International Journal of Yoga, Sports, and Health Sciences
Vol. 1, Issue. 2, Jun 2025, pp. 60~71

A Study to Assess the Effectiveness of Core Muscle Stabilization Regimen in Patients with Mechanical Low Back Ache

Yamamalini.S[1], Aravindhan.S[2]
[1]Associate Professor, PMR Department, Physical Director, Pondicherry Institute of Medical Sciences, Ganapathichettykulam -605014, Puducherry, India.
[2]Department of Physiotherapy, Pondicherry Institute of Medical Sciences, Ganapathichettykulam -605014 Puducherry, India.

Article Info

Article history:

Received Apr 3, 2025
Revised May 5, 2025
Accepted Jun 3, 2025

Keywords:

Low back pain
Core stability exercises
Muscle stabilization program
Mechanical low back pain
Pain and disability reduction

ABSTRACT

Background: Low back pain (LBP) is one of the most frequent causes for medical consultation and absenteeism from work. In developed nations, over 70% of persons will encounter LBP sometime in their lives, with 85-95% of those cases being categorized as "non-specific low back ache" (NSLBP). Weakness of delayed activation or motor control of deep muscles (transversus (TrA) and multifidus abdominis (MF)), abdominal muscles, and superficial trunk muscles are the major causes of LBP. Muscle tension in the lower back region causes the pain that patients with normal back pain experience between the lower corner and the lumbosacral of the costa region. Core stability exercises (CSE) are one intervention that could be used to help individuals with LBP feel less discomfort. Individuals with common back pain have pain between the lumbosacral and the lower corner of the costa arch, which is influenced by muscle tension in the lower back region. One strategy that can assist every patient with LBP feel less uncomfortable is CSEs. To compare and assess the efficacy of a core muscle stabilization program in individuals with mechanical LBP, a quasi-experimental study was carried out.

Methodology: The study involved 80 patients with mechanical LBP, who were split equally into two groups of forty patients each: the experimental group (EG) and the control group (CG). Since randomization was not used, the study is quasi-experimental. The CG was subjected to extension maneuvers, whereas the EG received back care and a core muscle stability routine. Prior to beginning the intervention, measures of pain and impairment were taken. Patients in each group began with a 10-minute static cycling warm-up, followed by an exercise regimen and back care. Every week of the therapy programme, the disability and pain scores were evaluated.

Results: The Friedmann ANOVA, Mann-Whitney U-test, and t-test have been utilized for statistical analysis of the data. The findings showed that in participants with mechanical LBP, a core muscle stabilization program combined with back care and ergonomic guidance is more successful than spinal extension maneuvers alone at improving lumbar spine function and reducing pain.

Conclusion: Exercises for CSE can improve quality of life and lessen pain.

Corresponding Author:

Yamamalini.S,
Associate Professor, PMR Department, Physical Director,
Pondicherry Institute of Medical Sciences, Ganapathichettykulam -605014, Puducherry, India.

1. INTRODUCTION

One of the most frequent reasons for occupational impairment is LBP. People who work in sedentary occupations experience it roughly as frequently as those who perform hard labor, albeit the latter are more likely to miss work due to their inability to work despite their discomfort. Almost 80% of

individuals have lower back pain (LBP) at certain point during their lifetime, which results in a substantial reduction in their productive working hours and incapacity. People with decreased function and chronic LBP (CLBP) frequently experience anxiety and depression, which affects their social and professional lives.

LBP primarily affects women between the ages of 45 and 60, contributing to social and economic misery. 4. Additionally, post-menopausal women had a superior age-predicted incidence of LBP. Postmenopausal women's quality of life (QOL) is specifically influenced by deteriorations in cognitive and psychological skill abilities as well as other health problems including cancer risk, heart disease, and mood swings. Since it weakens the capacity to preserve essential movement mechanics for optimal performance, this disease can lead to poor performance in an job, sport, or daily activities of the person.

Numerous factors contribute to chronic LBP, such as decreased physiological stimulation of the TrA and decreased or delayed activation of the TrA and lumbar multifidus muscles (LMF) during limb movement or walking. Loss of lumbar support due to muscle dysfunction might put more strain on the lumbar spine's surrounding joints and ligaments. The likelihood of developing comorbid illnesses, such as neurological, psychiatric, and musculoskeletal disorders, is greatly increased by chronic LBP. In addition, chronic LBP has a substantial negative influence on quality of life, influencing both physical and mental health. People who suffer from persistent LBP see a marked decline in their overall quality of life.

Depending on the patient's classification and the length of their symptoms, different approaches are taken to treating LBP. Generally, exercise therapy that targets the LMF, pelvic floor muscles and TrA is used. It is important to clarify whether activities that target the external rotator and hip abductor muscles increase the patella's lateral vector force. These exercises may include external rotator and hip abductor muscle training, as well as muscular contraction to activate the vastus lateralis (VL) muscle. During the external rotation and hip abduction motions, there was an escalation in VL muscle stimulation along with selective gluteus medius muscle (GMed) stimulation.

Because they transfer force from the legs to the spine throughout upright activities, the gluteal muscles are a key player when examining the muscles stimulus that contribute to LBP. Furthermore, the gluteal muscles—including the GMed and GMax—are crucial for biomechanically stabilizing the trunk and pelvis and transferring force from the legs to the pelvis during all walking activities. The GMax also become stable the pelvis, and the GMed and GMax are important for stabilizing the pelvis when standing on one leg. Consequently, during upright activities, the gluteal muscles are crucial in transferring force from the legs to the spine.

In clinical practice, people with LBP undergo gluteal evaluations and therapies since the gluteal muscles stabilize the pelvis in both the transverse and coronal planes and provide a stable base for the lumbar spine. Although the muscles of the hip joints and spine are closely linked to LBP, there isn't much research on people with LBP who also perform specialized gluteal muscle strengthening activities and spinal segmental strengthening exercises.

The importance of exercise is crucial for the treatment of LBP. Chronic LBP inflammation patients are less fit and actively trained than healthy people, according to Auvinen's research. Weakness of the abdominal muscles is the main cause of LBP; instability results from an imbalance between both extensors and flexors of the spine. Both spinal decompression and spinal stabilizing are linked to antagonistic activation of the abdominal muscles and elevated intra-abdominal pressure. It has been suggested that rehabilitation programs increase spinal stability by recruiting specific trunk muscle groups.

While core strength characterizes the ability of the core musculature to subsequently provide the necessary contractile power and pressure within the abdomen for movement, stabilizing the core belongs to the potential of the muscles at the core to maintain the equilibrium of the spine. Because it offers both proximal stability and distal mobility, CSE, also known as core strengthening exercises (CSEs), is becoming a more significant component of the sports therapy field. Theoretical underpinnings for the therapy of spinal illnesses provide good support for CSEs, which aid individuals with LBP by reducing pain and enhancing function.

Although CSE has received little study attention so far, it has been marketed as a way to improve performance, prevent lumbar spine and musculoskeletal injuries, and aid in rehabilitation. Up until now, the importance of CSEs in backache in postmenopausal women has been disregarded. In order to investigate the impact of strengthening exercises on LBP, disabilities, strength, and quality of life, the current study was designed to concentrate on CSEs in postmenopausal women with LBP. CSE can improve neuronal control of spinal equilibrium by retraining the vital activities of local trunk muscles while reducing pain and impairment.

Numerous CSE regimens have been created to treat NSCLBP and have been demonstrated to thicken the MF and TrA muscles. 12, 13 On the other hand, little is known concerning the way they affect muscle thickness and the activity of Gmax, TrA, MF and muscular electromyography (EMG). However, for NSCLBP rehabilitation, CSE sessions are run at low loads. Because of the possible hazards and

consequences of mechanical and pressure on the spine, clinicians frequently advise against heavy-load or resistance workouts. Since many people with LBP cannot withstand the loading intensities required to cause substantial activation and adaptation of the trunk musculature, this biomechanical limitation poses a treatment challenge.

Additionally, there is currently little experimental suggestion to assist the efficacy of low-load exercise regimens in eliciting neuromuscular adaptations in important deep trunk stabilizers, including the TrA, MF muscles, which are crucial for preserving spinal stability and motor control. Consequently, addressing patients with NSCLBP requires developing a novel rehabilitation approach that optimizes trunk, gastrointestinal, and lower limb muscle activation and adaptation.

Once the fundamental motor control reduction has been made, physiotherapy management of LBP, which involves spinal activities, physical interventions, neurological traction, spinal supports, and many other clinically employed techniques, may help integrate both local and worldwide stability retraining. Other methods for treating LBP include Pilates, yoga, tai chi, and the Feldenkrais technique.

Throughout time, activities for LBP have changed, with a focus on preserving spinal stability. The goal of these core stabilization exercises is to enhance the strength, neuromuscular, and endurance control of the muscles essential for maintaining dynamic spinal stability. CSE target the LMF, TrA, and other paraspinal, abdominal, diaphragm, and pelvic musculature. According to various studies, individuals with persistent LBP exhibit substantial multifidus atrophy and delayed TrA activation in relation to the erector spinae.

Despite the paucity of information on the frequency of various musculoskeletal conditions in Pakistan, lower back discomfort is a common complaint that leads individuals to seek treatment from their physical psychotherapist or other medical specialists. Since physical therapists recommend exercise as the primary treatment for LBP, it's critical to identify the most targeted and specialized activity for managing this condition.

The study objective is to ascertain whether a core muscle stabilization program combined with back treatment is beneficial for patients suffering from mechanical LBP. Exercises created specially to offer a "muscle corset" are used in core muscle stability training to restrict unwanted motions and promote recovery. Weakness of the superficial trunk, including stomach muscles, is a risk factor for persistent back pain; strengthening these muscles is frequently linked to notable improvements in persistent LBP and a reduction in functional impairment. During daily activities, the lumbar spine is supported by strong abdominal muscles. The incidence of lower back discomfort might be decreased by strengthening the abdominal muscles. Individuals who suffer from mechanical LBP are more likely to experience recurrences if their core muscles are weak. It is suggested that a crucial part of back muscle rehabilitation is preferentially reconditioning of the stabilizing muscles, which involves beginning with low-level isometric engagement and their gradual incorporation into functional tasks.

2. LITERATURE REVIEW

(Smrcina, 2022) Reviewing the available data about the efficacy of CSE in lowering discomfort and enhancing disability for NSLBP was the aim of this study. (2) Techniques: We conduct a thorough analysis of the Cochrane Library, Pedro, and PubMed, three popular Medline databases. Only English-language articles issued between January 2005 and November 2020 were included in the search results. An overall of 420 items were found during the search. 371 items were rejected, while 49 papers satisfied the inclusion requirements. (3) Findings: Individuals with non-specific persistent LBP benefit greatly from core stability, which improves quality of life, core muscle activation, and thickness while also lowering pain intensity and functional impairment. The experimental outcome indicates that the core stability can be more beneficial than rest or limited intervention, and it has been demonstrated to be more successful when combined with other forms of exercise for cLBP. (4) Conclusion: A complete strategy to CLBP could include core stability; it is important to encourage its integration with other therapeutic exercise methods. In order to assess the effectiveness of the intervention, patient compliance is essential.

(Ahn et al., 2024) to investigate the effectiveness of CSE exercises in treating adult patients' NSLBP. Studies were accepted if they were clinical trials, had individuals with NSLBP, and employed CSE as a therapy for NSLBP. Individuals who had a specific recognized disease contributing to their NSLBP or who had received intervention for their NSLBP during the previous six months were excluded, as were analyses that did not apply an objective pain scale. Five studies of moderate quality, assistance for patients with NSLBP, CSE is a useful technique for reducing pain, enhancing functionality, and strengthening the core. CSE has proven to be an effective treatment for NSLBP, despite the fact that there are other widely

utilized approaches. Core stabilization exercises may be a useful strategy for managing pain in people with NSLBP, according to grade B support.

(Khaledi and Gheitasi, 2024) investigate how patients with CLBP responded to gluteal muscle strengthening exercise-based CSE (GSE-based CST) in terms of pain, function, quality of life, and fear-avoidant behaviors. Thirty-four patients with nonspecific persistent pain in the lower back were included in this investigation. The GSE-based CST, combined with CGs, each had 17 participants. For four weeks, the GSE-based CST group engaged in 15 minutes of GSE and CST three times a week, while the CG engaged in thirty minutes of CST daily, three times weekly. The RMDQ was used to assess function, the fear-avoidance attitudes questionnaire was used to assess fear-avoidance patterns, the short form-36 was applied for measuring quality of life, and the numerical pain rating scale was employed for assessing pain both before and after therapy. In this study, both groups experienced significant decreases in pain, function, and fear-avoidance pattern. Both EG and CGs demonstrated a considerable development in both mental and physical aspects throughout the quality of life evaluation. Pain and quality of life were significantly different amongst the GSE-based CST and CGs. The necessity of gluteal muscle strengthening exercises for patients with non-specific chronic back pain in the future is thus highlighted by the fact that GSE-based CST can serve as the foundation for an efficient intervention to improve pain, function, fear-avoidance tendencies, and quality of life.

(El-Sherbini et al., 2025) Comparing the effectiveness of ISOM and ISOT exercises in terms of pain and impairment in patients with NSCLBP was the main goal of this study. 41 men and women with NSCLBP participated in this randomized controlled trial. The three groups to which participants were randomly assigned. Over the course of up to eight weeks, the exercise training was conducted three times a week for 40 to 60 minutes. Prior to and following the interventions, measures of pain (measured with VAS) and development (measured with the Oswestry Disability Index, or ODI) were taken. Based on the experimental outcomes, there was no discernible difference in pain or impairment between the two exercise groups (ISOM and ISOT). Nonetheless, the ISOM group outperformed the ISOT group numerically. When compared to the CG, the VAS scores of the ISOM and ISOT groups showed a substantial decrease in pain levels, going from 5.5 to 2.7 for ISOM and from 5.8 to 3.7 for ISOT. Furthermore, when compared to the baseline group, the average disability significantly improved in the ISOM and ISOT. Patients with NSCLBP can effectively reduce their pain and impairment using both ISOM and ISOT techniques. The advantages of each, however, are not appreciably different. ISOM exercises have been demonstrated to be superior in terms of numbers. To get a more precise response about their superiority, more research is required.

(Werasirirat et al., 2025) to look into how patients with persistent, generic LBP respond to core stabilization activities in terms of muscle soreness. Fifty patients with persistent, nonspecific LBP, both male and female, were gathered and randomized into group A was the CG, and group B was the EG. Core stabilization exercises and regulated conventional therapy were administered to Group B. Group A received no treatment other than standard care. For six weeks, the identical treatment was given to both groups. For both groups, the evaluation was done both before and after six weeks. Twenty-five participants in Group B underwent standard treatment, which comprised core stabilizing exercises, continuous ultrasonography, and electrical nerve stimulation through the skin. Twenty-five individuals in Group A received only standard care. The training regimen was given to both groups three times a week for six weeks. A manual intensity algometer was used to measure the paraspinal muscles' pain pressure threshold in both groups prior to and after a six-week training. Findings in comparison to the EG (Group B) and the CG (Group A): Paraspinal muscle discomfort at the lumbar region. With a p-value < 0.05, the unpaired t-test demonstrated a considerable variance between the two groups. For patients with persistent, NSLBP, CSE are useful in reducing muscular soreness.

(Bhattarai and Khanna, 2025) evaluate how BFR combined with core stabilization exercise (CSE) affected the muscular activity, muscle width, and impairment of people with NSCLBP. In all, 38 NSCLBP patients between the ages of 18 and 45 participated in this study. The BFR + CSE and CSE groups ($n = 19$ each) were randomly selected from among the participants. Over the course of four weeks, each participant received three weekly supervised rehabilitation sessions. Prior to and following the four-week intervention, measures of muscular activity, hamstring thickness, and impairment were taken. The TrA, MF, and the Gmax muscular activity, muscle thickness at rest and during contraction, and disability all considerably enhanced within the BFR + CSE group ($p < 0.05$). The electromyography, or activity of the MF muscle was significantly higher in the CSE group ($p < 0.05$), and the TrA, MF, and Gmax muscles were significantly thicker at rest ($p < 0.05$) and only the TrA muscle showed a substantial change in muscle thickness after tension ($p < 0.05$). Furthermore, across all factors, the BFR + CSE groups demonstrated greater benefits than the CSE group. TrA, MF, and Gmax muscle power, musculoskeletal thickness, and dysfunction are all improved more effectively when BFR and CSE are administered over a four-week period.

(Mirshahi et al., 2023) ascertain how core stabilization exercises combined with traditional physiotherapy (CP) affected the patients' suffering equilibrium, kinetic phobia, and impairment in CLBP patients. 52 CLBP patients were enrolled in the experimental investigation and split into two groups of 26. Core stabilization training with CP were given to group A, while CP was the only treatment given to group B. For four weeks, the drug was administered three times a week. Assessments of pain, equilibrium, movement phobia, and impairment were conducted both at baseline and four weeks into the intervention. Results showed that group A, which got core stabilization with CP, showed significant improvements in pain, balance, handicap, and kinesiophobia ($P < 0.01$). Only kinesiophobia, discomfort, and disability improved in Group B; balance was not significantly affected. The study demonstrates that using core stabilization in conjunction with CP can help people with CLBP with their pain, anxiety about kines, balancing, and impairment.

(Zuo et al., 2024) Finding out how CSE using the Huber® Motion Lab affected symptoms of depression, pain, and level of activity among individuals with NSLBP was the goal of this study. 30 patients with NSLBP were randomized into two different groups: the EG and the CG. For 15 sessions, each group underwent a traditional physiotherapy regimen. Additionally, the study group used the Huber was® Motion Lab equipment, while the CG engaged in floor-based core stabilization exercises for twenty minutes. On the first and end days of the course, the Beck Depression Inventory (BDI) was used to measure depressive disorders, the Oswestry impairment Index (ODI) was used to measure impairment; and the VAS was used to measure the degree of discomfort. All outcome indicators demonstrated a considerable enhancement in two groups at the finish of the training. Significantly larger gains were found in the mean changed score between groups for VAS and BDI and comparing the group receiving the experiment to the untreated group, the EG's ODI score was 51.78 versus 25.29. CSE combined with a physio program improved pain extent, depressive disorders, and impairment level for patients with NSLBP in this trial, both without and with the Huber® Movement Lab.

(Nwodo et al., 2022) Investigating the impact of essential stability training program on pain and function enhancement for artists with LBP was the goal of this study. In a randomized controlled experiment, 41 university-level instrumental artists who played the cello, violin, or piano and had nonspecific LBP were randomized to one of two groups. The CG lost one member to follow-up. As a result, 40 participants—17 men and 23 women—finished the study. A 12-week regimen of CSEs and education was given to the treatment cohort. Only an instructional pamphlet was given to the CG. The degree of pain and functional status were assessed using a VAS and the ODI, correspondingly. An impartial, blinded assessor gathered data at the start and at twelve and twenty-four weeks later. While the CG's pain and function scores deteriorated at 24 weeks, the EG demonstrated a substantial development in both pain severities on the functional status and VAS on the ODI during the whole follow-up period. Significant differences in pain intensity were observed at 12 and 24 weeks, according to a between-group analysis. But only after 12 weeks did the difference become noticeable in terms of functional status. Musicians' LBP was successfully managed with a structured CSE and an instructional pamphlet.

3. MATERIAL AND METHODS

Because pre- and post-tests were administered and randomization was not used, the study was quasi-experimental. The study included 80 mechanical LBP patients of both sexes, aged 25 to 40. They were split equally between the experimental cohort, which involved a core muscle stability routine, and the CG, which involved the Extension Manoeuvre. The study does not include patients with spinal abnormalities, spinal fractures, post-spinal equilibrium, or infectious spines. For four weeks, both the extension maneuver and the core muscle stabilization program were administered once each hour. Additionally, individuals participating in the test group receive back medical treatment, which includes electricity (short wave diathermy) and ergonomic recommendations. Roland-Morris and VAS were used to quantify the patients' pain and impairment. At baseline weeks prior and at the conclusion of each workout week, the study variables were measured.

Procedure

This study comprised 80 individuals of both sexes with mechanical back pain in the 25–40 age range. Following acceptance through a consent form, all participants met their inclusion along with exclusion criteria. Since it is a quasi-experimental study, randomization is not done. Each group consisted of 40 patients who were evenly divided between the EG and CGs. The Roland Morris application and VAS have been utilized for measuring disability and pain in each group. The subjects were chosen based on their cervical spine range of movements, manual spinal disorders. Flexor and extensor skeletal muscle testing, hamstring

strengthening and quadriceps weakness tightening, and a special test for the lumbar spine to check for a mechanical LBP. Patients in the experimental setting received back care and core muscle stability treatments, including ergonomic counseling and electromagnetic therapy technologies (Short Wave Diathermy), while the CG received extension maneuvers. Every week of the intervention program, the RMDQ was utilized for measuring the pain, and the VAS was applied for measuring the impairment.

Program for stabilizing core muscles:

All core exercises are based on the development of the deep core ligaments (diagonal abdominis and multifidus) in conjunction with regular respiration techniques.

- Spend ten minutes warming up with static cycling.
- Swiss ball supine bridging. The process of drawing the navel backward nearer the center of the body without moving the spine is known as abdominal hollowing. Ten seconds of holding, ten repetitions, and an isometric contraction of the transverse abdominal muscles.
- The Swiss cylindrical is prone to crossover.
- Dogs and birds work out on a Swiss ball.
- Side planks.
- The back treatment regime includes energy therapy (a 15-minute short-wave diathermy) and biomechanical recommendations.

Analogous Visual Scale:

A perception or sensation that is difficult or impossible to assess directly is measured using the VAS. Using a pain scale ranging from zero to intense pain, VAS measured the subjective level of discomfort. Patients mark a specific location on the horizontal 10-cm scale to represent their level of pain. Six categories—no pain, slight discomfort, moderate discomfort, somewhat severe pain, extremely severe pain, and deadliest possible pain—are used to categorize pain levels, each with a 2 cm increment. Participants were instructed to mark an imaginary location along a 100 mm long horizontal path to represent the perceived intensity of their pain, usually over the previous 24 hours. The line's left edge indicates that there is no pain, while its right edge indicates that the agony is at its worst.

Assessment of Low Lumbar Disability by Roland Morris:

A health status indicator called the RDQ106 is intended for patients to complete in order to evaluate the extent of their handicap as a result of LBP. Although it was created for study findings, clinical practice has also found it to be helpful to provide patient monitoring. The RDQ is brief, easy to fill out, and those receiving treatment can understand it easily. The patients' primary complaint is disability brought on by low back discomfort. The RMDQ is among the most often utilized tools in the diagnostic assessment of those individuals because it encourages them to seek outside assistance.

Participants

Therefore, this study will assist patients, physicians, and researchers in evaluating the disability of patients with LBP in less time (online or in-person) and with greater transparency and precision regarding the construct (disability) that the instrument is intended to evaluate. Additionally, cutting the total amount of merchandise (from 24 to 15) also lessens the instrument's redundancy, which will, in turn, make it easier to understand patients with low levels of education, favoring their inclusion in low back pain research and enabling targeted treatments for them (since the focused nature of the medication is contingent upon the accuracy of the diagnostic assessment). Its extensive use is a result of these qualities as well as proof of its scientific validity.

Intervention

The Sickness Impact Pro-file (SIP), a 136-item wellness assessment that covers every facet of mental and physical function, served as the basis for the RDQ. The original authors chose 37 items from the SIP, considering they were specifically connected to bodily systems that were predicted to be impacted by back discomfort. The statement "because of my back pain" was used to qualify each item in order to differentiate back pain difficulty from disability resulting from other reasons. Patients are generally able to make this difference with ease. The total quantity of questions checked is used to determine the RDQ score. Nothing is weighed. Since there is no disability, the score falls between 0 and 24 (highest disability).

4. RESULTS

Table 1. Difference between EG and CG

	VAS **Mean ± SD**	**ROLAND-MORRIS LBP** **Mean ± SD**
Pre-test	6.84[a] ± 1.141	14.30[a] ± 2.563
Week-I	5.69[b] ± 1.121	10.16[b] ± 2.410
Week-II	5.03[b] ± 1.253	8.51[c] ± 2.570
Week-III	4.60[c] ± 1.383	7.13 [d]± 3.407
Test statistic & p-value	Chi-square = 206.498 p-value = 0.000*	F = 33.064 & p-value = 0.000*

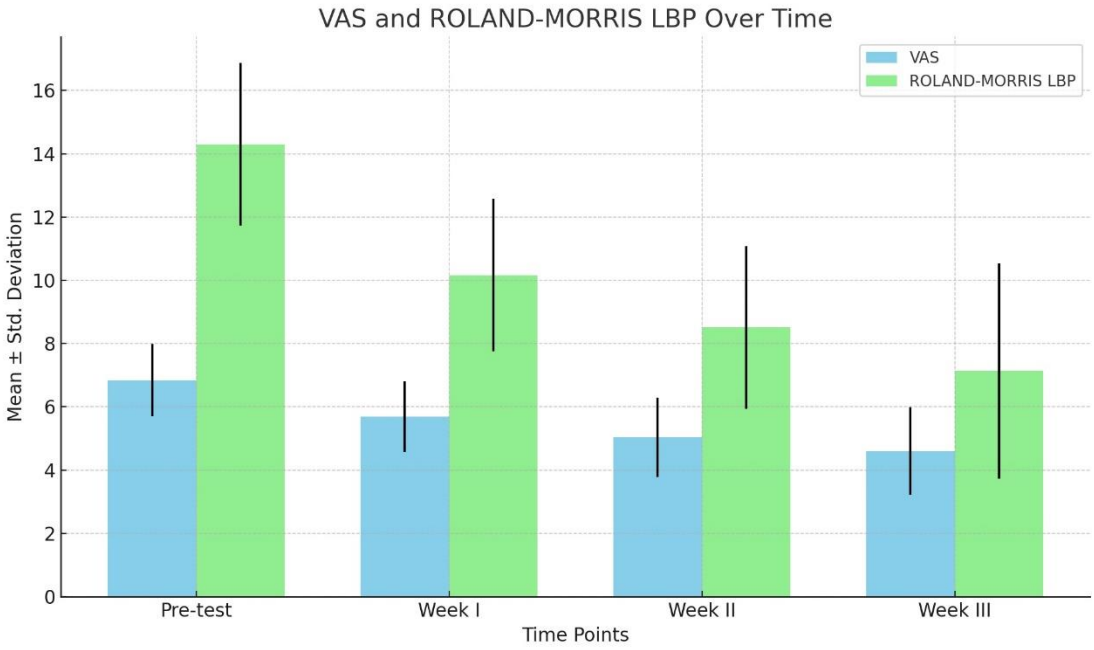

Figure 1. Analysis of VAS and ROLAND-MORRIS between EG and CG

Note: Superscripts with the same alphabet do not differ significantly, and those with different alphabets differ significantly

The descriptive data for the VAS and RMDQ scores, along with the F- and p-values for the between-EG and CG test, are shown in Table 1 above. In Figure 1, analysis of VAS and ROLAND-MORRIS between EG and CG is portrayed. Here, we see that there is a notable variation between the time periods taken into consideration for the parameter "Roland-Morris disability questionnaire LBP."

ANOVA is a crucial metric that reveals the differences between two groups under repeated measures. There is a substantial difference between the CG and EGs if the value of this metric is close to zero. There is no difference between two groups if these measures achieve a value close to or equivalent to 1. Therefore, based on the data under consideration, we discovered that the Roland-Morris LBP parameter has a Wilk's lambda value of 0.091, indicating that the two groups' pain scores differ.

The Friedman test yields a p-value below 0.05. As a result, we can observe that the mean ranks of the associated groups for the VAS scores varied significantly.

Table 2. Comparison VAS and ROLAND-MORRIS between EG and CG with respect to gender

Independent test

Group	**Gender**	**N**	**Mean ± SD**	**T-test & P-values**
Roland-Morris LBP	Male	54	7.2778±3.03698	T = 0.455 p-value = 0.651^{NS}
	Female	26	6.9615±2.63030	
	Female	26	18.5385±7.91065	
VAS Score	Male	26	2.3889±.85598	U= 516.000 p-value = 0.039*
	Female	54	1.9231±.93480	

In addition to the significant value, the table 2 offers helpful descriptive statistics for the both groups. Given that the RMDQ score's P-value was greater than 0.05, we may conclude that gender had no bearing on lowering the pain score.

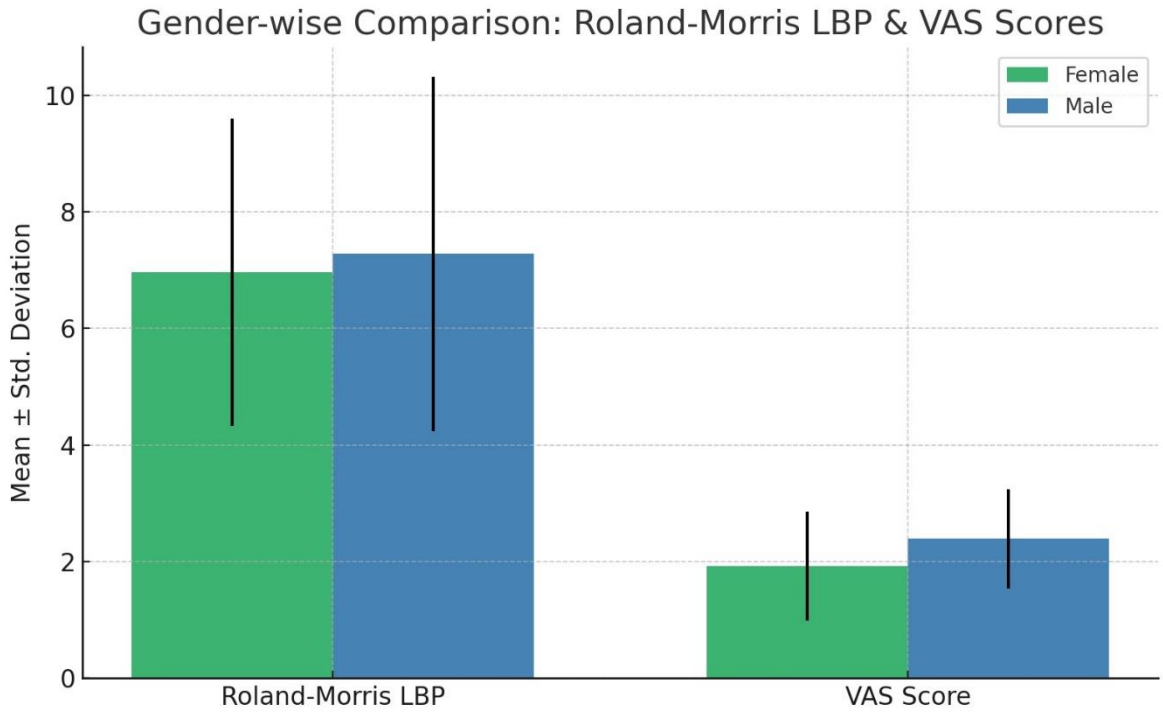

Figure 2. Comparison of VAS and ROLAND-MORRIS LBP and VAS scores between EG and CG

The study infers that there is a statistically substantial variance between the male and female groups with regard to VAS in decreasing pain level because the table specifically shows the statistics data, U-value, and the considerable p-value is lower than 0.05 for VAS scores. The comparison of the VAS and ROLAND-MORRIS LBP and VAS scores between EG and CG is displayed in Figure 2.

Table 3. Comparison VAS and ROLAND-MORRIS LBP and VAS scores across EG and CG with respect to age group

One way

		N	Mean ±SD	Test statistics	p-value
Roland-Morris LBP	< =29	17	73529±2.99877	F = 0.699	0.556
	30 - 34	22	6.5000±2.70361		
	35 - 40	20	7.1500±2.58080		
	41 +	21	7.7619±3.33024		
	Total	80	.1750±2.89817		
	Total	80	19.7625±10.32417		
VAS Score	< = 29	17	1.8824±1.11144	Chi-square = 5.937	0.115
	30 - 34	22	2.0909±.68373		
	35 - 40	20	2.4500±.99868		
	41 +	21	2.4762±.74960		
	Total	80	2.2375±.90349		

The dependent variable's mean and standard deviation for each distinct age group are among the helpful descriptive statistics that are provided in the descriptive Table 3. Additionally, we find that the Roland-Morris LBP significant level is 0.556, which is greater than 0.05, indicating that age group has no bearing on pain reduction.

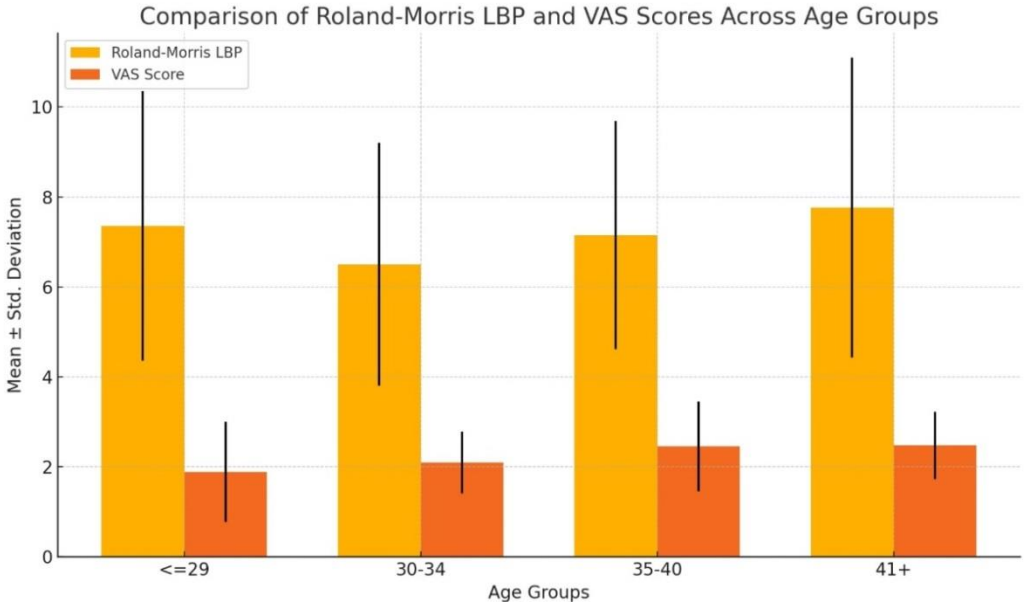

Figure 3. Comparison of VAS and ROLAND-MORRIS LBP and VAS scores across EG and CG

For comparisons with regard to age groups for the VAS scores, we employ the Kruskal-Wallis test analysis. The table analysis represents the chi-square (Kruskal-Wallis H) and the confidence level. Figure 3, shows the VAS and ROLAND-MORRIS LBP and VAS scores Across EG and CG of EG and CG. The study indicated that there is no considerable variance for the pain score amongst the various age groups; viz., age doesn't affect the pain score.

5. DISCUSSION

The lumbo-sacral biomechanic stability is based on the co-contraction of the LMF and TrA muscles, which attenuate or eliminate pain perception by lowering compressive overloads. Rectus abdominis and oblique muscles give secondary stabilization during exercise. In order to reduce compressive stresses on spinal tissues, both muscles serve as the lumbar segment's main stabilizers.

The core muscles dynamically maintain the lumbar spine against rotational and translational stress during functional motions18. The anterior shear stress and compressive stress at the L4-L5 junction19 are increased by contraction in the hip muscles (psoas, hamstrings). The deep erector spine, GMax, MLF, TrA and internal obliques, are also reciprocally inhibited. Extensor mechanism failure during functional movement patterns. According to our research, the greatest proportion of participants had hamstring and quadriceps tightness.

6. CONCLUSION

In this study, we investigate how well a core muscle stabilization program works for people who have mechanical LBP. The study included 80 mechanical LBP patients of both sexes, aged 25 to 40. They were split equally between the EG, which included a core muscle stabilization routine, and the CG, which included the Extension Manoeuvre. The study does not include patients with spinal abnormalities, spinal fractures, post-spinal stabilization, or infectious spines. For four weeks, both the extension maneuver and the core muscle stabilization program were administered once each hour. Additionally, patients in the EG receive back care, involving electrotherapy (short wave diathermy) and ergonomic recommendations. Roland-Morris and VAS were used to quantify the patients' pain and impairment. At zero weeks and the conclusion of each workout week, the study variables were measured. The Friedmann ANOVA, Mann-Whitney U-test, and t-test have been employed for the data analysis. According to the findings, people with mechanical LBP can benefit from a core muscle stabilization program in addition to the spinal extension procedure to lessen pain and enhance lumbar spine function.

REFERENCES

[1] Frizziero, A., Pellizzon, G., Vittadini, F., Bigliardi, D. and Costantino, C., 2021. Efficacy of core stability in non-specific chronic low back pain. Journal of functional morphology and kinesiology, 6(2), p.37.

[2] Jamil, M.A., Bashir, M.S., Noor, R., Niazi, R., Ahmad, N., Ahmad, S. and Ahmad, H.U., 2023. Effects of core stabilization exercises on low back pain, disability and back muscle endurance in patients with lumbar disc herniation. Annals of King Edward Medical University, 29(2), pp.123-128.

[3] Jamil, M.A., Bashir, M.S., Noor, R., Niazi, R., Ahmad, N., Ahmad, S. and Ahmad, H.U., 2023. Effects of core stabilization exercises on low back pain, disability and back muscle endurance in patients with lumbar disc herniation. Annals of King Edward Medical University, 29(2), pp.123-128.

[4] Ulger, O., Oz, M. and Asliyuce, Y.O., 2023. The effects of yoga and stabilization exercises in patients with chronic low back pain: A randomized crossover study. Holistic Nursing Practice, 37(4), pp.E59-E68.

[5] Hlaing, S.S., Puntumetakul, R., Khine, E.E. and Boucaut, R., 2021. Effects of core stabilization exercise and strengthening exercise on proprioception, balance, muscle thickness and pain related outcomes in patients with subacute nonspecific low back pain: a randomized controlled trial. BMC musculoskeletal disorders, 22, pp.1-13.

[6] Salik Sengul, Y., Yilmaz, A., Kirmizi, M., Kahraman, T. and Kalemci, O., 2021. Effects of stabilization exercises on disability, pain, and core stability in patients with non-specific low back pain: A randomized controlled trial. Work, 70(1), pp.99-107.

[7] Gorji, S.M., Mohammadi Nia Samakosh, H., Watt, P., Henrique Marchetti, P. and Oliveira, R., 2022. Pain neuroscience education and motor control exercises versus core stability exercises on pain, disability, and balance in women with chronic low back pain. International journal of environmental research and public health, 19(5), p.2694.

[8] Nayyab, I., Ghous, M., Shakil Ur Rehman, S. and Yaqoob, I., 2021. The effects of an exercise programme for core muscle strengthening in patients with low back pain after Caesarian-section: A single blind randomized controlled trial. J Pak Med Assoc, 71(5), pp.1319-1325.
[9] Al'Arifi, A.A. and Sudaryanto, W.T., 2024. The Effect of Core Stability Exercise on Myogenic Lower Back Pain: A Systematic Review. Jurnal Cahaya Mandalika ISSN 2721-4796 (online), pp.1910-1922.
[10] Zheng, F., Liu, S., Yin, Q., Zheng, Y., Yang, J., Huang, H., Chen, L., Wang, Y., Chen, X. and Wang, C., 2024. Long-term impact of self-compassion training with core stability exercise on patients with nonspecific chronic low back pain: A randomized controlled trial. Journal of Psychosomatic Research, p.111678.
[11] Rexha, E. and Kapedani, K., 2024. THE ROLE OF CORE TRAINING DURING THE REHABILITATION OF CHRONIC LOW BACK PAIN IN FOOTBALL PLAYERS. Journal of Orthopedics, 16(2).
[12] Liu, X., Wang, Y., Liu, M., Zhang, Y., Wu, Q. and Wang, Q., 2025. The efficacy of core stabilization exercise in mild and moderate adolescent idiopathic scoliosis: a systematic review and meta-analysis. Journal of Orthopaedic Surgery and Research, 20(1), pp.1-15.
[13] Özyurt, F., Tayfur, A. and Ülger, Ö., 2025. The effect of stabilization-based exercises on kinesiophobia in patients with non-specific chronic low back pain: a systematic review and meta-analysis. Sport Sciences for Health, 21(1), pp.1-13.
[14] Shabana, A.M.M., Hanafy, A.F., Yamany, A.S. and Ashour, R.S., 2025. Effect of core stabilization exercises on cervical sagittal balance parameters in patients with forward head posture: a randomized controlled trial in Egypt. Asian Spine Journal, 19(1), p.85.
[15] Liu, M., Huang, Z., Wang, X., You, P. and Cai, X., 2025. The effect of core stability training combined with fascial release on patients with nonspecific low back pain. Technology and Health Care, 33(1), pp.257-265.
[16] Akodu, A.K., Adedeji, A.R., Zibiri, R.A. and Bakre, A.T., 2024. Effect of telerehabilitation-based core-stability exercise on pain-related disability, pain self-efficacy, and psychological factors in individuals with non-specific chronic low back pain: a randomized controlled study. Bulletin of Faculty of Physical Therapy, 29(1), p.28.
[17] Blanco-Giménez, P., Vicente-Mampel, J., Gargallo, P., Baraja-Vegas, L., Bautista, I.J., Ros-Bernal, F. and Barrios, C., 2024. Clinical relevance of combined treatment with exercise in patients with chronic low back pain: a randomized controlled trial. Scientific reports, 14(1), p.17042.
[18] Zuo, C., Zheng, Z., Ma, X., Wei, F., Wang, Y., Yin, Y., Liu, S., Cui, X. and Ye, C., 2024. Efficacy of Core Muscle Exercise Combined with Interferential Therapy in Alleviating Chronic Low Back Pain in High-Performance Fighter Pilots: A Randomized Controlled Trial. BMC Public Health, 24(1), p.700.
[19] Jeon, Y.A., Tang, Y.Y., Cui, Z., Jung, Y. and Kim, M.K., 2024. Effects of Lumbar Stabilization Exercises Using a Pilates Reformer on Pain, Function, and Quality of Life in Patients with Chronic Low Back Pain. Korean Society of Physical Medicine, 19(1), pp.11-22.
[20] Nwodo, O.D., Ibikunle, P.O., Ogbonna, N.L., Ani, K.U., Okonkwo, A.C., Eze, C.J., Onwudiwe, C.U., Ezeja, G.U. and Maduanusi, I.A., 2022. Review of core stability exercise versus conventional exercise in the management of chronic low back pain. African Health Sciences, 22(4), pp.148-167.
[21] Karacay, B.C., Sahbaz, T., Gurtekin, B., Yildiz, S. and Ozcan, E., 2022. Effectiveness of whole-body vibration exercise and core stabilization exercise in chronic non-specific low back pain: A randomized-controlled study. Turkish Journal of Physical Medicine and Rehabilitation, 68(2), p.184.
[22] Mohammed Luqman, S. and Saravan, K., 2023. Efficacy of Core Muscle Stabilization in Chronic Nonspecific Low Back Pain Patients–A Systematic Review. INTI JOURNAL, 2023(40), pp.1-8.
[23] Liter Smrcina, Z., Woelfel, S. and Burcal, C., 2022. A systematic review of the effectiveness of core stability exercises in patients with non-specific low back pain. International journal of sports physical therapy, 17(5), p.766.
[24] Ahn, S.E., Lee, M.Y. and Lee, B.H., 2024. Effects of gluteal muscle strengthening exercise-based core stabilization training on pain and quality of life in patients with chronic low back pain. Medicina, 60(6), p.849.
[25] Khaledi, A. and Gheitasi, M., 2024. Isometric vs Isotonic Core Stabilization Exercises to Improve Pain and Disability in Patients with Non-Specific Chronic Low Back Pain: A Randomized Controlled Trial. Anesthesiology and Pain Medicine, 14(1), p.e144046.
[26] El-Sherbini, A.E.H.I.E.S., Mohammed, R.M.I., Eid, M.A. and Mohammed, F.S., 2025. Effect of Core Stabilization Exercises on Muscle Tenderness in Patients with Chronic Non-Specific Low Back Pain: A Randomized Controlled Trial. Bulletin of Physical Therapy Research and Studies, 3(1), pp.20-28.

[27] Werasirirat, P., Namsawang, J., Singhasoot, N., Luangpon, N., Snieckus, A. and Muanjai, P., 2025. Effect of blood flow restriction training with core stabilization exercise on muscle activity and muscle thickness in subjects with nonspecific chronic low back pain. Journal of Back and Musculoskeletal Rehabilitation, p.10538127251343856.

[28] Bhattarai, D. and Khanna, A., 2025. Effect of Core Stabilization Exercises in Combination with Conventional Physiotherapy in Chronic Low Back Pain. Integrative and Complementary Therapies, 31(1), pp.12-16.

[29] Mirshahi, M., Najafi, R., Golbakhsh, M., Mirshahi, A. and Pishkuhi, A., 2023. Effectiveness of a core stability exercise program on pain and function in musicians with chronic low back pain: A randomized controlled trial. Medical problems of performing artists, 38(4), pp.207-213.

[30] Shalamzari, M.H., Henteh, M.A., Shamsoddini, A. and Ghanjal, A., 2024. Comparison of the effects of core stability and whole-body electromyostimulation exercises on lumbar lordosis angle and dynamic balance of sedentary people with hyperlordosis: A randomized controlled trial. BMC Sports Science, Medicine and Rehabilitation, 16(1), p.91.