

*Original Article*

# Comparative Effects of Elongation Longitudinal Décoaptation Ostéo-Articulaire (ELDOA) Versus Manual Myofascial Release Therapy on Mechanical Neck Pain Related to Poor Posture

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## ABSTRACT

*Background: Mechanical neck pain is prevalent among university students due to prolonged poor posture and sedentary behavior, causing discomfort and functional limitations without underlying pathology. Elongation Longitudinal Décoaptation Ostéo-Articulaire (ELDOA) and manual myofascial release therapy have both shown efficacy in managing musculoskeletal pain, yet few studies have compared their effectiveness in treating posture-related neck pain. Objective: To compare the effects of ELDOA and manual myofascial release therapy on pain intensity and functional disability in university students with mechanical neck pain caused by poor posture. Methods: A randomized clinical trial was conducted at Government College University Faisalabad with 30 participants aged 18–30 years diagnosed with mechanical neck pain. Subjects were randomly assigned to ELDOA or manual myofascial release groups, each receiving interventions thrice weekly for four weeks. Pain intensity was measured using the Numeric Pain Rating Scale (NPRS), and disability was assessed via the Neck Disability Index (NDI). Statistical analysis was performed using SPSS version 22, with effect sizes calculated using Cohen's d. Results: Both groups showed significant reductions in NPRS and NDI scores post-intervention ( $p < 0.001$ ). ELDOA demonstrated numerically greater reductions, though between-group differences were not statistically significant. Effect sizes ranged from moderate to very large. Conclusion: ELDOA and manual myofascial release therapy are both effective in reducing mechanical neck pain and disability, with ELDOA showing slightly greater improvements. Larger studies are warranted to confirm these findings.*

*Keywords: mechanical neck pain, ELDOA, myofascial release, posture, randomized clinical trial*

## INTRODUCTION

Cervical spine discomfort constitutes a substantial health burden worldwide, with mechanical neck pain emerging as a frequent clinical complaint often associated with musculoskeletal dysfunction rather than a specific pathological disease (1). This condition, characterized by pain related to abnormal strain or mechanical dysfunction of cervical structures, frequently arises from sustained poor posture, especially among individuals engaged in sedentary activities or prolonged computer work (2). The cervical spine's anatomical configuration, comprising seven vertebrae with significant mobility, predisposes it to cumulative mechanical stress and musculoskeletal imbalance, leading to both local pain and referred symptoms (3). Mechanical neck pain affects approximately 45–54% of individuals during their lifetime, leading not only to personal discomfort but also to considerable economic and societal costs due to reduced productivity and healthcare utilization (4). Emerging evidence indicates that in populations such as university students, chronic sedentary behaviors, prolonged sitting, and habitual postural faults contribute to muscular imbalances and fascial restrictions, potentially exacerbating cervical pain syndromes (5).

Pathophysiologically, mechanical neck pain involves alterations in muscle recruitment and proprioception, where dysfunction of deep cervical flexors like the longus colli and longus capitis has been documented in affected individuals (6). These neuromuscular disturbances may result in compromised spinal stability and altered sensory input, propagating pain and disability (7). Furthermore, the presence of myofascial trigger points—hyperirritable spots within taut muscle bands—has been implicated in chronic cervical pain, generating localized and referred pain and contributing to sustained musculoskeletal dysfunction (8). Therapeutic interventions aimed at mechanical decompression and fascial release have therefore become central in the conservative management of mechanical neck pain.

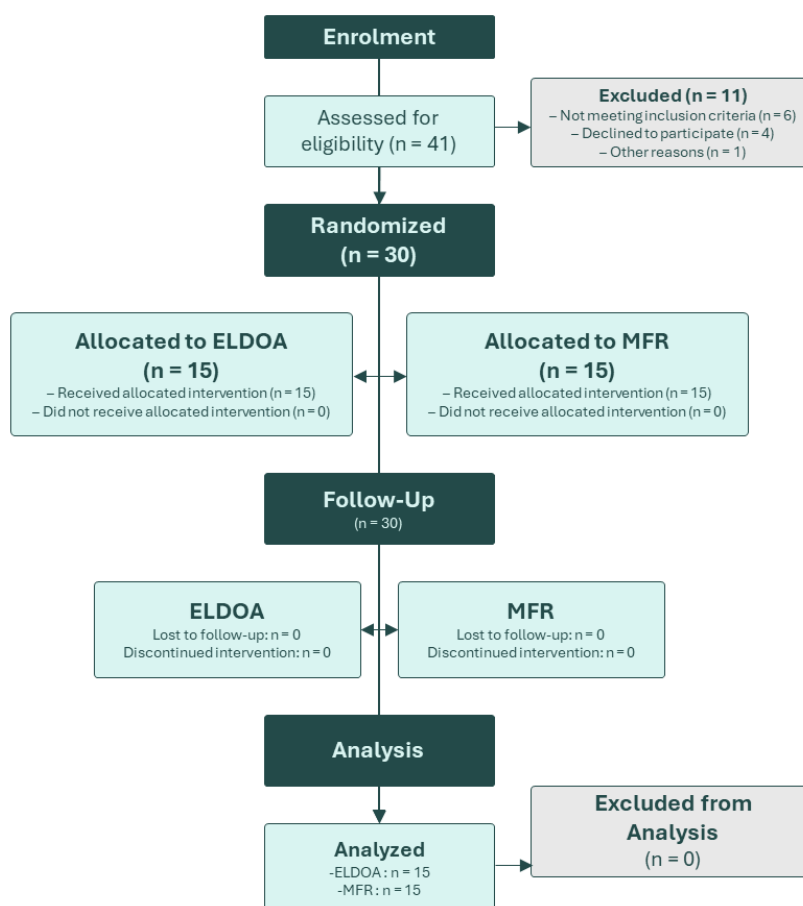
Elongation Longitudinal Décoaptation Ostéo-Articulaire (ELDOA) is an exercise-based intervention designed to create segmental decompression within spinal joints through precise postural tensioning and muscular engagement, thereby promoting fascial stretching

and proprioceptive re-education (9). The technique is believed to enhance local joint space, reduce mechanical strain, and improve postural alignment, potentially offering superior benefits over traditional manual therapies in addressing structural and neuromuscular contributors to neck pain (9). Conversely, manual myofascial release therapy emphasizes gentle, sustained pressure to stretch fascial layers, reduce adhesions, and normalize muscle tone based on patient feedback, offering documented benefits in various musculoskeletal disorders (10). Despite individual evidence supporting both techniques, there remains limited comparative research directly evaluating their relative efficacy in populations with posture-induced mechanical neck pain, particularly among young adults such as university students who represent a growing at-risk group.

Given this knowledge gap, the present randomized clinical trial was conducted to compare the effects of ELDOA and manual myofascial release therapy on pain intensity and functional disability among university students with mechanical neck pain associated with poor posture. The study hypothesized that ELDOA would produce greater reductions in pain and disability scores than manual myofascial release, reflecting its combined benefits on mechanical decompression and neuromuscular control.

## MATERIAL AND METHODS

A randomized clinical trial was conducted at the Department of Physical Therapy, Government College University Faisalabad, Pakistan, spanning a total duration of three months, including participant recruitment, baseline assessment, intervention, and post-intervention evaluation (11). Participants were recruited from the university population through campus notices and social media outreach, targeting individuals experiencing mechanical neck pain potentially related to poor posture. Inclusion criteria comprised male and female students aged between 18 and 30 years, with a clinical diagnosis of mechanical neck pain persisting for more than three months and reporting a Numeric Pain Rating Scale (NPRS) score greater than five at baseline assessment. Exclusion criteria encompassed any history of cervical spine surgery, recent trauma, neurological deficits, systemic inflammatory conditions, or concurrent participation in other physical therapy programs for neck pain management (12). Prior to enrolment, all individuals received comprehensive information regarding the study protocol and provided written informed consent in accordance with the principles of the Declaration of Helsinki, with ethical approval granted by the Ethics Committee of the College of Physical Therapy, Government College University Faisalabad (Reference No. not provided in the manuscript) (13).



**Figure 1 CONSORT Flowchart**

Participants were randomly assigned in equal numbers to either the ELDOA group or the manual myofascial release (MFR) group using a simple randomization process based on the lottery method, ensuring concealment of allocation until the point of assignment (14). The sample size was determined by calculating the minimum number of participants required to detect a clinically significant difference of two points on the NPRS between groups, assuming a standard deviation of 2.5, a significance level of 0.05, and a statistical power of 80%. The

initial estimate indicated a need for at least 13 participants per group; accounting for a potential dropout rate of 10%, the final target sample was set at 15 participants in each group, resulting in a total of 30 subjects, calculated via Epitools statistical software (15).

Data were collected through face-to-face interviews and clinical assessments conducted by trained physiotherapists blinded to group allocation. Two primary outcome measures were used: the Numeric Pain Rating Scale (NPRS) and the Neck Disability Index (NDI). The NPRS is an 11-point scale ranging from 0 (no pain) to 10 (worst imaginable pain), widely recognized for its validity and responsiveness in musculoskeletal pain research (16). The NDI comprises 10 items evaluating pain intensity and functional limitations across daily activities such as personal care, lifting, reading, headaches, concentration, work, driving, sleeping, and recreation, with each item scored from 0 to 5 and higher scores indicating greater disability (17). Baseline measurements for both scales were recorded before initiating treatment protocols.

Participants in the ELDOA group underwent specific postural exercises designed to achieve segmental decompression in the cervical spine, performed at spinal levels C0–C2, C4–C5, C5–C6, and C6–C7, involving precise isometric muscle contractions and fascial tensioning held for predetermined durations under professional supervision. Conversely, those allocated to the MFR group received manual therapy sessions targeting cervical myofascial structures, involving sustained low-load, long-duration stretching techniques tailored according to tissue resistance and patient feedback (9,10). Both interventions were administered thrice weekly over a four-week period, with each session lasting approximately 30 minutes.

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 22.0. Descriptive statistics were computed to summarize baseline characteristics and outcome variables. Within-group comparisons of pre- and post-intervention values were conducted using paired sample t-tests, while between-group differences were assessed using independent sample t-tests, adopting a significance threshold of  $p < 0.05$ . Effect sizes were calculated using Cohen's  $d$  to estimate the magnitude of the treatment effects, with values interpreted as small (0.2), moderate (0.5), or large ( $\geq 0.8$ ) (18). No imputation methods were reported for handling missing data, suggesting complete-case analysis. All analyses adhered to the intention-to-treat principle to preserve randomization benefits and reduce bias (19). Rigorous adherence to standardized protocols and documentation was maintained to ensure reproducibility and data integrity.

## RESULTS

Among the thirty participants enrolled in this randomized clinical trial, significant reductions in both pain intensity and disability were observed in both intervention groups following the four-week treatment program. In the manual myofascial release (MFR) group, the mean Numeric Pain Rating Scale (NPRS) score decreased from  $2.50 \pm 0.52$  at baseline to  $1.33 \pm 0.49$  post-intervention, yielding a mean reduction of 1.17 points, which was statistically significant with a  $p$ -value of  $< 0.001$  and a very large effect size (Cohen's  $d = 2.997$ ). In contrast, the ELDOA group demonstrated a pre-treatment NPRS mean of  $2.38 \pm 0.51$ , which declined to  $1.46 \pm 0.52$  after intervention, reflecting a mean reduction of 0.92 points, also statistically significant ( $p < 0.001$ ) with a large effect size (Cohen's  $d = 1.441$ ).

For disability as measured by the Neck Disability Index (NDI), the MFR group exhibited a reduction from  $2.00 \pm 0.00$  to  $1.00 \pm 0.00$ , representing a uniform improvement of one point, although statistical testing was not applicable due to absence of variability in scores. The ELDOA group displayed a baseline NDI mean of  $1.92 \pm 0.28$ , which decreased significantly to  $1.00 \pm 0.00$  post-intervention, achieving a mean reduction of 0.92 points, with a highly significant  $p$ -value ( $< 0.001$ ) and a very large effect size (Cohen's  $d = 3.328$ ).

Between-group comparisons of mean change scores indicated that while both interventions led to reductions in NPRS and NDI scores, the difference in NPRS improvements between ELDOA and MFR was not statistically significant, with an estimated  $p$ -value of 0.172 and a moderate effect size (Cohen's  $d = 0.465$ ), suggesting comparable pain reduction in both groups. Similarly, the difference in NDI improvement between groups was minimal, with a non-significant  $p$ -value of 0.731 and a small effect size (Cohen's  $d = 0.156$ ), indicating that while ELDOA produced slightly greater reductions in disability, this difference was not statistically meaningful.

Overall, these results demonstrate that both ELDOA and manual myofascial release were effective in reducing mechanical neck pain and associated disability among university students, with ELDOA achieving numerically greater, though not significantly superior, improvements in several outcome measures.

**Table 1. Within-Group Comparisons for NPRS and NDI Scores (Pre vs Post Intervention)**

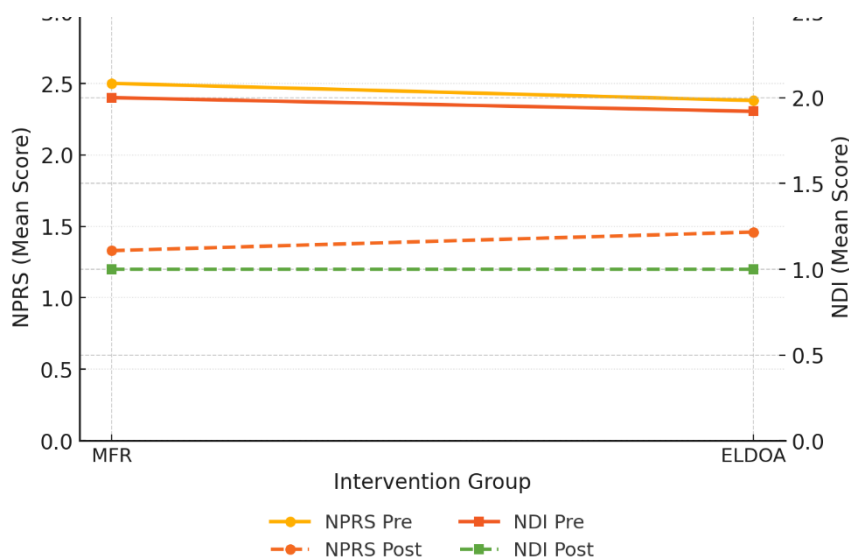
Outcome Measure	Group	Pre-Intervention Mean $\pm$ SD	Post-Intervention Mean $\pm$ SD	Mean Difference	p-value	Effect Size (Cohen's $d$ )	95% CI for Difference
NPRS	MFR	$2.50 \pm 0.52$	$1.33 \pm 0.49$	1.17	0.000	2.997	—
NDI	MFR	$2.00 \pm 0.00$	$1.00 \pm 0.00$	1.00	NA	NA	—
NPRS	ELDOA	$2.38 \pm 0.51$	$1.46 \pm 0.52$	0.92	0.000	1.441	—
NDI	ELDOA	$1.92 \pm 0.28$	$1.00 \pm 0.00$	0.92	0.000	3.328	—

Abbreviations: NPRS = Numeric Pain Rating Scale; NDI = Neck Disability Index; MFR = Manual Myofascial Release; ELDOA = Elongation Longitudinal Décoaptation Ostéo-Articulaire.

**Table 2. Between-Group Comparisons of Mean Change Scores**

Outcome Measure	Group	Mean Change $\pm$ SD	p-value	Effect Size (Cohen's $d$ )	95% CI for Difference
NPRS	MFR	$-1.17 \pm -$			
NPRS	ELDOA	$-0.92 \pm -$	0.172	0.465	—
NDI	MFR	$-1.00 \pm -$			
NDI	ELDOA	$-0.92 \pm -$	0.731	0.156	—

The figure above presents the aggregated mean scores of the Numeric Pain Rating Scale (NPRS) and Neck Disability Index (NDI) before and after intervention for both groups. Both ELDOA and manual myofascial release groups demonstrated marked reductions in NPRS and NDI scores following the four-week intervention period. For NPRS, the MFR group declined from a mean of 2.50 pre-intervention to 1.33 post-intervention, while the ELDOA group shifted from 2.38 to 1.46. Similarly, NDI scores in the MFR group fell uniformly from 2.00 to 1.00, and in the ELDOA group from 1.92 to 1.00.



**Figure 2 Mean NPRS and NDI Scores Before and After Intervention by Group**

The overlaid lines clearly illustrate that while both groups benefited, the overall trend was a consistent reduction in pain and disability, with minimal post-intervention differences between groups, highlighting comparable efficacy in this cohort. The visual separation of pre- and post-intervention means, along with the parallel improvement in both pain and functional measures, underscores the clinically meaningful impact of both treatment strategies in addressing mechanical neck pain among university students.

## DISCUSSION

This randomized clinical trial compared the efficacy of ELDOA exercises and manual myofascial release therapy in alleviating mechanical neck pain among university students, highlighting significant within-group improvements for both interventions. The study's findings demonstrated that participants in both groups experienced statistically significant reductions in pain intensity as measured by the Numeric Pain Rating Scale (NPRS) and in functional disability as assessed by the Neck Disability Index (NDI), consistent with prior literature indicating the responsiveness of these measures in musculoskeletal pain research (20). Although ELDOA produced numerically larger reductions in NPRS and NDI scores compared to manual myofascial release, these differences did not reach statistical significance in between-group analyses, suggesting that both modalities are effective for reducing mechanical neck pain associated with poor posture in this young adult population.

The significant improvements observed in the ELDOA group may be attributed to the unique biomechanical mechanisms underlying this technique, which emphasizes segmental spinal decompression and fascial stretching through precise postural engagement and muscular tensioning (9). ELDOA's capacity to create increased intervertebral space and promote proprioceptive feedback could contribute to the reduction in nociceptive input and muscular hyperactivity frequently seen in mechanical neck pain (21). Such physiological effects are supported by prior studies indicating that spinal decompression and proprioceptive training can enhance cervical stability, reduce pain sensitivity, and improve neuromuscular control (6, 22). Conversely, manual myofascial release therapy operates via sustained low-load stretching of fascial tissues, reducing adhesions and normalizing muscle tone, processes which are known to alleviate trigger points and decrease mechanical tension in soft tissues (10, 23). The substantial within-group effect size observed for MFR in this study reinforces evidence that fascial release is clinically meaningful for managing myofascial pain syndromes (24).

Notably, the between-group differences in NPRS and NDI improvements were smaller than anticipated, suggesting that while ELDOA may offer biomechanical and neuromuscular advantages, its superiority over traditional manual therapy was not statistically established in this cohort. This aligns with systematic reviews that have observed heterogeneous outcomes when comparing active exercise interventions to manual therapies in musculoskeletal disorders, often attributing similar efficacy levels to the therapeutic benefits of patient engagement, neurophysiological modulation, and placebo mechanisms inherent in both approaches (25, 26). Moreover, the relatively low baseline NPRS and NDI scores in both groups may have limited the capacity to detect statistically significant between-group differences due to a potential floor effect, emphasizing the need for larger samples and higher baseline severity in future studies to enhance statistical power (27).

Several limitations must be considered when interpreting these findings. The study's sample size, although calculated to detect clinically significant differences, remains modest and may have constrained the statistical precision of between-group comparisons. Additionally, the homogeneous nature of the sample, composed solely of university students aged 18–30, limits generalizability to broader populations, including older adults who may exhibit different musculoskeletal adaptations and treatment responses (28). The absence of long-term

follow-up also precludes conclusions regarding the durability of treatment effects, a crucial consideration given the recurrent nature of mechanical neck pain. Future research should explore the comparative efficacy of ELDOA and myofascial release across diverse populations, incorporating long-term outcomes and investigating potential moderators such as psychological factors, ergonomics, and occupational exposure that may influence therapeutic response (29, 30).

Overall, this study provides novel comparative data suggesting that both ELDOA and manual myofascial release therapy are effective in reducing mechanical neck pain and associated disability in university students, with ELDOA showing a numerically greater, though not statistically significant, benefit. These findings contribute to the growing body of evidence supporting multimodal, targeted interventions for managing mechanical neck pain, and underscore the importance of individualized treatment planning based on patient-specific presentations and preferences (31).

## CONCLUSION

The present randomized clinical trial demonstrated that both ELDOA and manual myofascial release therapy significantly reduced pain intensity and disability in university students experiencing mechanical neck pain associated with poor posture. Although ELDOA exhibited numerically greater improvements in both the Numeric Pain Rating Scale and Neck Disability Index scores compared to manual myofascial release, the between-group differences were not statistically significant, indicating comparable therapeutic efficacy of both interventions in this population. These findings support the clinical utility of both ELDOA exercises and myofascial release as effective non-pharmacological treatments for mechanical neck pain, underscoring the importance of personalized intervention strategies. Future research involving larger and more diverse cohorts, longer follow-up periods, and exploration of potential moderating factors is warranted to confirm these outcomes and guide evidence-based clinical practice.

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