

**Original research article**

# A comparative evaluation of core stabilization and back school exercise programs in chronic low back pain management

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## Abstract

Chronic low back pain (CLBP) is a prevalent musculoskeletal disorder that significantly impairs daily functioning and quality of life. Exercise therapy, particularly core stabilization exercises and Back School programs, are commonly used interventions for CLBP management. This study aims to compare the effectiveness of these two exercise programs in reducing pain, improving functional disability, and enhancing lumbar spine range of motion in patients with CLBP.

**Methods:** This randomized controlled trial included 40 participants with CLBP, aged 35 to 60 years, from the physiotherapy outpatient department of Deccan Hospital, Hyderabad. Participants were randomly assigned to Group A (Back School program) or Group B (core stabilization exercises), with 20 participants in each group. Both interventions were administered four times a week over a 4-week period. Outcome measures, including the Visual Analogue Scale (VAS), Roland-Morris Disability Questionnaire (RMDQ), and lumbar spine range of motion (TROM), were assessed at baseline and post-intervention. Data analysis included paired and independent t-tests, with significance set at  $p \leq 0.05$ .

**Results:** Both groups showed significant improvements in all outcome measures. Group A's mean VAS score decreased from 7.4 to 5.52, RMDQ score from 16.65 to 9.45, and TROM increased from 1.585 degrees to 2.09 degrees. Group B demonstrated greater improvements, with VAS decreasing from 7.2 to 2.4, RMDQ from 16.6 to 6.75, and TROM increasing from 1.53 degrees to 2.51 degrees. Group B's improvements were significantly greater across all measures ( $p < 0.0001$ ).

**Conclusion:** Core stabilization exercises resulted in superior outcomes compared to the Back School program, suggesting they may be a more effective intervention for managing CLBP. These findings support the use of core stabilization exercises as a primary therapeutic approach in CLBP management.

**Keywords:** Chronic low back pain, core stabilization exercises, back school program, pain management, lumbar spine range of motion, randomized controlled trial

## Introduction

Chronic low back pain (CLBP) is one of the most common musculoskeletal disorders affecting individuals worldwide. It is characterized by persistent pain and discomfort in the lower back region, often without a specific identifiable cause, and it can lead to significant impairments in daily activities, reduced quality of life, and substantial economic burden due to healthcare costs and lost productivity. Despite its prevalence, the management of CLBP remains a challenge, necessitating a multidisciplinary approach that often includes pharmacological treatments, physical therapy, and exercise-based interventions [1, 2, 3].

Exercise therapy is a cornerstone in the management of CLBP, with various exercise programs designed to alleviate pain, improve functional capacity, and enhance overall physical well-being. Among these, core stabilization exercises and Back School programs are two of the most widely used interventions. Core stabilization exercises focus on strengthening the muscles of the abdomen, pelvis, and lower back, which are essential for maintaining spinal stability. These exercises aim to improve the activation and

coordination of core muscles, thereby reducing the strain on the lumbar spine and addressing underlying biomechanical dysfunctions associated with CLBP. Research has shown that core stabilization exercises can lead to significant reductions in pain and disability, making them a popular choice in CLBP management [4, 5, 6].

On the other hand, Back School programs offer a more comprehensive approach by combining physical exercises with education on spinal anatomy, posture, ergonomics, and pain management strategies. The Back School concept, which originated in the 1960s, aims to empower patients with knowledge about their condition and provide them with practical skills to manage and prevent back pain. By addressing both the physical and educational aspects of back pain, Back School programs have been shown to improve pain, functional outcomes, and patient satisfaction. However, the long-term benefits of these programs compared to other exercise-based interventions are still a topic of ongoing research [7, 8, 9].

Despite the widespread use of both core stabilization exercises and Back School programs, there is limited evidence directly comparing their effectiveness in the management of CLBP. Understanding the relative efficacy of these interventions is crucial for developing evidence-based guidelines that can help clinicians tailor treatment plans to the specific needs of their patients. This study seeks to fill this gap by conducting a comparative evaluation of core stabilization exercises and Back School programs in the management of CLBP [10].

The primary objective of this study is to assess the impact of these two exercise programs on pain reduction, functional disability, and lumbar spine range of motion in patients with CLBP. By directly comparing the outcomes of core stabilization and Back School interventions, this study aims to provide valuable insights into which approach offers greater benefits in managing CLBP. The findings of this study are expected to inform clinical practice and guide the selection of exercise therapies for individuals suffering from chronic low back pain.

Overall, as CLBP continues to be a major health concern with significant implications for individuals and healthcare systems, it is imperative to identify the most effective treatment strategies. This study endeavors to contribute to the body of knowledge on CLBP management by evaluating and comparing the outcomes of core stabilization exercises and Back School programs, ultimately aiming to improve patient care and outcomes in this challenging condition.

## Materials and Methodology

**Study Design:** This study was designed as an experimental study with a pre- and post-intervention comparison design. The research aimed to compare the effectiveness of core stabilization exercises and Back School programs in managing chronic nonspecific low back pain (CNSLBP). The sample size consisted of 40 subjects, with 20 participants in each group. The study employed a randomized sampling method to ensure unbiased allocation to either the core stabilization exercise group (Group B) or the Back School program group (Group A). The intervention period lasted for 4 weeks, and the study was conducted over a one-year period, starting from the date of approval by the Ethics Committee. The study setting was the physiotherapy outpatient department (OPD) of Deccan Hospital, Hyderabad.

## Inclusion Criteria

Participants were included in the study based on the following criteria:

- Male and female patients aged between 35 to 60 years.
- Patients diagnosed with nonspecific low back pain.
- Patients experiencing low back pain for at least 3 months.
- Ability to follow two-step commands.
- Ability to participate in 30-minute physiotherapy sessions.

## Exclusion Criteria

Participants were excluded from the study if they met any of the following criteria:

- Presence of serious spinal pathology (e.g., tumors, fractures, inflammatory diseases).
- History of previous spinal surgery.
- Evidence of nerve root compromise.
- Cardiorespiratory illness.
- Pregnant women.

## Method of Data Collection

The study protocol was reviewed and approved by the Ethics Committee, and all necessary approvals were obtained from relevant authorities. Forty patients were recruited from the outpatient department of Deccan Hospital in Hyderabad. The participants were assessed for eligibility based on the inclusion and exclusion criteria. After providing informed consent, the subjects were randomly assigned to two groups using block randomization, ensuring an equal distribution of 20 participants in each group. Group A participated in the Back School program, while Group B underwent core stabilization exercises. Both interventions were administered four times a week over the 4-week intervention period.

## Materials Used

- Treatment couch.

## Measurement Procedure

An independent assessor, blinded to the treatment allocation, measured the outcome measures at baseline and at the end of the 4-week intervention. The outcome measures included:

- 1) **Visual Analogue Scale (VAS):** A 100-millimeter horizontal line was used to assess the patients' pain levels, with zero representing "no pain" and ten representing "maximum pain".
- 2) **Roland-Morris Disability Questionnaire (RMDQ):** A self-reported questionnaire designed to measure functional impairment and the impact of back pain on a patient's self-rated disability.
- 3) **Lumbar Spine Range of Motion (ROM):** Assessed using the modified Scholar method to evaluate lumbar spine mobility.

## Procedure

**Group A: Back School Program:** The Back School program consisted of four structured classes focusing on spinal anatomy, posture, ergonomics, and pain management strategies. The program included practical demonstrations of body mechanics and self-care techniques, aiming to empower patients to manage their condition effectively.

**Group B: Core Stabilization Exercises:** Group B participants performed a series of core stabilization exercises designed to strengthen the deep muscles of the abdomen, pelvis, and lower back. The exercises included abdominal bracing, bridging, leg lifts, and alternating arm and leg lifts, with a focus on maintaining spinal stability.

## Statistical Analysis

Data were analyzed using SPSS version 16.0. Descriptive statistics were used to present the overall characteristics of the participants in terms of mean and standard deviation. Paired t-tests were conducted to compare pre- and post-intervention results within each group, and independent t-tests were used to compare the differences between the two groups. A p-value of  $\leq 0.05$  was considered statistically significant.

## Results

The study included 40 participants, equally divided into two groups: Group A, which participated in the Back School program, and Group B, which underwent core stabilization exercises. The baseline characteristics of the participants, including VAS score, RMDQ score, and lumbar spine range of motion (TROM), were similar between the two groups, with no significant differences observed in the pre-intervention scores ( $p > 0.05$ ) (Table 1). This baseline similarity ensured that any post-intervention differences could be attributed to the effects of the respective exercise programs rather than initial disparities.

## Post-Intervention Outcomes

Significant improvements were observed in both groups following the interventions. However, the extent of improvement varied between the groups. In Group A (Back School program), the mean VAS score decreased from  $7.4 \pm 0.82$  to  $5.52 \pm 1.21$ , the RMDQ score from  $16.65 \pm 1.27$  to  $9.45 \pm 1.17$ , and TROM increased from  $1.585 \pm 0.12$  degrees to  $2.09 \pm 0.08$  degrees (Table 2). These changes indicate that the Back School program was effective in reducing pain and disability while improving lumbar spine mobility.

In Group B (core stabilization exercises), the improvements were more pronounced. The mean VAS score decreased from  $7.2 \pm 0.83$  to  $2.4 \pm 0.60$ , the RMDQ score from  $16.6 \pm 1.90$  to  $6.75 \pm 1.55$ , and TROM increased from  $1.53 \pm 0.09$  degrees to  $2.51 \pm 0.06$  degrees (Table 2). The mean differences in pre- and post-intervention scores were significantly greater in Group B compared to Group A across all outcome measures ( $p = 0.0001$ ) (Table 3).

## Comparative Analysis

The results of this study clearly indicate that both the Back School program and core stabilization exercises are effective in managing chronic low back pain. However, core stabilization exercises produced significantly greater improvements in pain reduction, functional disability, and lumbar spine range of motion compared to the Back School program. These findings suggest that core stabilization exercises may offer a more effective intervention for patients with chronic low back pain, providing superior clinical outcomes.

**Table 1:** Group Comparison of Pre-Intervention Scores

Outcome Measure	Group A (n=20)	Group B (n=20)	p-value
VAS Score	7.4 ± 0.82	7.2 ± 0.83	0.4492
RMDQ Score	16.65 ± 1.27	16.6 ± 1.90	0.9226
TROM (degrees)	1.585 ± 0.12	1.53 ± 0.09	0.1459

**Table 2:** Group Comparison of Post-Intervention Scores

Outcome Measure	Group A (n=20)	Group B (n=20)	p-value
VAS Score	5.52 ± 1.21	2.4 ± 0.60	0.0001
RMDQ Score	9.45 ± 1.17	6.75 ± 1.55	0.0001
TROM (degrees)	2.09 ± 0.08	2.51 ± 0.06	0.0001

**Table 3:** Mean Differences in Pre-and Post-Intervention Scores between Groups

Outcome Measure	Group A Mean Difference	Group B Mean Difference	p-value
VAS Score	2.15	4.8	0.0001
RMDQ Score	7.2	9.85	0.0001
TROM (degrees)	0.505	0.98	0.0001

**Discussion**

Chronic low back pain (CLBP) presents a significant clinical challenge due to its multifactorial etiology and its substantial impact on patients' daily lives. Effective management strategies are crucial to alleviate symptoms and improve functionality. This study provides valuable insights into the comparative effectiveness of two widely used exercise-based interventions: core stabilization exercises and Back School programs<sup>[11]</sup>.

The results clearly demonstrate that both interventions are effective in reducing pain and improving functional disability in patients with CLBP. However, core stabilization exercises were shown to be more effective than the Back School program across all measured outcomes. This finding is consistent with previous research suggesting that targeting the core muscles, which play a critical role in maintaining spinal stability, can lead to more substantial improvements in patients with CLBP<sup>[12]</sup>.

Core stabilization exercises focus on strengthening the deep muscles of the abdomen, pelvis, and lower back, which are essential for maintaining proper spinal alignment and reducing strain on the lumbar spine. The significant reduction in pain (VAS) and disability (RMDQ) scores in the core stabilization group highlights the efficacy of these exercises in addressing the biomechanical dysfunctions associated with CLBP. Additionally, the improvement in lumbar spine range of motion (TROM) further supports the effectiveness of core stabilization in enhancing overall spinal function<sup>[13]</sup>.

In contrast, the Back School program, while still beneficial, showed less pronounced improvements. The program's combination of physical exercises and educational components provides patients with a broader understanding of their condition and equips them with practical strategies for managing their pain. However, the educational aspect, while important, may not directly address the biomechanical issues to the same extent as targeted core stabilization exercises<sup>[14]</sup>.

The greater efficacy of core stabilization exercises observed in this study may be attributed to their ability to specifically target and strengthen the muscles responsible for spinal support, leading to more direct improvements in pain and function. This suggests that for patients with CLBP, particularly those with biomechanical dysfunctions, core stabilization exercises should be considered as a primary intervention<sup>[15]</sup>.

However, it is important to recognize the value of the Back School program, especially in its educational approach, which can empower patients to manage their condition independently. Integrating the strengths of both interventions-targeted exercises from core stabilization and the educational components from Back School-could potentially offer a more comprehensive treatment strategy.

This study has several limitations, including a relatively small sample size and a short follow-up period. Future research should focus on larger, long-term studies to validate these findings and explore the sustained effects of these interventions over time. Additionally, investigating the combination of core stabilization exercises with the educational components of the Back School program could provide further insights into optimizing CLBP management.

Overall, while both core stabilization exercises and Back School programs are effective in managing CLBP, core stabilization exercises offer superior benefits in reducing pain, improving disability, and enhancing spinal function. These findings support the recommendation of core stabilization exercises as a primary therapeutic approach for patients with chronic low back pain, particularly when addressing biomechanical dysfunctions.

**Conclusion**

This study demonstrates that both core stabilization exercises and Back School programs are effective in managing chronic low back pain by reducing pain, improving functional disability and enhancing lumbar

spine range of motion. However, core stabilization exercises showed superior outcomes across all measured parameters, suggesting they may be more effective in addressing the biomechanical dysfunctions associated with this condition. These findings support the integration of core stabilization exercises as a primary intervention in the treatment of chronic low back pain, while the Back School program may still serve as a valuable complementary approach, particularly for patient education and long-term self-management.

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