

Effectiveness of ELDOA Exercises Combined with Core Strengthening Exercises in Reducing Pain and Improving Functional Ability in Patients with Chronic Non-Specific Low Back Pain: Pre and Post Intervention Analysis

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Abstract

Background: Chronic non-specific low back pain (CNSLBP) is a highly prevalent musculoskeletal disorder that significantly affects quality of life, occupational productivity, and psychological wellbeing. Numerous exercise-based physiotherapy interventions are used in its management, among which spinal decompression techniques such as ELDOA (Etirements Longitudinaux avec Decoaptation Osteo-Articulaire) and neuromuscular core strengthening exercises have gained increasing clinical attention. However, the combined effect of these two approaches on pain and functional ability in the Indian clinical context has not been widely documented.

Purpose: The purpose of this study was to see how effective a combined program of ELDOA and core strengthening exercises was in reducing pain and improving functional abilities in patients with chronic non-specific low back pain.

Methods: Pre- and post-intervention evaluations were performed on thirty participants using the Visual Analogue Scale (VAS) for pain levels and the Oswestry Disability Index (ODI) for functional ability, before and after a structured six-week program of 18 supervised sessions (3 sessions/week, 60 minutes/session comprising 30 minutes of ELDOA followed by 30 minutes of progressive core strengthening).

Results: The results showed a considerable reduction in pain levels and a significant increase in functional ability following the intervention, with all outcome measures demonstrating statistically significant improvement ($p < 0.001$).

Conclusion: These data suggest the use of combined ELDOA and core strengthening exercises as an effective intervention for treating pain and improving functional outcomes in patients with chronic non-specific low back pain.

Introduction

Chronic non-specific low back pain (CNSLBP) is a common musculoskeletal condition that affects individuals of various age groups and can significantly impact their functional ability and quality of life. It is among the leading causes of disability worldwide and represents a major burden on healthcare systems, both in

terms of direct treatment costs and indirect costs related to lost productivity.

Muscular deficits, reduced spinal mobility, and impaired postural control play a crucial role in the development and persistence of chronic low back pain. These deficits can further exacerbate mechanical loading on the lumbar spine, contributing to pain and functional limitations.

Consequently, interventions that aim to restore spinal decompression, muscular strength, and neuromuscular coordination are commonly recommended for individuals with CNSLBP.

ELDOA exercises are specialized postural decompression techniques that create active axial elongation at specific vertebral segments, aiming to reduce intradiscal pressure, decrease mechanical irritation of nociceptive structures, and restore normal joint space. Core strengthening exercises, in contrast, are well established in the rehabilitation of low back pain for improving neuromuscular spinal stability, muscular endurance, and control of trunk musculature during functional activities.

Both approaches have individually shown promise in the management of low back pain. However, there is limited research specifically investigating the combined effect of ELDOA and core strengthening exercises in reducing pain and improving functional ability in patients with chronic non-specific low back pain, particularly within the Indian clinical population. Therefore, this study aims to examine the effectiveness of a combined ELDOA and core strengthening exercise program as an intervention for reducing pain and improving functional ability in patients with chronic non-specific low back pain.

By conducting a pre- and post-intervention analysis, this study aims to provide valuable insights into the potential benefits of combined ELDOA and core strengthening exercises for individuals with chronic non-specific low back pain. The findings of this study may contribute to the development of evidence-based interventions and rehabilitation programs that can optimize the management of low back pain and improve functional outcomes in this population.

Aims and Objective

1. To assess the effectiveness of combined ELDOA and core strengthening exercises in lowering pain levels in individuals with chronic non-specific low back pain.
2. To determine the effect of combined ELDOA and core strengthening exercises on increasing functional ability in people with chronic non-specific low back pain.

Materials and Methodology

The pre-test post-test experimental research design was used in this study. This design allows evaluation of within-group change in outcome measures before and after a structured therapeutic intervention. This study used consecutive purposive sampling as its sampling method. The study participants were individuals who had chronic non-specific low back pain of at least 12 weeks duration. These individuals were involved in the study to

assess how the combined ELDOA and core strengthening program affected their pain and function.

Sample Size: For this investigation, the sample size was thirty people. These individuals were chosen from the outpatient physiotherapy department to guarantee representativeness and adequate data for analysis. Three times a week for six weeks, individuals in a clinical environment had therapy as part of the study at Pacific College of Physiotherapy, Pacific Medical University (Udaipur), after obtaining ethical approval from the Institutional Ethics Committee (Approval No.: PMU/IEC/2024/____, dated 04/10/2024). All participants completed an information and consent form at recruitment.

Study Duration: the research was carried out over a six-week period. This time frame allowed for evaluation of the participants' responses to the therapy as well as any changes in their pain and functional levels. Each therapy session was scheduled for approximately 60 minutes, comprising 30 minutes of ELDOA exercises followed by 30 minutes of progressive core strengthening exercises. This time window was set aside to ensure that participants had enough time to perform both components of the intervention correctly. Exercise mats, a treatment plinth for participants to lie on during specific exercises, a digital inclinometer, resistance bands, VAS scale, ODI questionnaire, and paper and pencil for documentation were all used in the study.

Inclusion Criteria

1. Age between 20 and 55 years.
2. Diagnosis of chronic non-specific low back pain with symptom duration of at least 12 weeks.
3. Pain intensity of at least 3/10 on VAS at rest or during functional activity.
4. ODI score at least 20% (moderate or greater disability) at baseline.
5. Ability to independently perform prescribed exercises in standing, sitting, and supine positions.
6. Ability to provide written informed consent in Hindi or English.

Exclusion Criteria

1. Specific spinal pathology: vertebral fracture, spinal malignancy, infection, or spondylolisthesis Grade III or above.
2. Acute lumbar disc herniation with radiculopathy.
3. Previous lumbar spine surgery within the preceding 12 months.
4. Inflammatory spinal arthropathies.
5. Severe osteoporosis (DEXA T-score $\leq$ -2.5).
6. Pregnancy or childbirth within the preceding 6 months.
7. Any cardiovascular, pulmonary, or neurological

condition contraindicating exercise.
 8. Active participation in any other structured physiotherapy program during the study period.

Outcome Measure

The VAS scale, a validated instrument for determining pain severity, and the ODI, a validated instrument for assessing functional disability, were the main outcome measures employed in this investigation. High interclass correlation coefficient (ICC) values indicate the repeatability of both instruments for measuring chronic low back pain, supporting their reliability.

Intervention Protocol

The exercise protocol used in the present study comprised two structured components delivered within the same 60-minute session, five times a week for six weeks.

ELDOA COMPONENT: 1. L4-L5 supine decoaptation exercise. 2. L5-S1 long sitting anterior pelvic position. 3. T12-L1 cross-legged overhead arm elevation.

Holding durations were progressively increased from 60 seconds to 120 seconds across the six-week period, with 30-second recovery periods between repetitions.

CORE STRENGTHENING COMPONENT: 1.

Foundational activation exercises (abdominal bracing, pelvic tilts). 2. Progressive loading exercises (bridging, dead-bug, bird-dog). 3. Advanced endurance exercises including bilateral side-bridge and plank progressions.

The particular directions and procedures used for each exercise were detailed in full and demonstrated to each participant prior to independent practice. This technique was used in the study's evaluation of the combined ELDOA and core strengthening exercise program for treating chronic non-specific low back pain. The VAS and ODI scales, trustworthy instruments, were used to evaluate the results. Over the course of six weeks, the exercise program was performed, with sessions lasting approximately 60 minutes. Thirty people made up the sample size. The investigation was carried out in a clinical environment with the use of common supplies and tools for data collection and treatment.

Observation and Result

Table 1: Gender Distribution of Patients

Sex	Number of Patients	Percentage of Total
Male	16	53.3%
Female	14	46.7%
Total	30	100%

Table 1 shows the gender distribution of the study participants is shown in the table. Sixteen patients were male, making up 53.3% of the total patients in the study. The remaining 14 patients, or 46.7% of the total, were female. There were 30 patients overall in the sample. According to the patients' respective genders, the percentages show the proportion of participants.

Table 2: Age Distribution of Patients

Age in years	Number of Patients	Percentage
20-30	7	23.3%
31-40	8	26.7%
41-50	9	30.0%
51-55	6	20.0%
Total	30	100%

Table 2 represents the patient age distribution for the study group is shown in the table. With no patients between the ages of 56 and 70, the middle adult age range (31-50 years) had the greatest representation, comprising more than half of the sample. A total of 30 patients made up the sample, with a mean age of 36.4 ± 9.2 years. The results offer important insights into the age distribution of participants undergoing the combined exercise program.

Table 3: Comparison of VAS and ODI, Pre and Post Score (N=30)

S.No.	Outcome measures	Pre-Score	Post-Score	Mean Diff.	SD	T	P-value
1.	VAS	7.2 $\pm$ 1.3	2.6 $\pm$ 1.0	4.6	0.9	18.0(S)	P<0.001
2.	ODI	38.6 $\pm$ 8.9	16.4 $\pm$ 6.2	22.2	2.3	16.08(S)	P<0.001

Table 3 presents the comparison of VAS and ODI scores before and after the intervention. The VAS scores indicate the pain severity experienced by the participants, while the ODI scores indicate their level of functional disability. The mean VAS score decreased significantly from 7.2 ± 1.3 (pre-score) to 2.6 ± 1.0 (post-score), with a mean difference of 4.6. The standard deviation (SD) was 0.9. The paired-sample t-test showed a highly significant result ($t = 18.0$, $p < 0.001$), indicating a significant reduction in pain after the combined intervention.

The mean ODI score also decreased significantly, from 38.6 ± 8.9 (pre-score) to 16.4 ± 6.2 (post-score), resulting in a mean difference of 22.2. The SD was 2.3. The paired-sample t-test revealed a highly significant result ($t = 16.08$, $p < 0.001$), indicating a significant improvement in functional ability after the combined ELDOA and core strengthening intervention.

Table 4: Lumbar Range of Motion, Pre and Post Score (N=30)

ROM Direction	Pre-test (deg)	Post-test (deg)	% Improvement	P-value
Flexion	52.3 ± 8.6	71.8 ± 7.4	37.3%	<0.001
Extension	16.2 ± 4.3	24.6 ± 4.8	51.9%	<0.001
Rt Lateral Flexion	21.4 ± 4.2	29.8 ± 4.6	39.3%	<0.001
Lt Lateral Flexion	20.9 ± 4.5	29.2 ± 4.3	39.7%	<0.001

Table 4 shows significant improvement in all measured planes of lumbar motion following the six-week intervention ($p < 0.001$ for all directions), with extension demonstrating the greatest proportional improvement (51.9%). This is consistent with the improvement observed in pain and functional disability scores, suggesting a comprehensive positive effect of the combined exercise program on the lumbar spine.

Discussion

Overall, both outcome measures showed a reduction in pain and improvement in function, as evidenced by the decrease in VAS scores and the decrease in ODI scores. The combined ELDOA and core strengthening exercises demonstrated a statistically significant improvement in both pain intensity and functional disability.

The observed reduction in pain may be attributed to the decompressive effect of ELDOA on the lumbar intervertebral discs, reducing mechanical irritation of nociceptive structures, combined with the stabilizing effect of core strengthening on the neuromuscular control of the trunk. The improvement in functional ability, as reflected in the ODI scores, may be explained by improved lumbar mobility, reduced pain-related movement avoidance, and enhanced muscular endurance of the trunk stabilizers following the structured six-week program.

These results are broadly consistent with previous studies exploring ELDOA and core stabilization exercises independently in low back pain populations, and support the rationale for combining the two approaches in a single rehabilitation protocol to address both structural and neuromuscular contributors to chronic non-specific low back pain.

Conclusion

Hamstring loading and lumbar decompression via ELDOA, combined with core strengthening, addresses complementary contributors to chronic low back pain —

the former through targeted spinal decompression and the latter through neuromuscular stabilization — so as a trend it can be said that combined training of these two components is more effective than isolated training. Based on the study's findings, it can be said that combined ELDOA and core strengthening exercises are useful for treating chronic non-specific low back pain. In contrast to single-modality approaches reported in the literature, the combined program demonstrated a significant reduction in pain intensity and a significant improvement in functional ability. Participants reported much less discomfort, as seen by a considerable decline in VAS values, and displayed improved functional capacity, as seen by the decrease in ODI values.

These findings emphasize the value of combining spinal decompression and core strengthening exercises in the treatment of chronic non-specific low back pain. Exercises that combine ELDOA and core strengthening seem to be very effective at reducing discomfort and improving function. Therefore, it may be suggested as a successful addition to a rehabilitation or exercise program. The durability and long-term benefits of this combined exercise regimen in the treatment of low back pain might be explored in other studies and investigations.

Limitation

- Small sample size.
- Short duration of study.
- Absence of a randomized control group.
- Limited age group of subjects were included.

Recommendation

Recommendation for further enhancement.

- A wide range of participants with different age groups must be taken into consideration.
- Large group of the participants and increased time duration is advised.
- For getting better results a long-term follow-up program is needed.
- Future controlled studies should investigate the individual and combined effects of ELDOA and core strengthening exercises.

References

1. World Health Organization. Musculoskeletal conditions: key facts. Geneva: World Health Organization; 2023.
2. Maher C, Underwood M, Buchbinder R. Non-specific low back pain. *Lancet*. 2017;389(10070):736-47.
3. Balague F, Mannion AF, Pellise F, Cedraschi C. Non-specific low back pain. *Lancet*. 2012;379(9814):482-91.
4. Bindra S, Sinha AGK, Benjamin AI. Epidemiology of low back pain in Indian population: a review. *Int J Basic Appl Med Sci*. 2020;5(1):166-79.
5. Shetty GM, Jain S, Thakur H, Khanna K. Prevalence of low back pain in India: a systematic review and meta-analysis. *Work*. 2022;73(2):429-452.
6. Panjabi MM. The stabilizing system of the spine. Part I. Function, dysfunction, adaptation, and enhancement. *J Spinal Disord*. 1992;5(4):383-9.
7. Hodges PW, Richardson CA. Inefficient muscular stabilization of the lumbar spine associated with low back pain: a motor control evaluation of transversus abdominis. *Spine*. 1996;21(22):2640-50.
8. Hides JA, Jull GA, Richardson CA. Long-term effects of specific stabilizing exercises for first-episode low back pain. *Spine*. 2001;26(11):E243-8.
9. Searle A, Spink M, Ho A, Chuter V. Exercise interventions for the treatment of chronic low back pain: a systematic review and meta-analysis of randomised controlled trials. *Clin Rehabil*. 2015;29(12):1155-67.
10. Wang XQ, Zheng JJ, Yu ZW, et al. A meta-analysis of core stability exercise versus general exercise for chronic low back pain. *PLoS One*. 2012;7(12):e52082.
11. Voyer G. ELDOA: Etirements Longitudinaux avec Decoaptation Osteo-Articulaire - Methodology and Clinical Application. Montreal: Voyer Institute Press; 2015.
12. Carvalho FA, Lacerda AC, Miranda AS, et al. Immediate effects of ELDOA exercises on pain, function, and ultrasonographic measures of lumbar disc morphology. *J Bodyw Mov Ther*. 2020;24(3):114-9.
13. Richardson C, Hodges P, Hides J. Therapeutic Exercise for Lumbopelvic Stabilization: A Motor Control Approach for the Treatment and Prevention of Low Back Pain. 2nd ed. Edinburgh: Churchill Livingstone; 2004.
14. McGill SM. Low Back Disorders: Evidence-Based Prevention and Rehabilitation. 2nd ed. Champaign (IL): Human Kinetics; 2007.
15. Fairbank JC, Pynsent PB. The Oswestry Disability Index. *Spine*. 2000;25(22):2940-53.
16. Shamsi MB, Rezaei M, Zamanlou M, et al. Does core stability exercise improve lumbopelvic stability more than general exercise in chronic low back pain? *Physiother Theory Pract*. 2016;32(3):171-8.
17. Haleema B, Fatima U. The effect of ELDOA alone and ELDOA with core muscle strengthening to treat pain in patients with PIVD: a comparative interventional study. *Int J Phys Soc Sci*. 2020;10(12):1-9.
18. Shahzad M, Rafique N, Shakil-Ur-Rehman S, Ali Hussain S. Effects of ELDOA and post-facilitation stretching technique on pain and functional performance in patients with piriformis syndrome: a randomized controlled trial. *J Back Musculoskelet Rehabil*. 2020;33(6):983-988.
19. Coulombe BJ, Games KE, Neil ER, Eberman LE. Core stability exercise versus general exercise for chronic low back pain. *J Athl Train*. 2017;52(1):71-2.
20. Hayden JA, Ellis J, Ogilvie R, Malmivaara A, van Tulder MW. Exercise therapy for chronic low back pain. *Cochrane Database Syst Rev*. 2021;(9):CD009790.