderate impact and citation count for these publications within the nursing field. Finally, Surgery focuses on surgical interventions and techniques in SCI rehabilitation, with 16 publications. Although the AGR is 0, the field demonstrates a high PDLY of 50, indicating concentrated research efforts. The h-index of 7 reflects the impact and influence of these publications within the surgical community.

Authors' Keywords

Thematic analysis of the 3001 keywords (Figures 6a and 6b) used in indexed articles related to rehabilitation and SCI reveals several key themes and topics. VOS viewer's clustering analysis has identified five distinct clusters, each representing a significant research area within the field.

Cluster 1 (Red)

Recovery and Function: This cluster emphasizes the importance of functional recovery and rehabilitation interventions. Keywords like "recovery," "locomotion," "walking," "functional recovery," "spasticity," "motor," and "body-weight support" highlight the focus on improving physical function and mobility. This cluster is strongly associated with the concept of rehabilitation and its impact on regaining lost abilities.

Cluster 2 (Green)

Social and Psychological Aspects: This cluster focuses on the broader social and psychological aspects of SCI rehabilitation. Keywords like "people," "quality-of-life," "community," "social support," "satisfaction," "employment," "adults," "time," "work," and "vocational rehabilitation" indicate the importance of addressing the social, psychological, and occupational needs of individuals with SCI. This cluster suggests a growing recognition of the holistic nature of rehabilitation, extending beyond purely physical aspects.

Cluster 3 (Blue)

Neurological and Medical Complications: This cluster centers on the neurological and medical complications associated with SCI. Keywords like "spinal cord injuries," "paraplegia," "tetraplegia," "outcomes," "medical complications," "length-of-stay," "international standards," "illness," "severity," "physical capacity," and "occupational therapy" reflect the focus on understanding the underlying neurological mechanisms and addressing the specific medical challenges faced by individuals with SCI.

Cluster 4 (Yellow)

Assessment and Measurement: This cluster focuses on the assessment and measurement of outcomes in SCI rehabilitation. Keywords like "lesions," "diagnosis," "scale," "validity," "follow-up," "efficacy," "clinical-trials," and "outcome measures" highlight the importance of standardized assessments and reliable measures for evaluating the effectiveness of interventions.

Cluster 5 (Purple)

Psychological Well-being: This cluster addresses the psychological well-being of individuals with SCI. Keywords like "depression," "anxiety," "hospital anxiety," "trauma," and "barriers" indicate the significance of addressing mental health challenges and understanding the psychological impact of SCI. This cluster underscores the need for a multidisciplinary approach to rehabilitation, considering not just physical but also emotional and mental well-being.

This analysis of author keywords, guided by thematic clustering, provides a valuable overview of the diverse research areas within SCI rehabilitation. It highlights the ongoing focus on functional recovery, the growing recognition of social and psychological factors, the importance of addressing neurological and medical complications, the need for robust assessment and measurement tools, and the increasing attention to mental health and well-being.

Top Cited Papers (min 150 cited)

The Table 2 provides information on the most cited articles in the field of rehabilitation, particularly in the field of study by Ma *et al*.,[33] on the incidence, prevalence, costs, and impact of various common conditions requiring rehabilitation in the US.

This comprehensive study covers conditions such as stroke, SCI, traumatic brain injury, multiple sclerosis, osteoarthritis, rheumatoid arthritis, limb loss, and back pain. It has garnered 575 citations, highlighting its relevance in understanding the epidemiology and impact of these conditions on disability and healthcare costs.

The study by Giangregorio and McCartney[34] on "Bone loss and muscle atrophy in spinal cord injury" has been cited 232 times. Additionally, Nas *et al*.,[35] contributed to the field of SCI rehabilitation with their article "Rehabilitation of spinal cord injuries," which has garnered 208 citations. The authors explore various rehabilitation approaches and techniques for individuals with spinal cord injuries, emphasizing the importance of comprehensive rehabilitation programs.

DISCUSSION

This study provides a comprehensive bibliometric analysis of research in SCI rehabilitation, addressing key research questions related to the evolution of publication volume, leading contributors, emerging themes, and impactful studies. The findings offer valuable insights into the current state and future direction of the field.

Evolution of Research Publications

A remarkable development trajectory over the last three decades, especially in the most cited paper is revealed by the bibliometric study of research on SCI rehabilitation. The growing number of research published each year, particularly in the WoS database, which averaged 73 publications annually, is indicative of this expansion. This increasing trend demonstrates the increased interest in addressing the complicated demands of SCI patients as well as the growing acknowledgement of SCI rehabilitation as an important field of study.

Comparing these findings with previous studies offers valuable insights. Liu *et al*., conducted a bibliometric analysis from 1997 to 2016, noting a rise in publication rates and emphasizing the need for higher-quality research.[28] Their analysis emphasised the need for better research quality while identifying new research areas and international collaboration. This is in line with the current data, which also demonstrates a notable expansion and variety in the emphasis of publications, but it also points to the ongoing need for top-notch research and a more global viewpoint.

Kiraz and Demir provided an analysis from 1980 to 2018, highlighting trends and advancements in SCI research.[29] Their analysis revealed a rise in research production but also pointed up limitations, including the omission of grey literature and non-English publications. Although the current analysis provides a more recent and comprehensive assessment of the diversification in research focus, including multidisciplinary approaches, it is consistent with their findings on increased research output.

Li *et al*., analysed articles from 1999 to 2019, identifying leading countries and institutions and providing a knowledge base for future research.[30] Their findings, particularly regarding significant contributions from institutions like Harvard and the University of Toronto, are mirrored in the current study, which also highlights these institutions' roles in advancing SCI research.

Guo *et al*., focused on stem cell therapy for SCI, noting trends and limitations in clinical trials and long-term follow-up data.[36] The current analysis goes beyond their study's specific focus on stem cell research to include multidisciplinary approaches and emerging themes, in addition to broader trends in SCI recovery.

Phadke *et al*., examined gait rehabilitation research, highlighting the USA, Canada, and Switzerland as leading contributors, and noting a shift towards interdisciplinary and technology-driven approaches.[38] The current analysis, which also reflects an

Table 2: The most cited papers related to SCI in rehabilitation (minimum of 150 citations).

Authors	Title	Citations
Ma VY, Chan L, Carruthers KJ.[33]	Incidence, Prevalence, Costs, and Impact on Disability of Common Conditions Requiring Rehabilitation in the United States: Stroke, Spinal Cord Injury, Traumatic Brain Injury, Multiple Sclerosis, Osteoarthritis, Rheumatoid Arthritis, Limb Loss, and Back Pain.	575
Giangregorio L, McCartney N.[34]	Bone loss and muscle atrophy in spinal cord injury: epidemiology, fracture prediction, and rehabilitation strategies.	232
Nas K, Yazmalar L, Şah V, Aydın A, Öneş K.[35]	Rehabilitation of spinal cord injuries.	208
Behrman AL, Bowden MG, Nair PM.[42]	Neuroplasticity after spinal cord injury and training: An emerging paradigm shift in rehabilitation and walking recovery.	201
Chen D, Apple DF Jr, Hudson LM, Bode R.[43]	Medical complications during acute rehabilitation following spinal cord injury - Current experience of the model systems.	182
Stiens SA, Bergman SB, Goetz LL.[44]	Neurogenic bowel dysfunction after spinal cord injury: Clinical evaluation and rehabilitative management.	176
Lima C, Escada P, Pratas-Vital J, *et al*.,[45]	Olfactory Mucosal Autografts and Rehabilitation for Chronic Traumatic Spinal Cord Injury.	174
Harkema SJ.[46]	Neural plasticity after human spinal cord injury: Application of locomotor training to the rehabilitation of walking.	170
Dobkin B, Barbeau H, Deforge D, *et al*.,[47]	The evolution of walking-related outcomes over the first 12 weeks of rehabilitation for incomplete traumatic spinal cord injury: The multicentre randomized Spinal Cord Injury Locomotor Trial.	166

increasing emphasis on multidisciplinary techniques and technological integration in SCI rehabilitation, is enhanced by the study's focus on gait rehabilitation

According to the current data, there has been a notable increase in research on SCI rehabilitation over the previous 20 years, which is indicative of a greater understanding of the intricate difficulties that people with SCI confront. In addition to exhibiting a commitment to improving rehabilitation results, this expansion has resulted in a notable diversification of priority areas. These days, research covers a broad range of subjects, including patient-centred care, psychosocial rehabilitation, and technological innovations including virtual reality, robotic-assisted therapy, and telehealth. These developments are essential for satisfying the rising need for efficient rehabilitation services, especially in environments with limited resources.

However, the report also highlights the field's ongoing geographical disparities and quality gaps. Despite a rise in research production, there are notable regional differences in study quality. The literature is dominated by nations with established research infrastructures, placing others at a disadvantage because of a lack of resources and competent employees.[37,29]

This discrepancy calls into question the findings' generalisation as well as the equitable distribution of funds required for successful SCI recovery. Developing comprehensive treatment models that address the complex requirements of people with SCI requires a strong emphasis on interdisciplinary teamwork.[38] To guarantee that improvements benefit everyone, regardless of their situation or location, stakeholders must provide priority to these initiatives.

Leading Countries, Institutions, and Subject Areas

According to a recent bibliometric review of research on SCI rehabilitation, the United States is the world leader in this area, with Canada, Australia, and other European nations including the Netherlands and Switzerland also making substantial contributions. Key contributors that have demonstrated their significant output and impact in SCI rehabilitation research include the University of Toronto, the University of Groningen, and the University of British Columbia. The focus on fields like general and internal medicine, sports sciences, and neurosciences demonstrates a multidisciplinary approach that takes into account both the psychological and physical elements of SCI.

Comparing these findings with previous studies reveals both continuities and developments in SCI research trends. Liu *et al*., identified increasing publication rates and emerging research topics in SCI rehabilitation but noted the need for higher quality research.[28] Their study concentrated more on global trends and the need to raise the standard of research rather than exploring deeper into regional contributions. The current analysis confirms the growth noted by Liu *et al*., but provides a clearer picture of leading countries and institutions, illustrating a more detailed geographical and institutional landscape.[28]

Kiraz and Demir analysed SCI research from 1980 to 2018, identifying trends and advancements while noting limitations such as the exclusion of non-English publications and grey literature.[29] Their findings align with the current study's observation of increasing publication volume but do not fully capture the present-day focus on multidisciplinary approaches and emerging trends in SCI rehabilitation.

Li *et al*., examined global SCI research from 1999 to 2019, highlighting leading countries, institutions, and significant authors.[30] Their study corroborates the current analysis by recognizing the prominent roles of institutions like Harvard and the University of Toronto but may not fully reflect the recent shift towards broader multidisciplinary research areas as observed in the current study.

Therefore, by describing the evolving landscape of SCI rehabilitation research, highlighting top nations and institutions, and indicating a shift towards a multidisciplinary approach, the current analysis validates and expands on earlier studies.[37,40] However, a continuous disparity in contributions from low- and middle-income countries is revealed by the dominance of higher-income nations like the US, Canada, and portions of Europe.[29,39] This could restrict the findings' worldwide applicability and usefulness.

A more equal research environment is crucial, even though developments in sports sciences and neuroscience are encouraging. In order to meet the full range of SCI rehabilitation demands and guarantee research quality, inclusivity, and relevance across various populations and resource settings, future studies must promote collaboration across diverse areas.

Author Keywords and Emerging Research Themes

In this study, five distinct research themes in SCI rehabilitation were identified through a thematic analysis of author keywords. These clusters offer a comprehensive view of current research areas, yet reveal certain limitations in addressing broader issues in SCI rehabilitation. The first cluster, "Recovery and Function," emphasizes functional rehabilitation, with key terms like "walking," "spasticity," and "motor recovery" underscoring the centrality of physical improvement. The second cluster, "Social and Psychological Aspects," highlights growing recognition of SCI's broader social and psychological impacts, aligning with past studies that stress comprehensive recovery approaches.

The third cluster, "Neurological and Medical Complications," focuses on medical challenges and underlying neurological factors. This aligns with earlier research identifying the need to address SCI-related medical complexities in rehabilitation. The fourth cluster, "Assessment and Measurement," underscores standardized outcome measures, supporting prior studies

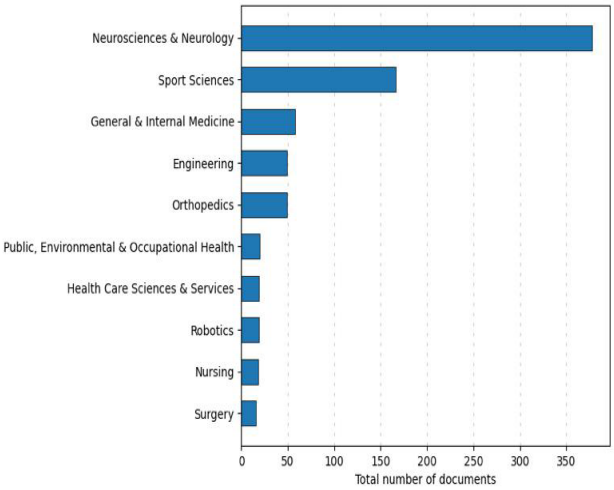

Figure 5: Top Subject Areas.

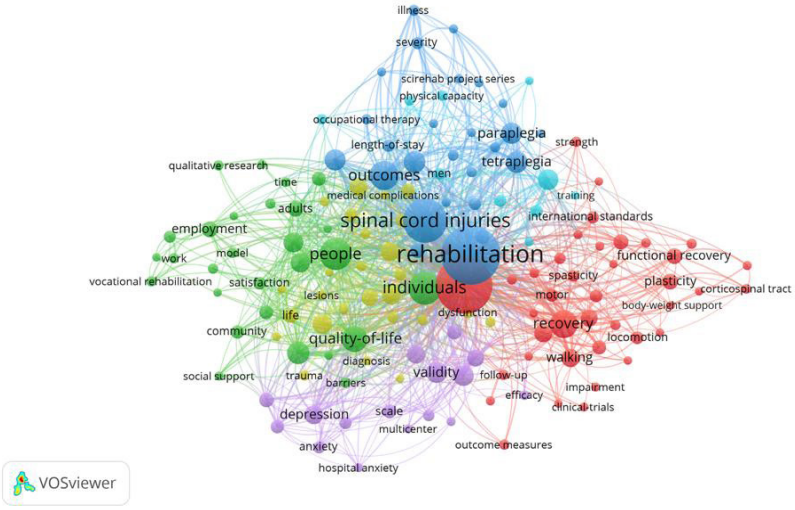

Figure 6(a): Visualization of all keywords.

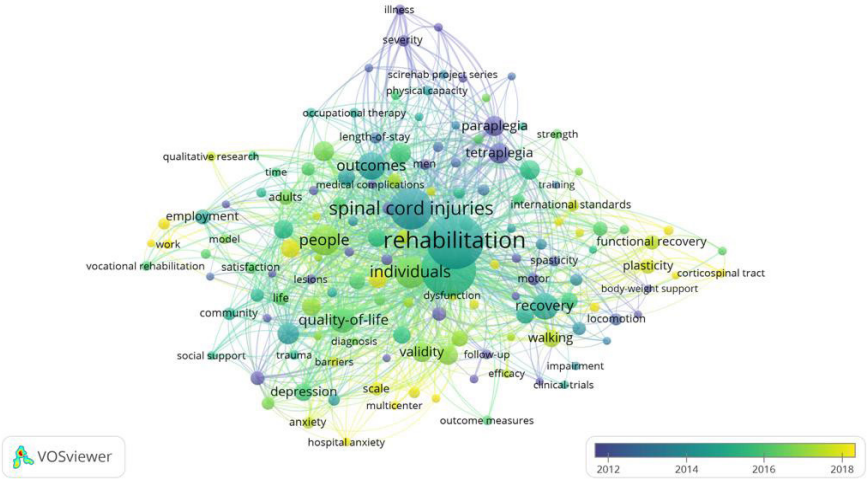

Figure 6(b): Overlays of all keywords.

on the importance of consistent evaluation tools. Finally, the "Psychological Well-being" cluster reflects an increased focus on mental health.

The thematic clusters in SCI rehabilitation research provide essential insights into the field's focus areas. However, certain gaps highlight limitations in addressing the full scope of post-injury needs. Notably, there is a lack of research on the economic impacts and community reintegration of individuals with SCI. This gap restricts the field from fully exploring long-term quality of life improvements beyond physical recovery, as studies predominantly emphasize clinical assessment and immediate rehabilitation outcomes.[2,41]

Although outcome measurement and assessment are critical for tracking recovery, this focus on evaluation over practical, real-world solutions suggests an opportunity to broaden research efforts. Current rehabilitation studies heavily prioritize assessment tools and techniques without consistently translating findings into accessible, impactful interventions that benefit diverse populations directly.[16] Bridging this gap could advance SCI rehabilitation by addressing economic factors, resource accessibility, and integration back into society.

Expanding these clusters to include community and economic considerations would support a more holistic approach, aligning with recent studies that emphasize long-term reintegration and resource accessibility for sustained rehabilitation outcomes. Such an inclusive model could significantly enhance the quality of life for SCI individuals, creating a foundation for ongoing support and integration beyond initial rehabilitation.

Impactful Research Publications

The analysis of highly cited publications in SCI rehabilitation research reveals several influential studies that have notably shaped the field. The studies by Ma *et al.*, and Giangregorio *et al.*, have garnered significant citations for their comprehensive exploration of SCI epidemiology and rehabilitation strategies.[33,34] These publications have contributed essential knowledge and frameworks that have guided subsequent research and clinical practice in SCI rehabilitation.

Comparing these findings with previous studies offers valuable context. Liu *et al.*, highlighted the increasing publication rates and emerging hot topics in SCI rehabilitation but did not specifically focus on highly cited individual studies.[28] Their analysis was more concerned with global trends and the need for higher quality research. In contrast, the current analysis provides a detailed look at how specific influential publications have shaped the field, offering a more granular understanding of their impact.

Kiraz and Demir also examined trends in SCI research but focused on broader publication trends from 1980 to 2018.[29] Their study did not delve deeply into citation counts of individual papers but provided a comprehensive overview of research output and collaborations. The current analysis complements their findings by highlighting the role of highly cited publications in shaping research directions.

Li *et al.*, identified significant contributors and influential institutions but did not emphasize specific highly cited studies.[30] Their work is aligned with the current findings in recognizing the contributions of leading institutions and authors, yet the current analysis adds depth by detailing the impact of specific influential papers.

The current analysis of highly cited articles gives a concentrated evaluation of important works that have significantly influenced the field of SCI rehabilitation, although earlier studies have offered insightful information about trends, institutions, and research output.[37,40] Though these seminal studies offer crucial foundations and benchmarks, the focus on widely referenced works may obscure new voices and creative research from less well-known sources.[29] It's also possible to run the risk of putting popularity ahead of originality or study quality when using citation counts as the primary indicator of influence.

Effectively advancing SCI rehabilitation requires striking a compromise between incorporating more recent research that examines under-represented viewpoints and well-established, widely referenced studies, especially in areas like community reintegration and customised therapy techniques. Promoting a wider range of studies may yield more comprehensive, equitable progress in SCI rehabilitation practices.

Implications for the Field

The findings from this bibliometric analysis offer several significant implications for the field of SCI rehabilitation research. Firstly, the analysis underscores the growing body of literature in this domain, reflecting an increasing global commitment to advancing knowledge and practice in SCI rehabilitation. However, the uneven distribution of research across different regions points to geographical disparities in research efforts. The dominance of high-income countries, particularly the United States and Canada, suggests that research leadership is concentrated in regions with more substantial resources and research infrastructures. This concentration has implications for the generalizability of research findings, as the specific needs and challenges faced by SCI patients in low- and middle-income countries may not be adequately addressed.

Moreover, the identification of leading institutions, such as the University of Toronto and the University of Groningen, highlights centers of excellence that drive innovation in SCI rehabilitation. These institutions not only produce a significant volume of research but also shape the direction of the field through their contributions. The clustering of frequently used keywords reveals emerging themes and trends in SCI rehabilitation research. The emphasis on recovery and function, social and

psychological aspects, and neurological complications indicates a multidisciplinary approach to SCI rehabilitation, reflecting the complexity of the condition and the need for comprehensive care strategies.

Finally, the analysis of highly cited publications demonstrates the critical impact of certain studies on the field. These influential works have set the foundation for current practices and future research directions. However, the reliance on citation counts as a measure of impact may overlook newer, innovative research that has not yet had the time to accumulate citations.

Future Research Directions

The findings from the bibliometric analysis of SCI rehabilitation research reveal critical insights that can guide future research efforts. To address the geographical disparities in research output, there is a pressing need for increased international collaboration, particularly involving researchers from low- and middle-income countries. By fostering global partnerships, researchers can pool resources, share expertise, and ensure that the challenges of SCI rehabilitation are addressed comprehensively.[35] Funding agencies should prioritize support for collaborative research initiatives that bridge the gap between regions with varying levels of research infrastructure, thereby enhancing the inclusivity and applicability of SCI rehabilitation research on a global scale.

The complexity of SCI rehabilitation underscores the importance of a multidisciplinary approach that integrates perspectives from neurology, psychology, engineering, and social sciences.[36] The identified research clusters emphasize the value of such integration in developing holistic rehabilitation strategies that address both the physical and psychological needs of SCI patients. Future research should continue to encourage collaboration across disciplines, bringing together scientists, clinicians, and engineers to develop innovative interventions that advance comprehensive rehabilitation programs.

Innovation in SCI rehabilitation research must be a priority.[40] While well-established research has significantly impacted the field, emerging themes and innovative approaches should be actively supported. Funding agencies and academic institutions should prioritize cutting-edge research that explores new frontiers in SCI rehabilitation, such as the use of robotics, personalized medicine, and advanced neurorehabilitation techniques.[41] Additionally, the analysis identifies gaps in current research, particularly regarding long-term outcomes of rehabilitation interventions and the integration of technology. Addressing these gaps is crucial to building a more comprehensive evidence base for SCI rehabilitation. Improving the accessibility of research findings to practitioners and policymakers is essential for translating research into practice, ultimately leading to better patient outcomes in SCI rehabilitation.

LIMITATIONS

While this study offers a comprehensive overview of research trends in SCI rehabilitation, it is important to acknowledge certain limitations. The reliance on bibliometric data from specific databases may have led to the exclusion of relevant publications not indexed in these sources. Additionally, the analysis does not account for the quality of publications, which could vary significantly across different studies. Future research could address these limitations by incorporating a more diverse range of sources and applying qualitative assessments of publication impact.

CONCLUSION

In conclusion, this bibliometric analysis highlights the dynamic and evolving nature of SCI rehabilitation research. The growing volume of publications, the contributions from leading countries and institutions, and the emergence of new research themes all point to a field that is expanding in scope and impact. However, the analysis also reveals gaps in certain research areas and geographical disparities, suggesting opportunities for further exploration and collaboration. Future research should continue to build on these findings, addressing the identified gaps and exploring new frontiers in SCI rehabilitation to enhance the quality of life for individuals with SCI.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

REFERENCES

1. Yue JK, Upadhyayula PS, Chan AK, Winkler EA, Burke JF, Readdy WJ, *et al.* A review and update on the current and emerging clinical trials for the acute management of cervical spine and spinal cord injuries-Part III. J Neurosurg Sci. 2016;60(4):529-42. PMID 26606433.
2. Kirby RL, de Groot S, Cowan RE. Relationship between wheelchair skills scores and peak aerobic exercise capacity of manual wheelchair users with spinal cord injury: a cross-sectional study. Disabil Rehabil. 2020;42(1):114-21. doi: 10.1080/09638288.2018.1493545, PMID 30183422.
3. Thompson C, Mutch J, Parent S, Mac-Thiong JM. The changing demographics of traumatic spinal cord injury: an 11-year study of 831 patients. J Spinal Cord Med. 2015;38(2):214-23. doi: 10.1179/2045772314Y.0000000233, PMID 25096709.
4. Zhang ZR, Wu Y, Wang FY, Wang WJ. Traumatic spinal cord injury caused by low falls and high falls: A comparative study. J Orthop Surg Res. 2021;16(1):222. doi: 10.1186/s13018-021-02379-5, PMID 33771177.
5. Schmitt H, Gerner HJ. Paralysis from sport and diving accidents. Clin J Sport Med. 2001;11(1):17-22. doi: 10.1097/00042752-200101000-00004, PMID 11176141.
6. Yu H, Zhu B, Song Q, Liu X. Evaluation of full-endoscopic lumbar discectomy in the treatment of obese adolescents with lumbar disc herniation: a retrospective study.

BMC Musculoskelet Disord. 2021;22(1):562. doi: 10.1186/s12891-021-04449-5, PMID 34147091.

7. Furlan JC, Fehlings MG. Attitudes toward the elderly with CNS trauma: a cross-sectional study of neuroscientists, clinicians, and allied-health professionals. J Neurotrauma. 2009;26(2):209-25. doi: 10.1089/neu.2008.0663, PMID 19196075.
8. Warnock C, Tod A. A descriptive exploration of the experiences of patients with significant functional impairment following a recent diagnosis of metastatic spinal cord compression. J Adv Nurs. 2014;70(3):564-74. doi: 10.1111/jan.12215, PMID 23865510.
9. Espinosa G, Mendizábal A, Mínguez S, Ramo-Tello C, Capellades J, Olivé A, *et al*., editors. Transverse myelitis affecting more than 4 spinal segments associated with systemic lupus erythematosus: clinical, immunological, and radiological characteristics of 22 patients. Semin Arthritis Rheum. 2010;39(4):246-56. doi: 10.1016/j.semarthrit.2008.09.002, PMID 19022478.
10. Mulroy SJ, Hafdahl L, Dyson-Hudson T. A primary care provider's guide to shoulder pain after spinal cord injury. Top Spinal Cord Inj Rehabil. 2020;26(3):186-96. doi: 10.46292/sci2603-186, PMID 33192046.
11. Tarvonen-Schröder S, Kaljonen A, Laimi K. Comparing functioning in spinal cord injury and in chronic spinal pain with two ICF-based instruments: WHODAS 2.0 and the WHO minimal generic data set covering functioning and health. Clin Rehabil. 2019;33(7):1241-51. doi: 10.1177/0269215519839104, PMID 30935211.
12. Burns AS, St-Germain D, Connolly M, Delparte JJ, Guindon A, Hitzig SL, *et al*. Phenomenological study of neurogenic bowel from the perspective of individuals living with spinal cord injury. Arch Phys Med Rehabil. 2015;96(1):49-55. e1. doi: 10.1016/j.apmr.2014.07.417, PMID 25172370.
13. Aravind N, Harvey LA, Glinsky JV. Physiotherapy interventions for increasing muscle strength in people with spinal cord injuries: a systematic review. Spinal Cord. 2019;57(6):449-60. doi: 10.1038/s41393-019-0242-z, PMID 30723256.
14. Lee KS, Zaman M, Hwang J. Reduced muscle activity of the upper extremity in individuals with spinal cord injuries. Int J Environ Res Public Health. 2022;19(8):4708. doi: 10.3390/ijerph19084708, PMID 35457574.
15. Eitivipart AC, de Oliveira CQ, Arora M, Middleton J, Davis GM. Overview of systematic reviews of aerobic fitness and muscle strength training after spinal cord injury. J Neurotrauma. 2019;36(21):2943-63. doi: 10.1089/neu.2018.6310, PMID 30982398.
16. Peters J, Abou L, Rice LA, Dandeneau K, Alluri A, Salvador AF, *et al*. The effectiveness of vigorous training on cardiorespiratory fitness in persons with spinal cord injury: a systematic review and meta-analysis. Spinal Cord. 2021;59(10):1035-44. doi: 10.1038/s41393-021-00669-7, PMID 34274948.
17. Poutanen J, Savolainen S, Shulga A, Arokoski J, Hiekkala S. ICF-linking and psychometric properties of upper extremity mobility outcome measures in spinal cord injury–a scoping review. J Spinal Cord Med. 2023:1-13.
18. Li R, Yang Y, Hu X. Study on the correlation between the brief ICF scale and Barthel index scale in the evaluation of patients with spinal cord injury. Rehabilitation. 2021;3(2):43-7.
19. Rabinstein AA. Traumatic spinal cord injury. Neurol Emerg A Pract Approach. 2020:271-80.
20. Lili L, Sunnerhagen KS, Rekand T, Alt Murphy M. Independence and upper extremity functioning after spinal cord injury: a cross-sectional study. Sci Rep. 2023;13(1):3148. doi: 10.1038/s41598-023-29986-y, PMID 36823179.
21. Gross-Hemmi MH, Post MW, Bienert S, Chamberlain JD, Hug K, Jordan X, *et al*. Participation in people living with spinal cord injury in Switzerland: degree and associated factors. Arch Phys Med Rehabil. 2019;100(10):1894-906. doi: 10.1016/j.apmr.2019.03.018, PMID 31026462.
22. Halvorsen A, Pape K, Post MW, Biering-Sørensen F, Mikalsen S, Hansen AN, *et al*. Participation and quality of life in persons living with spinal cord injury in Norway. J Rehabil Med. 2021;53(7):jrm00217. doi: 10.2340/16501977-2858, PMID 34232321.
23. Manaf H, Tahir I, Hisham H, Justine M, Hasnan N. Return to work after spinal cord injury: A systematic review. Adv Sci Lett. 2018;24(4):2374-7. doi: 10.1166/asl.2018.10957.
24. Sturm C, Gutenbrunner CM, Egen C, Geng V, Lemhöfer C, Kalke YB, *et al*. Which factors have an association to the Quality of Life (QoL) of people with acquired Spinal Cord Injury (SCI)? A cross-sectional explorative observational study. Spinal Cord. 2021;59(8):925-32. doi: 10.1038/s41393-021-00663-z, PMID 34239041.
25. Khazaneha M, Zandrahimi F, Sadatmoosavi A, Salarpour S, Karegar-Borzi H, Tajedini O, *et al*. An overview of scientific publication of the *chamomile* (*Matricaria Chamomilla*) research: A bibliometric analysis. J Scientometr Res. 2024;13(2):604-14. doi: 10.5530/jscires.13.2.47.
26. Bakhshinejad B, Khazaneha M, Mehrabani M, Sabahi A, Sadatmoosavi A, Tajedini O, et al. Dynamic Tracking to Identify Topics and Thematic Evolution of obsessive-compulsive disorder as an Emerging Topic. Res J Pharm Technol. 2024; 17(1): 303-8. doi: 10.52711/0974-360X.2024.00047.
27. Eslami O, Nakhaie M, Rezaei Zadeh Rukerd MR, Azimi M, Shahabi E, Honarmand A, *et al*. Global trend on machine learning in Helicobacter within one decade: A scientometric study. Glob Health Epidemiol Genomics. 2023;2023(1):8856736. doi: 10.1155/2023/8856736, PMID 37600599.
28. Liu X, Liu N, Zhou M, Lu Y, Li F. Bibliometric analysis of global research on the rehabilitation of spinal cord injury in the past two decades. Ther Clin Risk Manag. 2019;15:1-14. doi: 10.2147/TCRM.S163881, PMID 30588000.
29. Kiraz M, Demir E. A bibliometric analysis of publications on spinal cord injury during 1980-2018. World Neurosurg. 2020;136:e504-13. doi: 10.1016/j.wneu.2020.01.064, PMID 31954906.
30. Li Y, Wei B, Zhong Y, Feng H, Wu H. A bibliometric analysis of global research on spinal cord injury: 1999-2019. Spinal Cord. 2022;60(4):281-7. doi: 10.1038/s41393-021-00691-9, PMID 34497380.
31. Azizan A, Fadzil NH. What stops us and what motivates us? A scoping review and bibliometric analysis of barriers and facilitators to physical activity. Ageing Res Rev. 2024;99:102384. doi: 10.1016/j.arr.2024.102384 [ePub]. PMID 38914263.
32. Ruiz-Rosero J, Ramirez-Gonzalez G, Viveros-Delgado J. Software survey: ScientoPy, a scientometric tool for topics trend analysis in scientific publications. Scientometrics [Internet]. 2019;121(2):1165-88. doi: 10.1007/s11192-019-03213-w.
33. Ma VY, Chan L, Carruthers KJ. Incidence, prevalence, costs, and impact on disability of common conditions requiring rehabilitation in the United States: stroke, spinal cord injury, traumatic brain injury, multiple sclerosis, osteoarthritis, rheumatoid arthritis, limb loss, and back pain. Arch Phys Med Rehabil. 2014;95(5):986-995.e1. doi: 10.1016/j.apmr.2013.10.032, PMID 24462839.
34. Giangregorio L, McCartney N. Bone loss and muscle atrophy in spinal cord injury: epidemiology, fracture prediction, and rehabilitation strategies. J Spinal Cord Med. 2006;29(5):489-500. doi: 10.1080/10790268.2006.11753898, PMID 17274487.
35. Nas K, Yazmalar L, Şah V, Aydın A, Öneş K. Rehabilitation of spinal cord injuries. World J Orthop. 2015;6(1):8-16. doi: 10.5312/wjo.v6.i1.8, PMID 25621206.
36. Guo S, Wang L, Xie Y, Luo X, Zhang S, Xiong L, *et al*. Bibliometric and visualized analysis of stem cells therapy for spinal cord injury based on Web of Science and CiteSpace in the last 20 years. World Neurosurg. 2019;132:e246-58. doi: 10.1016/j.wneu.2019.08.191, PMID 31493613.
37. Bachani AM, Bentley JA, Kautsar H, Neill R, Trujillo AJ. Suggesting global insights to local challenges: expanding financing of rehabilitation services in low and middle-income countries. Front Rehabil Sci. 2024;5:1305033. doi: 10.3389/fresc.2024.1305033, PMID 38711833.
38. Phadke V, Sharma R, Sharma N, Mitra S. Global research trends on gait rehabilitation in individuals with spinal cord injury- A bibliometric analysis. Glob Spine J. 2024:21925682241243074; 14(8):2408-19. doi: 10.1177/21925682241243074, PMID 38548623.
39. Ørtenblad L, Maribo T, Quistgaard B, Madsen E, Handberg C. Goal-Setting in clinical practice: A study of health-care professionals' perspectives in outpatient multidisciplinary rehabilitation of patients with spinal cord injury. Disabil Rehabil. 2023;45(20):3330-41. doi: 10.1080/09638288.2022.2125086, PMID 36137224.
40. Alqahtani S, Joseph J, Dicianno B, Layton NA, Toro ML, Ferretti E, *et al*. Stakeholder perspectives on research and development priorities for mobility assistive-technology: a literature review. Disabil Rehabil Assist Technol. 2021;16(4):362-76. doi: 10.1080/17483107.2019.1650300, PMID 31535934.
41. Willingham TB, Stowell J, Collier G, Backus D. Leveraging emerging technologies to expand accessibility and improve precision in rehabilitation and exercise for people with disabilities. Int J Environ Res Public Health. 2024;21(1):79. doi: 10.3390/ijerph21010079, PMI.
42. Behrman AL, Bowden MG, Nair PM. Neuroplasticity after spinal cord injury and training: an emerging paradigm shift in rehabilitation and walking recovery. Phys Ther. 2006;86(10):1406-25. doi: 10.2522/ptj.20050212, PMID 17012645.
43. Chen D, Apple DF Jr, Hudson LM, Bode R. Medical complications during acute rehabilitation following spinal cord injury current experience of the Model Systems. Arch Phys Med Rehabil. 1999;80(11):1397-401. doi: 10.1016/s0003-9993(99)90250-2, PMID 10569433.
44. Stiens SA, Bergman SB, Goetz LL. Neurogenic bowel dysfunction after spinal cord injury: clinical evaluation and rehabilitative management. Arch Phys Med Rehabil. 1997;78(3) Suppl:S86-S102. doi: 10.1016/s0003-9993(97)90416-0, PMID 9084372.
45. Lima C, Escada P, Pratas-Vital J, Branco C, Arcangeli CA, Lazzeri G, *et al*. Olfactory mucosal autografts and rehabilitation for chronic traumatic spinal cord injury. Neurorehabil Neural Repair. 2010;24(1):10-22. doi: 10.1177/1545968309347685, PMID 19794133.
46. Harkema SJ. Neural plasticity after human spinal cord injury: application of locomotor training to the rehabilitation of walking. Neuroscientist. 2001;7(5):455-68. doi: 10.1177/107385840100700514, PMID 11597104.
47. Dobkin B, Barbeau H, Deforge D, Ditunno J, Elashoff R, Apple D, *et al*. The evolution of walking-related outcomes over the first 12 weeks of rehabilitation for incomplete traumatic spinal cord injury: the multicenter randomized Spinal Cord Injury Locomotor Trial. Neurorehabil Neural Repair. 2007;21(1):25-35. doi: 10.1177/1545968306295556, PMID 17172551.

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