

**Effect of Strain Counter Strain versus Mckenzie Exercise on Pain and Disability in Subjects with Mechanical Neck Pain**

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**Conflicts of Interest:** Nil

**Abstract**

**Background and Objectives:** Mechanical Neck Pain (MNP) is a common musculoskeletal disorder characterized by pain in the cervical region, significantly impacting daily function and quality of life. Among various interventions, Strain Counter Strain (SCS) and McKenzie exercises are used to manage MNP, but there is limited evidence comparing their effectiveness. The objective of this study was to compare the effect of Strain Counter Strain versus McKenzie exercise on pain and disability in individuals with mechanical neck pain.

**Methods:** Quasi Experimental Study Design. This study includes 74 subjects who have clinically diagnosed with Mechanical Neck Pain were randomly allocated into 2

groups. In group A (37) subjects were treated with Strain Counter Strain along with conventional therapy whereas Group B (n=37) received McKenzie exercises along with conventional therapy. Participants were treated for 3 sessions per week for 4 weeks. The outcome measures of this intervention were measured in terms of VAS for pain, Neck disability index (NDI) for disability.

**Results:** The independent “t” test was used to compare the mean significant difference between pre and post test scores. Paired “t” test was used to assess the statistical significance difference between pre and post test score. Statistical Analysis of the data revealed that both groups showed significant improvement in parameters when compared within groups. Where as in between groups

comparison Strain Counter Strain along with conventional therapy showed better improvement in reducing pain and disability compared to the McKenzie exercise with conventional therapy.

**Conclusion:** After 4 weeks of intervention both Strain Counter Strain along with conventional therapy and McKenzie exercise along with conventional therapy showed significant improvement in reducing Pain and improving Disability in subjects with mechanical neck pain. However, Strain Counter Strain along with conventional therapy was found to be more effective when compared to McKenzie exercise along with conventional therapy. From the findings of the current study, Strain Counter Strain can be opted as treatment of choice for the management of subjects with Mechanical neck pain.

**Keywords:** Mechanical Neck Pain, Strain Counter Strain, McKenzie exercise, Visual Analogue Scale, Neck Disability Index.

### Introduction

Mechanical neck pain is an orthopaedic musculoskeletal disorder arising from cervical spine components such as muscles, ligaments, facet joints, and intervertebral discs, occurring in the absence of neurological symptoms or major pathology. The World Health Organization describes this condition as pain confined to the cervical area, which may extend toward the shoulders or upper limbs, and is frequently accompanied by limited motion and localized muscle tenderness.<sup>1</sup> The American Physical Therapy Association (APTA) further identifies mechanical neck pain as a subgroup of non-specific neck pain in which symptoms are provoked by sustained postures, particular cervical movements, or palpation of involved tissues This condition is recognized as one of the most prevalent musculoskeletal disorders world- wide,

second only to low back pain, and is strongly linked to contemporary lifestyle factors such as prolonged desk-based tasks and reduced physical activity. Epidemiological reports indicate wide-ranging lifetime prevalence rates between 12% and 71% globally, with annual estimates reaching approximately 30–50%. As the fourth leading cause of disability across the world, mechanical neck pain most commonly affects adults between 30 and 50 years of age, with higher rates noted among women and individuals whose occupations demand sustained postures or repetitive cervical movements.<sup>3</sup>

The condition is commonly categorized by duration into acute (<6 weeks), subacute (6–12 weeks), and chronic (>12 weeks) stages, with its underlying pathophysiology reflecting a multifactorial interplay of soft-tissue dysfunction, joint-related impairments, and altered neural processing.<sup>4</sup> Muscular contributions include micro-trauma from prolonged overload, leading to myofascial trigger point formation, heightened gamma motor neuron activity, and localized ischemia. In parallel, articular factors such as facet joint hypomobility generate mechanical nociceptive input, while persistent peripheral nociception may progress to central sensitization in chronic presentations, amplifying pain perception beyond the extent of the structural impairment<sup>5</sup>

Pathomechanically, postural deviations such as forward-head posture markedly increase mechanical stress on the posterior cervical structures while contributing to weakness of the deep anterior neck flexors, ultimately promoting muscle fatigue and recurrent pain cycles.<sup>6</sup> Repeated end-range loading, as emphasized in the McKenzie approach, may trigger derangement or dysfunction syndromes in which certain directional movements lead to either centralization or

peripheralization of symptoms<sup>7</sup>. Typical clinical features include localized or widespread cervical pain, stiffness, restricted cervical mobility, tenderness in muscles such as the upper trapezius and levator scapulae, and in many cases, cervicogenic headaches.<sup>8</sup> Diagnosis is primarily established through a comprehensive clinical evaluation, including detailed patient history and physical examination, with attention to posture, movement patterns, and muscle tone. Advanced imaging techniques are generally reserved for cases where structural pathology is suspected, while functional assessment tools such as the Neck Disability Index (NDI) are used to objectively quantify the level of disability.<sup>9</sup> Conventional management involves a multimodal strategy that includes pharmacological interventions such as NSAIDs—like Ibuprofen, Naproxen, and Diclofenac—and muscle relaxants for short-term symptom relief. Oral corticosteroids are administered in cases of inflammation or acute flare-ups, while local injections, such as epidural steroid injections, are employed for persistent or radicular pain.<sup>10</sup> Physical modalities involve treatments such as ultrasound, TENS, and heat therapy to provide adjunctive pain relief. Exercise therapy includes stretching exercises like the Upper Trapezius Stretch, strengthening exercises targeting the Deep Cervical Flexors and isometric strengthening, as well as stabilization and proprioceptive exercises. Manual therapy encompasses mobilization techniques such as Muscle Energy Techniques, manipulations including High Velocity Low Amplitude (HVLA) thrusts, and myofascial approaches like deep tissue release and positional release techniques. Patient education and ergonomics focus on posture correction, lifestyle modifications, and stress management.<sup>11</sup> Surgical intervention is reserved for severe cases with neurological

involvement or structural instability, with procedures including anterior cervical discectomy and fusion, cervical disc arthroplasty, and posterior decompression with fusion. The Strain-Counter Strain (SCS) technique is a gentle, passive manual therapy commonly employed to address musculoskeletal dysfunctions. It involves positioning the body in a way that maximizes comfort to alleviate pain and reduce muscle spasms.<sup>12</sup> This approach works by decreasing gamma motor neuron activity, lowering muscle spindle hyperexcitability, resetting spindle function, reducing nociceptor sensitization, and restoring normal muscle tone. In cases of mechanical neck pain (MNP), SCS is particularly effective for managing muscle tension and postural strain, and research has shown that it can provide additional benefits when combined with conventional therapy. The McKenzie Technique, or Mechanical Diagnosis and Therapy (MDT), is a structured method that emphasizes patient self-management. It involves assessment, classification, and the use of repeated directional movements to determine the direction of movement that alleviates or centralizes symptoms.<sup>14</sup> Evidence indicates that MDT is effective in reducing pain and disability in mechanical neck pain, offering a cost-effective and sustainable approach by empowering patients to manage their condition independently.<sup>15</sup>

Therefore the aim of this study is to compare the effects of Strain Counter Strain and McKenzie exercise on reducing pain and neck disability in subjects with mechanical neck pain.

### **Materials and Methods**

This is a Quasi Experimental Study Design approved by the Ethical Committee of GSL Medical College & General Hospital, The study was conducted at Department of Physiotherapy OPD, Tertiary Care

Teaching Hospital, Rajamahendravaram affiliated to Dr. NTR University one year from July 1<sup>st</sup> 2024 to June 30 2025. A total of 74 subjects diagnosed with Mechanical neck pain were recruited according to inclusion and exclusion criteria. The participants were randomized by Systematic random sampling into two groups with 37 subjects in Group-A Strain counter strain with conventional therapy and 37 subjects in Group-B McKenzie Exercise with conventional therapy. For GROUP – A 3 sessions per week for 4 weeks, each session along with conventional therapy. GROUP -B 3 Sessions per week for 4 weeks, each session along with conventional therapy.

**Inclusion criteria:** Subjects with age above 18 years group, Both male and female subjects were included, Subjects with a confirmed diagnosis of mechanical neck pain by orthopaedician, Neck pain and symptoms for more than 3 weeks, Grade 1 and 2 according to neck pain task force.

**Exclusion criteria:** Subjects with history of neck pain radiating to upper limbs (Radiculopathy), Other conditions like: Ankylosing spondylosis, Recent trauma, Spondylolisthesis, Osteoporosis and Malignancy.

**Outcome Measures: Visual Analogue Scale (VAS):** Pain intensity was assessed at baseline (pre-test) and at the end of the fourth week (post-test) using the Visual Analogue Scale (VAS). The VAS is a reliable, valid, and widely accepted tool for measuring pain. It typically consists of a 100-millimeter (10-centimeter) horizontal line, with “NO PAIN” marked at the left end and “WORST PAIN” at the right end. Patients indicate their current level of discomfort by placing a mark on the line. The distance from the left end to the patient’s mark is measured and recorded as the VAS score, reflecting the severity of pain.

**Neck Disability Index (NDI):** Perceived disability was measured using the Neck Disability Index (NDI), the most commonly used instrument for self-assessment of disability in individuals with neck pain. The questionnaire includes five main domains, covering pain intensity, ability to perform activities of daily living, and headache severity. Each item has six response options, scored from 0 (no disability) to 50 (complete disability), to quantify the patient’s level of functional limitation.

### **Intervention**

The study consist of 4 weeks of intervention. Group A subjects were treated with Strain Counter Strain with Conventional physiotherapy and Group B with McKenzie Exercise with Conventional physiotherapy. **Group A: Strain Counter Strain:**

**Procedure:** To perform the procedure of SCS, the subject will be in supine and their spine is in neutral cervical position, the therapist locates tender area. Then slowly and passively positions the patient, passive positioning causes a counter strain, a mild strain in the opposite direction of original strain, to the muscle. Each tender area found corresponds with a specific treatment position, called a position of relief. The location of the position is often similar to the original injury position. In the cervical area, the therapist will hold the patient in the position of relief for 90 seconds, and palpate the point occasionally, to monitor tissue texture and patient subjective pain level will change. The therapist will then very slowly returns the patient back to neutral position, it results in a disappearance of edema and muscle tension as the tender area relaxes. Here the range of motion may show slight improvement, others state that pain decreases by approximately 60-70% immediately following treatment. Patients may experience mild soreness similar to delayed onset muscle soreness following day.



Figure 1: Strain Counter Strain on Cervical Erectors (Sternocleidomastoid)



Figure 3: Hydrocollator Packs



Figure 2: the therapist holds the patient in the position of relief for 90 seconds to ease the sternocleidomastoid muscle

**Conventional Therapy:** Patient is instructed to lie in prone position and Moist Hot Pack is given to the neck for 30min's

**Group B: Mckenzie Exercise:** McKenzie exercise used in the form of neck retraction exercise. The patient is instructed to move the head backwards as far as possible but at the same time maintain forward facing position. It is important that the movement is made to the maximum. On completion the patient returns to the neutral rest position. The movement is done for four sets of 10-15 repetitions with 1-2 minutes rest between each set.

**First Week:** The patient was lying in supine position, chin was trucked in or head was retracted, to maintain slight flexion. The patient was asked to pull his head and neck posterior into a position in which head was directly over the shoulder girdle. The end position was maintained for one second and then allowed to relax into a resting posture. This procedure was done for 4 sets of 10 to15 repetitions and 1 to 3 minutes rest between each set

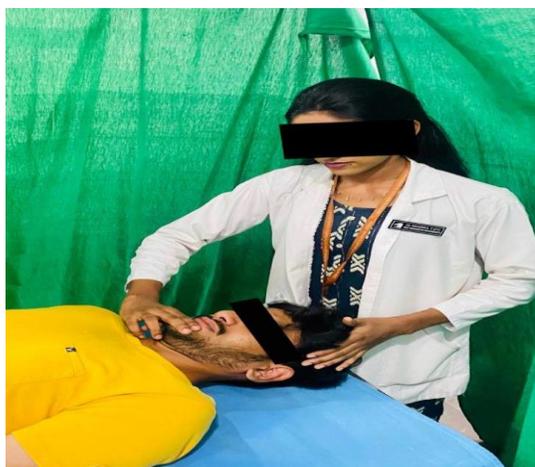


Figure 4: Cervical Retraction Exercise in Lying

**Second Week:** In sitting position, progression was given by the addition of neck extension with chin trucked over pressure in the end of motion by the therapist. This procedure was done for four sets of 1 to 2 minutes rest was given in between each set.



Figure 5: Cervical Retraction and Extension Exercise in Sitting

**Third Week:** In supine lying, head was kept out of the couch. The retraction and extension exercise with traction was performed by the therapist. The traction and extension was maintained throughout the range of motion.



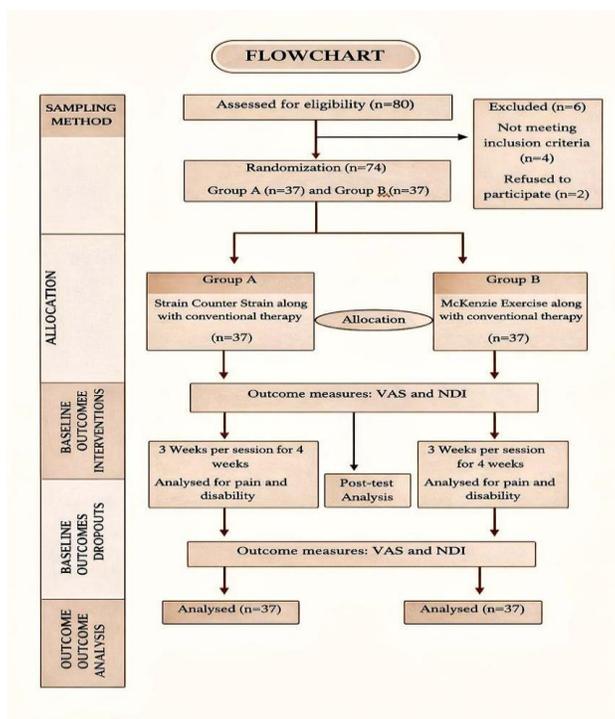
Figure 6: Traction with Cervical Extension in Lying

**Fourth Week:** The patient was asked to come in sitting, progression was done by combined retraction and lateral flexion with over pressure performed by the therapist. This procedure was done for four sets of 10 to 15 repetitions and 1 to 2 minutes rest was given in between each set.



Figure 7: Cervical Retraction with Lateral Flexion Exercise

**Conventional Therapy:** Patient is instructed to lie in prone position and Moist Hot Pack is given to the neck for 30min's



### Statistical Analysis

All Statistical analysis was done by using SPSS software version 20.0 and Microsoft excel 2010. Descriptive data was presented in the form of mean +/- standard deviation and mean difference percentages were calculated and presented. Data also tabulated and graphically represented.

**Within the groups:** Paired student “t” test was performed to assess the statistical difference within the groups for Pain and Function from pre-test and post-test values.

**Between the groups:** Independent student “t” test was performed to assess the statistically significant difference in mean value between the groups for Visual Analogue Scale for Pain and Neck disability index (NDI) for function. For all statistical analysis,  $p \leq 0.05$  will be considered as Statistically Significant.

### Results

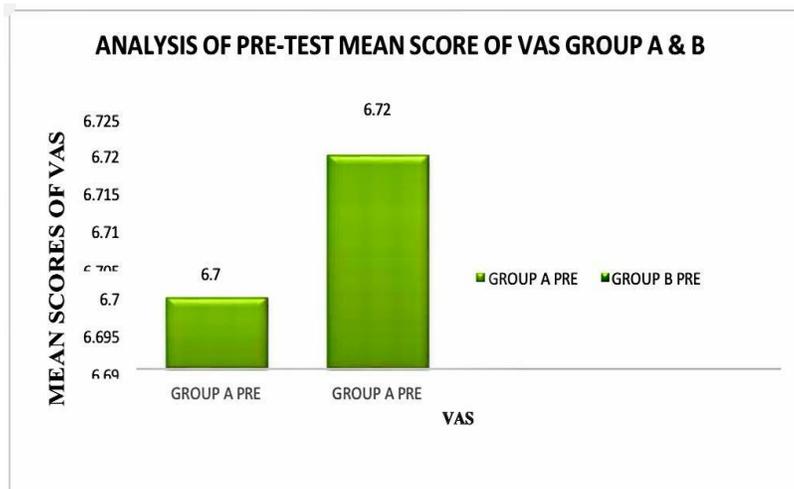
The results of this study were analysed in terms of reduction of pain on Visual analogue scale (VAS) and improvement in function on Neck Disability Index (NDI). The consort flow chart of the study showed the study organization in terms of subjects screening, random allocation and analysis following the intervention. A total of 80 subjects with Mechanical Neck were screened for eligibility, amongst 74 subjects were included in the study trail. All the 74 subjects who met the inclusion criteria had undergone baseline assessment and included subjects were randomized into two groups consisting of 37 participants in group A (Strain Counter Strain with conventional therapy) and 37 participants in group B (McKenzie exercise with conventional therapy). In this study 37 participants completed training in Group A and 37 participants completed training in Group B. Comparison was done within the groups as well as in between the groups to evaluate the intra group and inter group effect of the intervention.

## Tables and Graphs

Table 1: Analysis of Pre-Test Mean Score of Visual Analogue Scale Within Group A And Group B:

VAS		Mean	Standard Deviation	P Value	Inference
Pre Test	Group A	6.70	0.74	0.87	Insignificant
	Group B	6.72	0.69		

Graph 1:

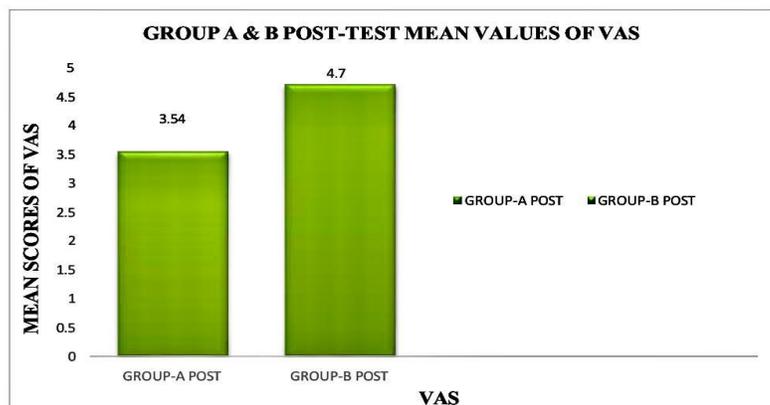


**Result:** The above table 1 and graph 1 indicate that the pre-test mean group-A (6.7) and group-B (6.72) scores of the VISUAL ANALOUGE SCALE between the two groups found to be statistically insignificant. ( $p > 0.05$ )

Table 2: Analysis of Pre-Test Mean Score of Visual

VAS		Mean	Standard Deviation	P Value	Inference
Post Test	Group A	3.54	0.64	0.001	Highly Significant
	Group B	4.70	0.84		

Graph 2:

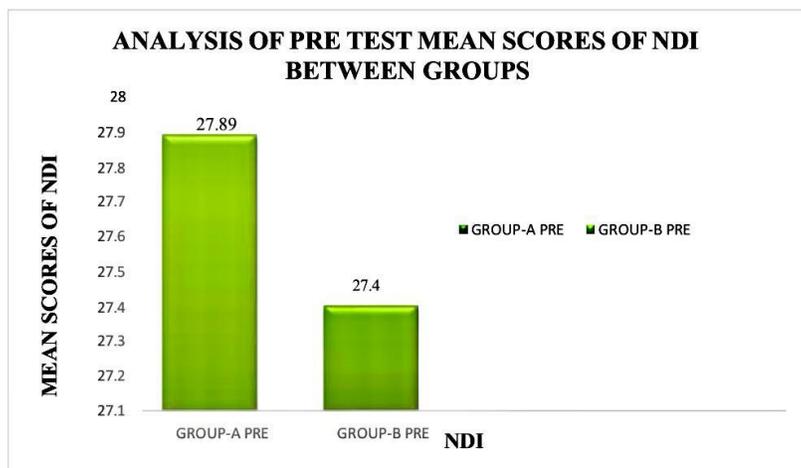


**Result:** The above table 2 and graph 2 indicate that the post-test mean group-A (3.54) and group B (4.7) scores of the VISUAL ANALOUGE SCALE between the two groups were found to be statistically insignificant ( $p < 0.001$ )

Table 3: Analysis of Pre-Test Mean Score of Neck Disability Index within the Group A & B

Group A&B		Mean	Standard Deviation	P Value	Inference
Post Test	SCS	27.89	1.28	0.098	In Significant
	McKenzie	27.40	1.21		

Graph 3:

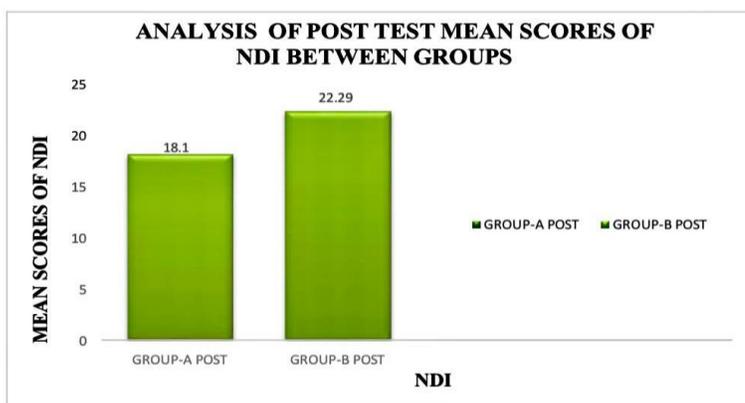


**Results:** The above table 3 and graph 3 indicate that the pre-test mean group-A (22.54) and group-B (22.62) scores of the NECK DISABILITY INDEX between the two groups were found to be statistically insignificant. ( $p > 0.098$ ).

Table 4: Analysis of Post-Test Mean Score of Neck Disability Index within the Group A & B

Group A&B		Mean	Standard Deviation	P Value	Inference
POST	SCS	18.10	1.82	0.001	Highly Significant
	McKenzie	22.29	1.46		

Graph 4:



**Results:** The above table 4 and graph 4 indicate that the post-test mean group-A (8.62) and group-B (19.86) scores of the NECK DISABILITY INDEX between the two groups were found to be statistically highly significant ( $p < 0.001$ ) in group-A.

## Discussion

The aim of the present study was to compare the effects of Strain Counter Strain and McKenzie exercises on pain and disability in subjects with mechanical neck pain. Seventy-four participants were randomly assigned to two groups: Group A received SCS along with conventional physiotherapy, while Group B performed McKenzie exercises in addition to conventional physiotherapy. Over the 4-week treatment period, both groups showed statistically significant improvements in both pain (VAS) and disability (NDI) scores from baseline to post intervention. However, the between group comparison indicated that Group A (SCS) achieved markedly greater reductions in both outcome measures than Group B (McKenzie). The substantial improvements noted in both groups correspond with previous research demonstrating the effectiveness of both SCS and McKenzie techniques in treating musculoskeletal pain. The outcomes for the McKenzie group agree with the findings of Lametal.(2021), whose meta-analysis reported that McKenzie therapy significantly decreases pain and disability in individuals with neck pain by emphasizing patient self-management, directional preferences, and symptom centralization.<sup>26</sup> The active component of McKenzie exercises facilitates neuromuscular re-education and helps restore normal movement patterns, thereby supporting overall functional improvement.

Likewise, the marked improvements seen in the SCS group support the findings of Kadrya H et al. (2024) and D'Alessandro G et al.(2022), who reported notable reductions in pain and enhanced functional outcomes following SCS treatment. The underlying neurophysiological rationale of SCS is based on placing the affected muscle into a position of maximal comfort, which helps diminish abnormal proprioceptive signals

originating from muscle spindles. This process reduces gamma motor neuron activity and interrupts the persistent cycle of pain and muscle spasm, ultimately promoting rapid symptom relief and normalization of muscle tone. The primary outcome of this study showing greater effectiveness of SCS compared to McKenzie exercises can be understood through the fundamental differences in how the two techniques function therapeutically. The McKenzie method is an active, patient driven exercise protocol that may initially aggravates discomfort in sensitive or acutely painful tissues, whereas SCS is a passive and gentle approach that addresses the neurogenic component of muscle spasm without triggering protective muscle guarding.<sup>30</sup> In cases of mechanical neck pain, where heightened sensitivity and reflexive muscle guarding are common, a passive approach that directly influences neural output to the muscle (as SCS does) may yield quicker and more substantial symptom reduction compared to an active exercise based intervention. The larger reduction in NDI scores observed in the SCS group (18.2 vs 23.7,  $p=0.002$ ) highlights its strong influence on functional disability. By effectively reducing pain and decreasing muscle tension, SCS likely enabled an earlier return to comfortable, pain free movement, which in turn improved the ability to perform daily tasks such as personal care, reading, work, recreation activities. Although the McKenzie group also demonstrated meaningful improvement, the slower progression of exercises and the possibility of initial discomfort may have postponed the full functional gains within the 4-week treatment period. From the SCS standpoint, its therapeutic effect is thought to occur through several mechanisms: lowering gamma gain within muscle spindles, re-establishing normal spindle activity, reducing nociceptor hypersensitivity, and restoring appropriate

afferent signaling to the central nervous system<sup>33</sup> Ali S (2021) reported that techniques inducing autogenic inhibition— such as SCS—lead to greater muscle relaxation and improved functional outcomes when compared with passive stretching alone, further supporting the neurophysiological rationale behind SCS’s effectiveness. The clinical relevance of these results is considerable. SCS appears to be a highly effective method for quickly decreasing pain and disability in individuals with mechanical neck pain, making it especially useful during the early phases of rehabilitation or for patients experiencing marked pain and muscle spasm. Its gentle, non-invasive approach ensures good patient tolerance and makes it appropriate for a wide range of individuals.<sup>35</sup>

Empowerment-based approaches such as the McKenzie method may play an important role in long-term self-management and in preventing symptom recurrence, thereby contributing to a more comprehensive rehabilitation strategy. The findings of the present study gain added importance in light of the increasing global burden of neck pain. Wu AM et al. (2024) reported that neck pain continues to be one of the leading contributors to years lived with disability worldwide, with its prevalence expected to rise further due to aging populations and increasingly sedentary lifestyles. Early, effective interventions such as SCS—capable of delivering rapid symptom relief may therefore play a key role in preventing chronicity and reducing the overall healthcare load.<sup>36</sup>

No adverse effects were observed during the study, and the SCS protocol used (a 90-second hold for each tender point, delivered three times per week) was found to be safe and well tolerated. Earlier work by D’Alessandro G et al. (2022) similarly reported a strong safety profile for SCS, noting that side effects were minimal and generally

limited to mild, transient soreness comparable to delayed-onset muscle soreness. While the present study showed meaningful short-term improvements, the absence of long-term follow-up is a notable limitation. Future research should examine how long the benefits of SCS are maintained and assess whether combining SCS with McKenzie exercises in a sequential manner could produce additional therapeutic advantages. Including objective assessment tools such as surface electromyography, cervical range of motion measurements, and postural analysis would also help clarify the underlying mechanisms of both interventions. In conclusion, this randomized comparative study shows that both Strain Counter Strain and McKenzie exercises are effective in reducing pain and disability in individuals with mechanical neck pain. However, SCS produced significantly greater improvements in both pain reduction and functional outcomes over the 4-week intervention period. These results highlight SCS as a valuable, effective, and well-tolerated therapeutic approach that clinicians can confidently integrate into their treatment plans for mechanical neck pain.

### **Limitations**

The sample population limits to a small sample size (74 participates), which may affect generalizability, the duration of intervention was short (4weeks), the study relied on subjective outcome measures (VAS and NDI), without objective biomechanical or EMG data, participants home exercise adherence was not monitored, which could influence outcomes and Only Grade I and II neck pain cases were included results may differ in severe or chronic cases.

### **Conclusion**

The findings of this current study concluded that both Strain Counter Strain and McKenzie Exercises are

effective in reducing pain and disability among individuals with Mechanical Neck Pain. However, the Strain Counter Strain technique produced greater improvement compared to McKenzie exercises. This may be attributed to SCS's ability to directly reduce muscle spasm and normalize proprioceptive function through passive positioning, leading to faster relief and improved neck mobility. Hence, SCS can be recommended as an effective, gentle, and well tolerated therapeutics option for mechanical neck pain.

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