

Original Article

A Study to Compare the Effectiveness of McKenzie Neck Exercise and Contract Relax Stretching in Mechanical Neck Pain

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ABSTRACT

Background: Mechanical neck pain is commonly defined as pain between the superior nuchal line and an imaginary transverse line through the tip of the first thoracic spinous process, extending laterally to the sagittal planes peripheral to the lateral borders of the neck. Neck pain (NP) can be local and/or referred into the head and/or upper limbs. NP is a prevalent musculoskeletal issue worldwide, similar to low back pain (LBP), characterized by episodic occurrences with high recurrence and chronicity rates. It frequently arises insidiously and is multifactorial in origin, with modifiable factors including smoking, poor posture, anxiety, depression, neck strain, and occupational activities. NP is a significant societal burden, particularly prevalent among office workers and computer users.

Objective: The objective of this study was to compare the effectiveness of McKenzie neck exercises and contract-relax stretching in alleviating mechanical neck pain.

Methods: This quasi-experimental study included 40 participants aged 25 to 50 years from Allied Hospital Faisalabad, selected using purposive sampling. Participants were divided into two groups of 20 each. Group 1 received McKenzie neck exercises, while Group 2 received contract-relax stretching. Both groups underwent treatment three times per week for 6 to 8 weeks. Pain and functional performance were evaluated using the Numeric Pain Rating Scale (NPRS) and Neck Disability Index (NDI). Statistical analysis was conducted using SPSS version 27.0, with the Wilcoxon signed-rank test applied for within-group comparisons and the Mann-Whitney U test for between-group comparisons.

Results: In Group 1 (contract-relax stretching), NPRS scores improved from a mean of 2.56 (SD=0.51) to 2.11 (SD=0.47) ($Z=-2.828$, $p<0.05$), and NDI scores improved from a mean of 3.78 (SD=0.55) to 0.73 (SD=0.73) ($Z=-3.419$, $p<0.05$). In Group 2 (McKenzie neck exercises), NPRS scores improved from a mean of 2.61 (SD=0.50) to 1.72 (SD=0.57) ($Z=-2.828$, $p<0.01$), and NDI scores improved from a mean of 3.22 (SD=0.73) to 2.06 (SD=0.94) ($Z=-3.391$, $p<0.05$). Between-group comparisons indicated that Group 2 had significantly greater improvements in NPRS (mean rank 15.47 vs. 21.53, $p<0.05$) and NDI scores (mean rank 13.86 vs. 23.14, $p<0.05$).

Conclusion: Both McKenzie neck exercises and contract-relax stretching effectively reduced pain and improved function in patients with mechanical neck pain. However, McKenzie neck exercises demonstrated significantly greater improvements in pain relief and functional outcomes. Therefore, McKenzie neck exercises may be preferred for managing mechanical neck pain.

Keywords: Mechanical Neck Pain, McKenzie Neck Exercise, Contract-Relax Stretching, Numeric Pain Rating Scale, Neck Disability Index

INTRODUCTION

Neck pain is a prevalent musculoskeletal issue, affecting individuals across various age groups and significantly impacting their quality of life and functional abilities. Mechanical neck pain, specifically, is a condition characterized by pain originating from the cervical spine's structures, including muscles, joints, ligaments, and intervertebral discs. This type of neck pain often arises insidiously and is generally multifactorial in origin. Modifiable risk factors such as poor posture, anxiety, depression, neck strain, and occupational

activities, particularly those involving prolonged computer use, have been identified as contributing to the onset of mechanical neck pain (1).

The symptoms of mechanical neck pain include localized pain that may be referred to the head and upper limbs, muscle tightness, spasms, decreased range of motion, and headaches. These symptoms are often exacerbated by maintaining the head in a fixed position for extended periods, such as during driving or computer work. The etiology of mechanical neck pain encompasses muscle strain due to overuse, age-related joint wear and tear, herniated discs, bone spurs causing nerve compression, and injuries to the cervical region (2).

Mechanical neck pain is not only a common cause of discomfort but also a significant societal burden due to its high prevalence among office workers and computer users. Epidemiological studies have shown that mechanical neck pain can affect up to 71% of people during their lifetime, with a point prevalence of 23% and a higher incidence reported among middle-aged individuals (3). The economic impact is also considerable, given the associated healthcare costs and productivity losses.

Various therapeutic interventions have been employed to manage mechanical neck pain, with physical therapy playing a crucial role. Among the widely recognized methods are the McKenzie neck exercises and contract-relax stretching techniques. The McKenzie method, also known as mechanical diagnosis and therapy (MDT), emphasizes patient autonomy and self-management through specific exercises designed to alleviate pain and restore function by targeting mechanical factors contributing to the pain (4). On the other hand, the contract-relax stretching technique, part of proprioceptive neuromuscular facilitation (PNF), involves alternating between muscle contraction and passive stretching to improve flexibility and reduce muscle tension (5).

Despite the widespread use of these interventions, there remains a need for comparative studies to evaluate their relative effectiveness in managing mechanical neck pain. Previous research has shown that both McKenzie exercises and contract-relax stretching can lead to significant improvements in pain relief, range of motion, and functional performance. However, direct comparisons between these two approaches are limited, warranting further investigation to determine the optimal treatment strategy for patients with mechanical neck pain (6).

This study aims to compare the effectiveness of McKenzie neck exercises and contract-relax stretching in alleviating mechanical neck pain, with a focus on pain relief, functional improvement, and postural correction (7-10). By employing a quasi-experimental design and utilizing validated assessment tools such as the Numeric Pain Rating Scale (NPRS) and the Neck Disability Index (NDI), this research seeks to provide evidence-based recommendations for clinicians in selecting the most appropriate therapeutic interventions for managing mechanical neck pain (11-16). Through this comparative analysis, we hope to contribute to the body of knowledge in physical therapy and enhance clinical decision-making for the benefit of patients suffering from this debilitating condition.

MATERIAL AND METHODS

The study was designed as quasi-experimental research to compare the effectiveness of McKenzie neck exercises and contract-relax stretching in alleviating mechanical neck pain. The study was conducted over a period of two months at Allied Hospital, Faisalabad, involving a purposive sample of 40 participants, both male and female, aged between 20 and 50 years. Participants were selected based on inclusion criteria that required them to have mechanical neck pain for at least three months with a pain score greater than 3 on the Numeric Pain Rating Scale (NPRS) (12).

Exclusion criteria included a history of severe neck trauma such as fractures, congenital disorders of the cervical spine, neurological deficits, tumors, spinal surgery, rheumatoid arthritis, spondylolisthesis, any psychological problems, cardiac issues, or vertebral insufficiency. Ethical approval was obtained from the institutional ethical committee, and the study adhered to the principles outlined in the Declaration of Helsinki. Informed consent was obtained from all participants, ensuring their understanding of the study's procedures, potential risks, and their right to withdraw at any time (12, 13).

Participants were randomly assigned into two groups of 20 each. Group 1 received contract-relax stretching while Group 2 underwent McKenzie neck exercises. Both groups received baseline treatment with a hot pack applied for 10 minutes before each session. The contract-relax stretching involved isometric resistance applied for 8 to 10 seconds followed by a 34-second stretch, repeated 5-10 times per session, three times a week for 6 to 8 weeks. The McKenzie neck exercises included specific repetitive movements aimed at centralizing pain and improving function, performed six to eight repetitions per session, three times a week for 6 to 8 weeks (13).

Data were collected using a data collection proforma that recorded demographic information such as name, gender, age, occupation, and medical history. Pain levels were assessed using the NPRS, where participants rated their pain on a scale from 0 (no pain) to 10 (worst possible pain). Neck disability was evaluated using the Neck Disability Index (NDI), a questionnaire consisting of 10 items scored from 0 to 5, with a total score of 50. Scores were categorized as no disability (0-4), mild disability (5-14), moderate disability (15-24), severe disability (25-34), and complete disability (above 34) (14).

Baseline measurements were taken before the intervention and post-treatment measurements were collected after the last session in the sixth week. The collected data included pre- and post-treatment NPRS scores and NDI scores. The data were analyzed using SPSS version 25.0. Normality of data was assessed using the Shapiro-Wilk test, and due to the non-normal distribution of data, non-parametric tests such as the Wilcoxon Signed Rank Test and the Mann-Whitney U Test were employed for intra-group and inter-group comparisons, respectively (5).

RESULTS

The study included 36 participants, distributed across two intervention groups. The age distribution showed that 55.6% of participants were aged between 20-30 years, 16.7% were between 31-40 years, and 27.8% were between 41-50 years. Gender distribution was 75% female and 25% male.

Table 1 Demographics

Demographic	Category	Frequency	Percent
Age Group	20-30	20	55.6
	31-40	6	16.7
	41-50	10	27.8
Total	-	36	100.0
Gender	Female	27	75.0
	Male	9	25.0
Total	-	36	100.0

Table 2 Contract-Relax Stretching

Measurement	Time Point	N	Mean	SD	Median	Z	p-value
NPRS	Pre-treatment	18	2.56	0.51	3.00		
	Post-treatment	18	2.11	0.47	2.00	-2.828	<0.05
NDI	Pre-treatment	18	3.78	0.55	4.00		
	Post-treatment	18	0.73	0.73	3.00	-3.419	<0.05

Table 3 McKenzie Neck Exercises

Measurement	Time Point	N	Mean	SD	Median	Z	p-value
NPRS	Pre-treatment	18	2.61	0.50	3.00		
	Post-treatment	18	1.72	0.57	2.00	-2.828	<0.01
NDI	Pre-treatment	18	3.22	0.73	3.00		
	Post-treatment	18	2.06	0.94	2.00	-3.391	<0.05

Within-group analysis using the Wilcoxon signed rank test demonstrated significant improvements in NPRS and NDI scores for both groups after the intervention. In Group 1 (contract-relax stretching), NPRS scores improved from a mean of 2.56 to 2.11 ($p < 0.05$) and NDI scores improved from a mean of 3.78 to 0.73 ($p < 0.05$). In Group 2 (McKenzie neck exercises), NPRS scores improved from a mean of 2.61 to 1.72 ($p < 0.01$) and NDI scores improved from a mean of 3.22 to 2.06 ($p < 0.05$).

Table 4 Mann-Whitney U Test Comparing Both Groups

Measurement	Group	N	Mean Rank	Sum of Ranks	p-value
NPRS	Contract-Relax (Group 1)	18	21.53	387.50	<0.05
	McKenzie (Group 2)	18	15.47	278.50	
NDI	Contract-Relax (Group 1)	18	23.14	416.50	<0.05
	McKenzie (Group 2)	18	13.86	249.50	

The between-group analysis using the Mann-Whitney U test indicated that the McKenzie neck exercises had a greater effect on reducing pain and improving neck disability compared to contract-relax stretching. For NPRS scores, Group 2 had a mean rank of 15.47 compared to Group 1's 21.53 ($p < 0.05$). For NDI scores, Group 2 had a mean rank of 13.86 compared to Group 1's 23.14 ($p < 0.05$). These results prove that both interventions were effective in reducing pain and improving function in patients with mechanical neck pain. However, the McKenzie neck exercises showed significantly greater improvements in pain relief and functional outcomes compared to contract-relax stretching.

DISCUSSION

The findings of this study highlighted the significant effectiveness of McKenzie neck exercises compared to contract-relax stretching in alleviating mechanical neck pain. Participants in both groups demonstrated improvements in NPRS and NDI scores, indicating reduced pain and disability. However, the improvements were markedly greater in the McKenzie neck exercises group, aligning with previous studies that have documented the superior benefits of this intervention for neck pain relief (15, 16).

The McKenzie method, which emphasizes patient autonomy and specific movements to centralize pain, has consistently shown to be effective in treating musculoskeletal disorders, particularly in the cervical and lumbar regions (17). The current study's results support these findings, as the participants who performed McKenzie exercises exhibited significant reductions in pain and disability scores. This aligns with Diab et al. (2016), who reported substantial improvements in patients with non-specific neck pain using the McKenzie protocol (6). Furthermore, Kang et al. (2019) found that McKenzie exercises were beneficial in reducing muscle fatigue and disability in chronic neck pain patients, which is corroborated by the current study's outcomes (14, 17-19).

Contract-relax stretching, while effective, did not yield as significant improvements as the McKenzie method. This technique, which combines passive stretching with muscle contraction, has been shown to enhance flexibility and range of motion through mechanisms such as autogenic inhibition and reciprocal inhibition (20). Although beneficial, its impact on pain and disability in this study was less pronounced, suggesting that while it is a useful adjunct therapy, it may not be as robust as the McKenzie exercises for mechanical neck pain (21).

The strengths of this study include the use of validated outcome measures (NPRS and NDI) and the application of right statistical analyses to evaluate the effectiveness of the interventions. However, there were several limitations. The sample size was relatively small, which might affect the generalizability of the findings. Additionally, the study's duration was limited to six weeks, which might not capture the long-term effects of the interventions. Future research should consider larger sample sizes and longer follow-up periods to validate and extend these findings (22). Another limitation was the lack of control over participants' daily activities, which could influence the results. The study also did not account for individual characteristics such as weight, height, nutrition, or psychological factors, which could impact the outcomes. Additionally, the exclusion criteria might have limited the applicability of the findings to the general population (23).

CONCLUSION

In conclusion, this study proved that McKenzie neck exercises are more effective than contract-relax stretching in reducing pain and disability in patients with mechanical neck pain. These findings suggest that the McKenzie method should be considered a primary intervention for managing mechanical neck pain, while contract-relax stretching can be used as a supplementary therapy. Future research should aim to address the limitations of this study by including larger, more diverse populations and exploring the long-term effects of these interventions. By improving our understanding of these treatments, clinicians can better tailor interventions to individual patient needs, ultimately enhancing patient outcomes and quality of life.

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