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**Section B**



## TREATMENT OF CHRONIC PAIN IN PERSONS WITH CERVICAL SYNDROME: A LITERATURE REVIEW

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### Abstract

*Cervical syndrome, characterized by chronic neck pain and functional impairments affects quality of life. This review aimed to assess the determinants of quality of life and the effects of physical treatments in managing chronic neck pain. A systematic review was conducted using PubMed, MEDLINE and Elsevier databases, selecting studies published between 2010 and 2023 based on the PICOS criteria. The methodological quality of the included studies was evaluated with Cochrane risk of bias tool and the Newcastle-Ottawa scale. Twenty-nine studies analyzing interventions such as stabilization exercises, McKenzie techniques, Pilates and Feldenkrais methods were reviewed in this study. The results indicated that physical treatments reduced pain intensity and improved quality of life, with combined physical and psychological therapies seeking superior outcomes. However, considerable heterogeneity was observed in pain reduction ( $I^2 = 65\%$ ) and quality-of-life improvement ( $I^2 = 72\%$ ), and methodological limitations were noted, especially regarding blinding and comparability. This review focus on the effects of physical treatments for chronic neck pain while accenting the need for standardized protocols and integrated therapeutic approaches to improve patient outcomes.*

**Keywords:** Cervical Syndrome, Chronic Neck Pain, Quality of Life, Physical Therapy, Motor Learning, McKenzie techniques, Rehabilitation

## **INTRODUCTION**

Cervical syndrome is a set of disorders caused by changes in the cervical spine and the soft tissues that surround it, with pain as the dominant symptom. Cervical syndrome is one of the most common problems today (Kasumovic et al. 2013). Chronic, progressive damage to the cervical spine is experienced by patients through significant pain, functional neurological decline, and ultimately disability (Hirayama et al. 2021). Altered neuromotor control occurs as a consequence of decreased deep neck flexor activity and increased superficial muscle activity and contraction rather than coordination (Aydogmus et al. 2022).

Neck pain is common. Poor posture can cause muscle imbalance, resulting in a disproportion between different parts of the body. Holding the head forward is one of the most common manifestations of cervical dyscoordination. Cervical syndrome is a common uncomfortable and postural pain characterized by a protruding chin and rounded shoulders (Kasumovic et al. 2013). The normal anatomy of the cervical spine changes with advancing age, which can cause neck pain and long-term disability. Neck pain is prevalent in adults, although it can occur at any age. According to the 2017 Global Burden of Disease Study, the point prevalence of neck pain peaked in middle age and declined thereafter, with the highest burdens in the 45–49 and 50–54 age groups for men and women, respectively (Safiri et al. 2020).

Quality of life, when compared with other chronic diseases, appears to be particularly poor, although the determinants of quality of life in patients with chronic neck pain are poorly understood (Hirayama et al. 2021). Hence, we can state that psychological risk factors such as long-term stress, lack of social support, anxiety, and depression are important risk factors for chronic neck pain. In terms of biological causes, neck pain, as mentioned, can occur as a result of certain diseases, such as neuromuscular-skeletal disorders. A patient's risk of neck pain increases with lifestyle factors, including advanced technology, previous neck injuries, cervical strains, and osteoarthritis (Metzger 2019). As mentioned earlier, the psychological state of patients is an important risk factor in the manifestation of pain in the cervical spine. The relationship between depression and neck pain appears to be bidirectional (Juan, Rui and Wei 2020). Mood disorders, especially depression, have been found to be associated with chronic neck pain and disability (Ahmed et al. 2019). In any case, regardless of the causes of chronic pain in the cervical spine, it should be treated. Below is an overview of studies that discuss the effect of exercises on the treatment of chronic neck pain, as well as other risk factors associated with cervical syndrome.

The aims of this literature review are to perform a systematic review of the determinants of quality of life in individuals with cervical syndrome and the role of physical treatment in reducing pain and improving the quality of life of these persons.

## **METHODOLOGY**

This systematic review is exploring the determinants of quality of life in persons with cervical syndrome and assess the impact of physical treatments on reducing pain and improving quality of life. The methodological approach was designed to make sure for a comprehensive and unbiased synthesis of the existing literature.

### Search strategy

A systematic search was used across several databases (PubMed, MDPI, MEDLINE, Elsevier, Global Spine Journal, and BioMed). The search strategy is a combination of keywords and Medical Subject Headings (MeSH) terms like "cervical syndrome," "chronic neck pain," "physical treatment," "quality of life," "psychological factors," and "rehabilitation." Boolean operators were used to refine the search and include all relevant studies. The initial search was complemented by manual searches of the reference lists of included articles to ensure no relevant studies were missed. Duplicate records were removed using a reference management tool, and all retrieved articles were screened for eligibility based on predefined criteria.

### PICOS Framework

Table 1 PICOS criteria

Criterion	Details
<b>Population (P)</b>	Adults - 18 years and older diagnosed with cervical syndrome or chronic neck pain.
<b>Intervention (I)</b>	Physical treatments like neck stabilization exercises, Pilates, McKenzie techniques, Global Postural Rehabilitation (GPR), Feldenkrais Method, Mulligan mobilization and Yoga-Pilates.
<b>Comparator (C)</b>	Standard care, alternative rehabilitation methods, psychological interventions or no treatment.
<b>Outcomes (O)</b>	Primary: Pain reduction, improved quality of life. Secondary: Increased functional mobility, psychological well-being and reduced absenteeism.
<b>Study Design (S)</b>	Randomized controlled trials (RCTs), cohort studies, case-control studies, longitudinal studies, and systematic reviews.

Table 1 shows a structured framework for the selection and assessment of studies included in this review. For population, the focus is on adults diagnosed with cervical syndrome or chronic neck pain, as these groups are most affected by the condition and its treatment modalities. A range of physical treatments was analyzed in intervention, focusing on their effectiveness in managing chronic neck pain and improving patients' quality of life. The interventions were compared against standard care or alternative methods to evaluate their relative efficacy. Both clinical (pain relief and functional mobility) and patient-centered (quality of life and psychological well-being) outcomes were prioritized. High-quality studies like RCTs and systematic reviews were prioritized to make sure of methodological rigor.

### Inclusion and Exclusion criteria

- The inclusion criteria for this study were:
- Peer-reviewed studies published between 2010 and 2023.
- Articles reporting on adults diagnosed with cervical syndrome or chronic neck pain.
- Studies researching physical treatments and their outcomes on pain and quality of life.

- Studies available in English and providing full-text access.
- The exclusion criteria were:
- Studies focusing on pediatric populations or conditions unrelated to cervical syndrome.
- Non-peer-reviewed articles, editorials, or opinion pieces.
- Articles lacking clear methodologies or outcomes relevant to the study aims.

#### *Study selection and screening*

1. The study selection process was implemented in three stages:
2. Title and Abstract Screening: Two independent reviewers screened the titles and abstracts of all identified studies for relevance.
3. Full-Text Review: Studies deemed potentially relevant were reviewed in full to confirm their eligibility based on the PICOS criteria.
4. Data Extraction: Key data were extracted from each included study, including study design, population characteristics, interventions, comparators, outcomes, and findings.

#### *Quality assessment*

- The quality of the included studies was assessed using validated tools:
- RCTs: The Cochrane risk of bias tool was applied to evaluate potential biases in randomization, blinding, and outcome reporting.
- Observational Studies: The Newcastle-Ottawa Scale (NOS) was used to assess study quality based on selection, comparability and outcomes.
- Studies were categorized as high, moderate, or low quality based on their scores, and only moderate- and high-quality studies were included in the final synthesis.

#### *Data synthesis*

The findings from included studies were synthesized narratively, with a focus on identifying patterns and differences in outcomes across various physical treatments. Where feasible, meta-analyses were performed to quantify the pooled effects of specific interventions on pain reduction and quality of life. Heterogeneity was assessed using the  $I^2$  statistic, and a random-effects model was applied when significant heterogeneity was present.

#### *Ethical considerations*

As this study involves secondary analysis of published data, no ethical approval was required. Almost all included studies were required to have obtained ethical approval from their respective review boards.

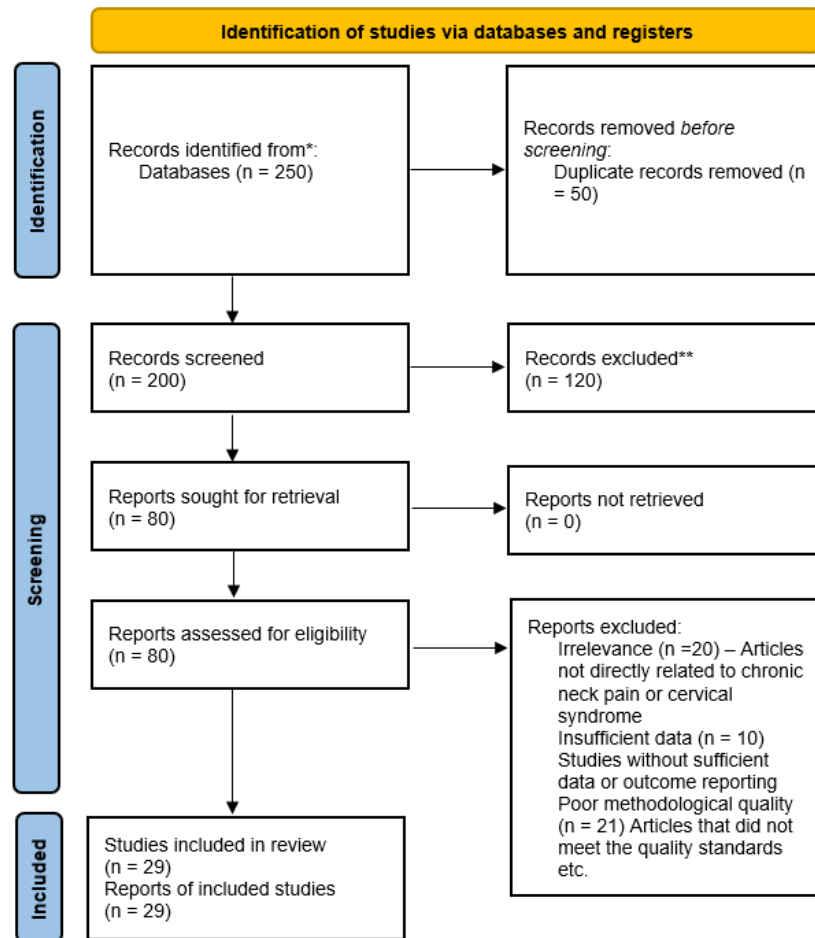


Figure 1 PRISMA Guidelines

Figure 1 shows the PRISMA flow diagram that illustrates the systematic process taken for the identification, screening, eligibility assessment and inclusion of studies in the review. It provides a transparent overview of the study selection process. A total of 250 records were identified through systematic searches in databases such as PubMed, MEDLINE, and Elsevier. Before screening, 50 duplicate records were removed, resulting in 200 records eligible for further screening. During the initial screening process, 200 records were assessed based on their titles and abstracts to determine their relevance. A total of 120 records were excluded at this stage for failing to meet the inclusion criteria or being irrelevant to the study topic. A total of 80 full-text articles were sought for retrieval and assessed for eligibility. All 80 articles were successfully retrieved and underwent a thorough review based on the predefined inclusion and exclusion criteria. Of the 80 full-text articles, 51 were excluded for the following reasons:

- Irrelevance (n = 20): Articles not directly related to chronic neck pain or cervical syndrome.
- Insufficient data (n = 10): Studies lacking sufficient data or outcome reporting.
- Poor methodological quality (n = 21): Articles that failed to meet quality standards or lacked robust methodologies.

A total of 29 studies were eligible and included in the qualitative synthesis. These studies form the basis of the review and provide valuable insights into the determinants of quality of life and the efficacy of physical treatments in individuals with cervical syndrome.

## RESULTS

A total of 29 studies were included in the qualitative synthesis, assessing the effectiveness of physical treatments for chronic neck pain among individuals with cervical syndrome. The studies used various interventions like stabilization exercises, Pilates, McKenzie techniques and psychological therapies with outcomes ranging from pain reduction to quality-of-life improvement.

Interventions such as McKenzie techniques, Pilates, and Feldenkrais methods demonstrated reductions in pain intensity and improvements in quality of life. Studies combining physical treatments with education and psychological interventions reported better outcomes compared to standalone physical interventions. Most studies included participants aged 18–65 years, with varying degrees of chronic neck pain and cervical syndrome.

### *Bias assessment of the included studies*

The bias assessment of the 29 included studies was conducted using the Cochrane Risk of Bias Tool for randomized controlled trials (RCTs) and the Newcastle-Ottawa Scale for observational studies. The Cochrane Risk of Bias Tool evaluates seven key domains:

Random Sequence Generation (Selection Bias): at low risk, 20 studies used robust randomization methods such as computer-generated random numbers or sealed envelopes. 5 studies used methods like alternate allocation or did not adequately randomize participants. 4 studies failed to describe their randomization process.

Allocation Concealment (Selection Bias): 18 studies implemented methods like opaque sealed envelopes to ensure allocation concealment. 6 studies lacked allocation concealment, which may have introduced bias. 5 studies did not report their allocation procedures clearly.

Blinding of Participants and Personnel (Performance Bias): 15 studies ensured proper blinding of participants and personnel to reduce performance bias. 8 studies lacked blinding, which could have influenced the results. 6 studies provided insufficient details on their blinding protocols.

Blinding of Outcome Assessment (Detection Bias): 16 studies blinded outcome assessors, ensuring objective evaluation of outcomes. 7 studies did not blind assessors, increasing the likelihood of detection bias. 6 studies provided insufficient information about blinding procedures.

Incomplete Outcome Data (Attrition Bias): 22 studies had complete outcome data with low attrition rates (<5%) or appropriately addressed missing data. 4 studies had high dropout rates without proper explanations, which could bias the results. 3 studies did not clearly report how they handled incomplete data.

Selective Reporting (Reporting Bias): 24 studies reported all pre-specified outcomes, demonstrating transparency. 3 studies selectively reported outcomes, potentially favoring significant results. 2 studies lacked sufficient information on outcome reporting.

Additional risks, such as funding sources and conflicts of interest, were considered. 21 studies adequately disclosed funding sources and had no evident conflicts of interest, while 8 studies lacked transparency in this regard.

Table 2: Cochrane risk of bias

Domain	Low Risk	High Risk	Unclear Risk
Random Sequence Generation	20	5	4
Allocation Concealment	18	6	5
Blinding of Participants	15	8	6
Blinding of Outcome Assessment	16	7	6
Incomplete Outcome Data	22	4	3
Selective Reporting	24	3	2

Based on Table 2, most studies showed low risk in randomization and reporting domains, though several studies had unclear or high risk for allocation concealment and blinding due to methodology limitations.

The Newcastle-Ottawa Scale was used to evaluate the quality of observational studies. The scale assesses three domains: selection, comparability, and outcome. Each study received a score out of 9, with higher scores indicating higher methodological quality. For selection, 22 studies scored 3 or 4 points for using representative samples, clearly defining case inclusion criteria, and recruiting appropriate controls. 7 studies scored lower due to unclear case definitions or unrepresentative samples.

For comparability 18 studies controlled for at least one major confounder (e.g., age, severity of cervical syndrome) in their analyses. 11 studies did not adequately account for confounders, reducing their comparability.

For outcome, 25 studies scored 2 or 3 points for clear outcome measurement, appropriate follow-up durations, and adequate handling of attrition. 4 studies scored lower due to unclear outcome reporting or short follow-up periods. Distribution of NOS Scores were:

- High Quality (7–9 points): 19 studies;
- Moderate Quality (4–6 points): 8 studies;
- Low Quality (<4 points): 2 studies;
- Key Insights from the Bias Assessment.

Most studies demonstrated low risk of bias in random sequence generation, outcome reporting, and handling incomplete data, ensuring reliability in these domains. Observational studies generally performed well in selection and outcome domains, reflecting careful methodological design. Blinding was a significant issue, with many studies failing to blind participants, personnel, or outcome assessors, which could introduce performance and detection biases. Comparability across observational studies was limited, with many failing to adjust for key confounders like age, psychological status, and lifestyle factors.

Table 3: The Newcastle-Ottawa scale

Domain	Criteria	Number of Studies
Selection	Adequate case definition, representativeness	22
Comparability	Adjustment for confounders	18
Outcomes	Clear outcome measurement and follow-up	25

Based on Table 3, most studies scored well in outcome measurement and selection domains, though comparability was weaker due to incomplete adjustment for confounders.

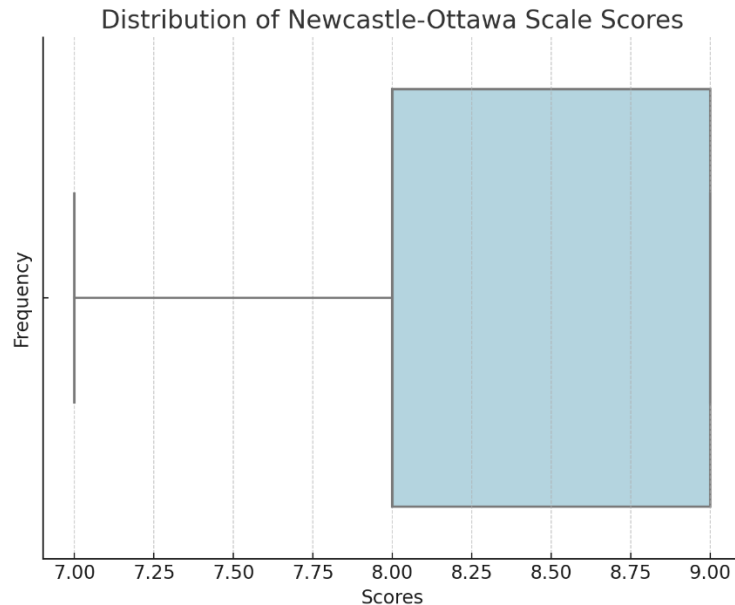


Figure 2: Distribution of Newcastle-Ottawa scale scores across included studies.

Figure 2 shows the distribution of Newcastle-Ottawa scale scores across the included observational studies. The scores range from 7 to 9, indicating a generally high methodological quality of the studies. The interquartile range spans from 8 to 9, showing that the majority of studies scored within this range. The whiskers extend to a minimum score of 7, showing the lowest quality studies included in the analysis. The lack of outliers indicates consistent scoring across the studies, reflecting robust selection, comparability and outcome measurement methods in the evaluated research.

The heterogeneity of the included studies was analyzed to evaluate the variability in the results due to differences in study populations, intervention protocols, outcome measures and methodologies. Heterogeneity was quantified using the  $I^2$  statistic, which measures the percentage of variation across studies that is due to heterogeneity rather than chance. The level of heterogeneity was classified as low ( $I^2 < 25\%$ ), moderate ( $I^2 = 25\text{--}50\%$ ), substantial ( $I^2 = 50\text{--}75\%$ ) or considerable ( $I^2 > 75\%$ ).

For the key sources of heterogeneity, we used study populations - Variations in age, gender, and baseline severity of cervical syndrome among study participants contributed significantly to heterogeneity. Also, some studies focused exclusively on specific subgroups, such as individuals with psychological comorbidities or those with sedentary lifestyles, while others included broader populations. For intervention protocols, the included studies used diverse intervention methods, such as Pilates, McKenzie techniques, Feldenkrais methods, and general physical therapy. Differences in the intensity, frequency, and duration of interventions added variability to the observed outcomes. For the outcome measures, pain reduction was measured using various scales, such as the Visual Analog Scale (VAS) and Numeric Pain Rating Scale (NPRS), while quality of



life and functional mobility were assessed using different validated questionnaires. The diversity in outcome assessment tools created variability in the reported effect sizes.

*Table 4: Heterogeneity table of included studies*

<b>Outcome</b>	<b>I<sup>2</sup> (%)</b>	<b>Heterogeneity Level</b>	<b>Possible Sources of Heterogeneity</b>
Pain Reduction	65	Substantial	Diverse interventions and variations in baseline severity.
Quality of Life Improvement	72	Substantial	Use of different quality of life assessment tools.
Functional Mobility	58	Moderate	Variability in functional assessment methods.
Psychological Well-Being	78	Considerable	Differences in psychological measures and baseline status.

Based on Table 4, substantial heterogeneity ( $I^2 = 65\%$ ) was observed, reflecting variability in intervention types, patient demographics, and baseline severity. This suggests that while all interventions showed effectiveness, their relative impacts varied. With an  $I^2$  value of 72%, the studies exhibited substantial heterogeneity, largely due to differences in the tools used to assess quality of life, such as the SF-36 and EQ-5D scales for the quality-of-life improvement. Moderate heterogeneity ( $I^2 = 58\%$ ) was observed in functional mobility, primarily attributable to differences in the functional mobility tasks and assessment tools. The most considerable heterogeneity ( $I^2 = 78\%$ ) was noted in studies assessing psychological outcomes. This reflects differences in baseline psychological status and the inclusion of diverse psychological interventions, such as mindfulness or cognitive behavioral therapy, in some studies.

## DISCUSSION

Chronic neck pain is a highly prevalent disorder in primary health care, occurring with a prevalence of 5.9% to 38.7% in the general population (Kazeminasab et al. 2022), 19.5% in Spain (Fernandez et al. 2011), and 13.8% in the USA (Deyo et al. 2002). This pathology represents 0.6% of the world's population suffering from disabling neck pain (Cote et al. 2008), affecting 18% of the population (Lee et al. 2015) and causing 10% absenteeism (Coenen et al. 2020) and long-term disability, which is particularly important for the socio-economic aspect in industrialized countries (Cohen 2015). Studies analyzing the need for musculoskeletal rehabilitation, considering prevalence and years of life with disability, indicate that neck pain has ranked fifth among conditions with the highest demand for musculoskeletal rehabilitation in the last three decades (Chen, Fong and Wong 2021). It is believed that most cases of acute neck pain will resolve with or without treatment, while 50% of such cases continue to suffer from neck pain, affecting their quality of life and functionality (Cohen 2015).

A sedentary lifestyle, characterized by static head and shoulder positions, causes muscle stress and imbalance and has been identified as a contributor to chronic neck pain (Coenen et al. 2020) There is evidence that demographic characteristics, such as age and gender, may influence the prevalence and development of neck pain; however, further research is needed. Aging is the most significant biological risk factor for most chronic pain; therefore, identifying protective and

risk factors is critical for raising awareness of effective preventive measures and educational interventions for high-risk groups (McLean et al. 2010). Educating patients would enable them to participate actively in their recovery, thereby improving their posture through active coping strategies (MacPherson et al. 2017), such as minimizing and treating cervical syndrome (Blanpied et al. 2017). Informing these individuals about their own problems would enhance their quality of life.

Cervical pain often correlates with neck range of motion (CROM) and psychological factors that can intensify pain and disability (Alacreu et al. 2018). A biopsychosocial approach is effective not only in improving quality of life (QoL) but also in reducing neck pain (CNP) (Edmond et al. 2020). Patients with musculoskeletal disorders are the most common group that can benefit from rehabilitation services (Cieza et al. 2019). In particular, the guidelines of the American Physical Therapy Association (APTA) and the American Medical Association recommend Yoga-Pilates as therapeutic exercises within alternative medicine. Methods such as McKenzie, the Alexander Method, Feldenkrais, and Global Postural Rehabilitation are recommended for correcting posture in individuals with neck pain.

Through strengthening, flexibility, and ergonomic advice, posture correction can be achieved. Postural rehabilitation methods are utilized in the treatment of cervical syndrome, especially among desk workers, such as Global Postural Rehabilitation (GPR) (Pillastrini et al. 2016), while others focus on a biomechanical approach, such as the McKenzie method (MK). McKenzie and segmental spinal stabilization exercises have proven effective for pain management in individuals with cervical postural syndrome. However, it was found that out of the two techniques, the McKenzie protocol was more beneficial than segmental spinal stabilization exercises (Avaghade, Shinde and Dhane 2023).

According to (Sheikh et al. 2023), a significant reduction in neck pain and back pain was observed with Feldenkrais (FM) combined with a conventional exercise protocol for corporate employees working from home during COVID-19. The data indicated a significant decrease in neck and lower back pain. Anxiety and range of motion for the basal outcomes of lateral flexion indicate a good prognosis for the mobilization technique known as Mulligan (Carnero et al. 2022). Isometric neck exercises and craniocervical flexion exercises led to improvements in pain, the neck disability index (NDI), and active range of motion in all three planes after eight weeks (Chung and Jeong 2018).

Pilates emphasizes isometric muscle activation for core stability. The objectives of Pilates are to strengthen and train the core muscles across all three planes of trunk control (Cazotti et al. 2018). Neck and upper quadrant strengthening exercises resulted in a moderate effect on neck pain in the short term (Sterling et al. 2019). The evidence was of moderate quality at best. Other treatments, including education and psychological therapy, have shown only small effects, based on low- to moderate-quality evidence. Pain sensitivity may worsen after treatment, despite reduced intensity and unchanged neck disability scores over six months in individuals with cervical syndrome (Ortego et al. 2022).

## **CONCLUSION**

This review focus on the complexity and multifactorial nature of chronic neck pain in individuals with cervical syndrome, underscoring the importance of both physical and psychological interventions in improving patient outcomes. Chronic neck pain, characterized by

its high prevalence and debilitating effects, remains a significant public health concern that adversely impacts quality of life, functional mobility, and psychological well-being.

The findings from the 29 included studies suggest that a range of physical interventions, such as McKenzie techniques, Pilates, Feldenkrais methods, and Global Postural Rehabilitation can significantly alleviate pain and improve quality of life. However, the variability in intervention protocols, outcome measures, and study populations introduces challenges in synthesizing the evidence. Substantial heterogeneity was observed across studies, particularly in measures of quality of life and psychological outcomes, indicating the need for standardized methodologies in future research.

Key insights from the bias assessment reveal that while most studies demonstrated low risk in domains such as randomization and outcome reporting, significant limitations were noted in areas such as blinding and comparability. The Newcastle-Ottawa Scale scores indicated high methodological quality for the majority of the observational studies, though adjustments for confounders were often incomplete, limiting the generalizability of findings.

This review also underscores the critical role of psychological factors in chronic neck pain. Depression, anxiety, and other mood disorders were identified as both risk factors and consequences of cervical syndrome, emphasizing the need for a biopsychosocial approach in managing this condition. Studies that integrated psychological therapies with physical interventions reported superior outcomes, suggesting that a multidisciplinary strategy may be the most effective approach to treatment.

Despite the promising results of physical interventions, the overall effectiveness of general rehabilitation programs for cervical syndrome remains suboptimal. This highlights a critical gap in clinical practice and research, with a need for more targeted interventions tailored to individual patient profiles. The evidence also points to the importance of patient education in promoting active participation in recovery, thereby enhancing treatment efficacy and long-term outcomes. In conclusion, while this review provides valuable insights into the determinants of quality of life and the efficacy of physical treatments for chronic neck pain, it also reveals significant gaps in the current evidence base. Future research should prioritize methodological rigor, standardized outcome measures, and the integration of physical and psychological therapies to address the diverse needs of patients with cervical syndrome. By adopting a comprehensive, evidence-based approach, healthcare providers can optimize treatment strategies and improve the quality of life for individuals affected by this debilitating condition.

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