

Effect of Movement Control and Stabilization Exercises in Non-Specific Low Back Pain: A Case Series

Libin George Babu¹, Nimmy A², Jasna Mariam John³

¹Associate Professor, Laxmi Memorial College of Physiotherapy, Mangalore

²Assistant Professor, Laxmi Memorial College of Physiotherapy, Mangalore

³Bachelor of Physiotherapy Student, Laxmi Memorial College of Physiotherapy, Mangalore

Abstract

Background: Non-specific low back pain is a common musculoskeletal condition associated with pain, functional limitation, altered movement patterns, and impaired trunk control. Movement control exercises focus on correcting faulty lumbopelvic movement, whereas stabilization exercises emphasize activation, strength, and endurance of the trunk musculature. **Objective:** The present case series was undertaken to describe the effects of movement control and stabilization exercises on pain intensity and functional disability among individuals with non-specific low back pain. **Methods:** Ten individuals with non-specific low back pain were included in a case series. Participants were allocated into a movement control exercise group or a stabilization exercise group. The intervention was delivered three to five times per week for approximately three to four weeks. Pain intensity and functional disability were assessed before and after the intervention using the Visual Analog Scale and Oswestry Disability Index, respectively. **Results:** All ten participants demonstrated reductions in pain intensity and functional disability following the intervention. Visual Analog Scale scores decreased by 3 to 4 points in most participants, while Oswestry Disability Index scores decreased by 12 to 14 percentage points. Both intervention approaches were associated with improved outcomes. The movement control group showed a greater descriptive improvement in movement coordination and control, although no inferential statistical comparison was performed. **Conclusion:** In this case series, both movement control and stabilization exercises were associated with reduced pain and disability in individuals with non-specific low back pain. Individualized exercise selection, based on movement impairments and trunk stability deficits, may be useful in clinical rehabilitation.

Keywords: Non-specific low back pain, Movement control exercises, Stabilization exercises, Pain, Functional disability, Physiotherapy

1. Introduction

Non-specific low back pain refers to pain in the lumbar region in the absence of an identifiable specific pathology such as fracture, infection, tumour, inflammatory disease, major structural deformity, or nerve root compression. It is commonly associated with mechanical, functional, neuromuscular, psychological, and social factors rather than a single demonstrable anatomical lesion [1, 2].

Low back pain is one of the most prevalent musculoskeletal disorders worldwide and is a major contributor to disability, work absenteeism, reduced productivity, and healthcare utilization [3, 4]. It frequently affects adults during their productive years and may become recurrent or persistent. Altered lumbar movement control, impaired trunk muscle activation, reduced spinal stability, poor proprioception, fear-avoidance beliefs, physical inactivity, and occupational loading may contribute to symptom persistence [5–9].

Exercise therapy is a central component of conservative management for non-specific low back pain. Movement control exercises are designed to retrain faulty movement patterns and improve coordination of the lumbar spine, pelvis, and limbs during static and functional activities. Stabilization exercises, also described as core stability exercises, aim to improve activation, strength, endurance, and coordination of the deep trunk muscles, including the transversus abdominis and multifidus [13, 14].

Although both approaches are widely used, they emphasize different therapeutic targets. Movement control exercises primarily address movement precision and neuromuscular coordination, while stabilization exercises emphasize active spinal support and trunk endurance. Previous studies have reported benefits from both approaches, but no single exercise strategy has been shown to be consistently superior for all individuals with non-specific low back pain [15, 21]. Therefore, the present case series describes the pre- and post-intervention changes observed following movement control and stabilization exercises.

2. Objective

To describe the effects of movement control and stabilization exercises on pain intensity and functional disability in individuals with non-specific low back pain.

3. Materials and Methods

3.1 Study Design and Participants

A case series design was used. Ten individuals with non-specific low back pain participated in the study. The participants were young adults between 19 and 24 years of age. Both male and female participants were included.

3.2 Eligibility Criteria

Participants were included if they had symptomatic non-specific low back pain, pain duration of at least three months, and the ability to participate in the prescribed exercise sessions. Individuals with specific spinal pathology, neurological disorders, previous lumbar spine surgery, significant spinal deformity, systemic disease affecting the spine, pregnancy or postpartum low back pain, or musculoskeletal conditions limiting exercise participation were excluded.

3.3 Outcome Measures

Pain intensity was assessed using the Visual Analog Scale, a 10 cm scale ranging from 0, representing no pain, to 10, representing the worst imaginable pain. Functional disability was assessed using the Oswestry Disability Index, which evaluates limitations related to pain, personal care, lifting, walking, sitting, standing, sleeping, social life, travelling, and employment or homemaking. Scores are expressed as a percentage, with higher scores indicating greater disability.

3.4 Intervention Procedures

Participants were divided into two intervention groups: a movement control exercise group and a stabilization exercise group. The intervention was conducted three to five times per week for

approximately three to four weeks. Participants were instructed not to undertake any additional exercise programme during the study period.

The movement control programme included pelvic tilting, bent-knee fallout, quadruped rocking, controlled arm or leg lifting in quadruped, and sit-to-stand training. Emphasis was placed on maintaining a neutral spine, preventing pelvic rotation, avoiding excessive lumbar movement, and performing each movement slowly and accurately. Exercises were performed for approximately 8–12 repetitions and 2–3 sets, with rest intervals as required.

The stabilization programme included the abdominal drawing-in manoeuvre, bridging, bird-dog exercise, plank, and side plank. Participants were instructed to maintain spinal alignment, activate the trunk musculature, breathe normally, and avoid compensatory movements. Holds were initially maintained for approximately 10–15 seconds and progressed towards 30 seconds according to tolerance. Exercises were performed for approximately 8–10 repetitions and 2–3 sets.

3.5 Ethical Considerations

The purpose and procedures of the study were explained to all participants, and written informed consent was obtained before participation. Participation was voluntary, confidentiality was maintained, and participants were informed of their right to withdraw at any time.

4. Results

The descriptive findings indicated improvement in both pain intensity and functional disability following the exercise interventions. All ten participants demonstrated a reduction in Visual Analog Scale scores. The reduction ranged from 3 to 4 points. Oswestry Disability Index scores decreased by 12 to 14 percentage points in all participants.

The five participants who received movement control exercises had pre-intervention Visual Analog Scale scores ranging from 5 to 8 and post-intervention scores ranging from 2 to 4. Their Oswestry Disability Index scores decreased from a range of 24–30% to 10–16%. The five participants who received stabilization exercises had pre-intervention Visual Analog Scale scores ranging from 6 to 8 and post-intervention scores ranging from 2 to 4. Their Oswestry Disability Index scores decreased from a range of 26–32% to 12–18%.

The findings are presented descriptively because the project was conducted as a small case series and no inferential statistical testing was reported.

Table 1: Individual Pre- and Post-Intervention Outcome Scores

Case	Age	Sex	Intervention	VAS Pre	VAS Post	ODI Pre (%)	ODI Post (%)
1	23	Female	Movement control	6	2	26	12
2	23	Male	Movement control	7	3	28	14
3	24	Female	Movement control	6	2	26	12
4	24	Male	Movement control	8	4	30	16
5	23	Male	Movement	5	2	24	10

			control				
6	23	Female	Stabilization	7	3	28	14
7	20	Male	Stabilization	8	4	32	18
8	23	Female	Stabilization	7	3	26	14
9	19	Male	Stabilization	8	4	30	16
10	23	Female	Stabilization	6	2	26	12

5. Discussion

The present case series demonstrated that both movement control and stabilization exercises were associated with improvements in pain intensity and functional disability among individuals with non-specific low back pain. The findings are consistent with the multidimensional understanding of non-specific low back pain, in which impaired neuromuscular control, altered movement strategies, and reduced trunk muscle performance may contribute to symptoms and functional limitation.

Movement control exercises emphasize the correction of faulty lumbopelvic movement and the development of precise, coordinated movement during both supported and functional tasks. In the present series, participants receiving movement control exercises showed reductions in Visual Analog Scale and Oswestry Disability Index scores. Previous research has suggested that individualized movement control exercises may improve movement quality, coordination, and disability, particularly when exercises are selected according to the individual's movement impairment pattern [16, 22, 24].

Stabilization exercises focus on improving the activation and endurance of deep trunk muscles and enhancing active spinal support. The stabilization group also demonstrated reductions in pain and disability. These findings correspond with reports that stabilization exercises may improve trunk muscle performance, proprioception, postural stability, and functional ability in individuals with chronic non-specific low back pain [18, 19].

In the current dataset, the descriptive changes appeared slightly greater in some movement control outcomes; however, this observation should not be interpreted as proof of superiority. The small sample size, absence of a control group, short intervention period, and lack of inferential statistical testing limit the ability to determine whether one intervention is more effective than the other. Systematic reviews have similarly emphasized that motor control exercises are beneficial but are not consistently superior to other exercise interventions, supporting individualized treatment selection [15, 21].

The clinical implication is that movement control and stabilization exercises may be used as complementary approaches. Movement control exercises may be prioritized when faulty movement patterns and poor lumbopelvic coordination are prominent, whereas stabilization exercises may be emphasized when reduced trunk endurance and impaired active spinal support are identified. A combined and individualized programme may address both movement precision and muscular stability.

6. Limitations

The study had several limitations. The sample consisted of only ten participants, and the case series design did not include a separate non-exercise control group. The intervention period was relatively short, and long-term follow-up was not reported. The study also relied on descriptive pre- and post-intervention comparisons, and no inferential statistical analysis was performed. Therefore, the findings should be interpreted as preliminary observations rather than definitive evidence of comparative effectiveness.

7. Conclusion

Within the limitations of this case series, both movement control and stabilization exercises were associated with reductions in pain intensity and functional disability among individuals with non-specific low back pain. Movement control exercises addressed movement coordination and faulty movement patterns, while stabilization exercises focused on trunk muscle activation and spinal support. These findings support the use of individualized exercise programmes that are selected according to the specific movement and stability impairments of each patient. Larger controlled studies with longer follow-up are recommended to establish comparative effectiveness.

9. Acknowledgement

The authors acknowledge the support and guidance provided by the faculty and staff of Laxmi Memorial College of Physiotherapy, Mangalore, and express gratitude to all participants who contributed to the study.

Libin George Babu is an Associate Professor at Laxmi Memorial College of Physiotherapy, Mangalore.

Nimmy A is an Assistant Professor at Laxmi Memorial College of Physiotherapy, Mangalore.

Jasna Mariam John is a Bachelor of Physiotherapy student at Laxmi Memorial College of Physiotherapy, Mangalore.

11. References

1. Hartvigsen J, Hancock MJ, Kongsted A, Louw Q, Ferreira ML, Genevay S, et al. What low back pain is and why we need to pay attention. *The Lancet*, 2018, 391 (10137), 2356–2367.
2. Maher C, Underwood M, Buchbinder R. Non-specific low back pain. *The Lancet*, 2017, 389 (10070), 736–747.
3. Hoy D, Bain C, Williams G, March L, Brooks P, Blyth F, et al. A systematic review of the global prevalence of low back pain. *Arthritis and Rheumatism*, 2012, 64 (6), 2028–2037.
4. Wu A, March L, Zheng X, Huang J, Wang X, Zhao J, et al. Global low back pain prevalence and years lived with disability from 1990 to 2017. *Annals of Translational Medicine*, 2020, 8 (6), 299.
5. Balagué F, Mannion AF, Pellisé F, Cedraschi C. Non-specific low back pain. *The Lancet*, 2012, 379 (9814), 482–491.
6. O’Sullivan P. Diagnosis and classification of chronic low back pain disorders: maladaptive movement and motor control impairments. *Manual Therapy*, 2005, 10 (4), 242–255.
7. Hodges PW, Moseley GL. Pain and motor control of the lumbopelvic region: effect and possible mechanisms. *Journal of Electromyography and Kinesiology*, 2003, 13 (4), 361–370.
8. Panjabi MM. The stabilizing system of the spine. Part I: function, dysfunction, adaptation, and enhancement. *Journal of Spinal Disorders*, 1992, 5 (4), 383–389.
9. van Dieën JH, Selen LPJ, Cholewicki J. Trunk muscle activation in low back pain patients. *Journal of Electromyography and Kinesiology*, 2003, 13 (4), 333–351.
10. Laird RA, Gilbert J, Kent P, Keating JL. Comparing lumbo-pelvic kinematics in people with and without back pain. *BMC Musculoskeletal Disorders*, 2014, 15, 229.
11. Shum GL, Crosbie J, Lee RYW. Movement coordination of the lumbar spine and hip during bending in people with and without low back pain. *Clinical Biomechanics*, 2005, 20 (6), 580–587.
12. Luomajoki H, Kool J, de Bruin ED, Airaksinen O. Movement control tests of the low back: evaluation of reliability and validity. *BMC Musculoskeletal Disorders*, 2008, 9, 170.

13. Richardson CA, Hodges PW, Hides JA. Therapeutic Exercise for Lumbopelvic Stabilization: A Motor Control Approach. 2nd ed. Edinburgh: Churchill Livingstone, 2004.
14. Ferreira PH, Ferreira ML, Maher CG, Herbert RD, Refshauge K. Specific stabilization exercise for spinal and pelvic pain: systematic review. *Australian Journal of Physiotherapy*, 2006, 52 (2), 79–88.
15. Saragiotto BT, Maher CG, Yamato TP, Costa LO, Menezes Costa LC, Ostelo RW, et al. Motor control exercise for chronic non-specific low back pain. *Cochrane Database of Systematic Reviews*, 2016, (1), CD012004.
16. Shankar Ganesh GS, et al. Motor control exercise in chronic non-specific low back pain with central sensitization: a randomized controlled trial protocol, 2023.
17. Zhang C, et al. Effects of motor control exercise on chronic low back pain: a systematic review and meta-analysis. *Journal of Pain Research*, 2021, 14, 123–135.
18. Sengul YS, et al. Effects of stabilization exercises in patients with chronic non-specific low back pain: a randomized controlled trial. *Journal of Back and Musculoskeletal Rehabilitation*, 2021, 34 (3), 1–8.
19. Puntumetakul R, et al. Effects of core stabilization exercise on lumbar joint position sense in patients with chronic low back pain. *Journal of Physical Therapy Science*, 2018, 30 (1), 1–6.
20. Dankaerts W, et al. Movement control and stabilization exercises in extension-related low back pain: a pilot randomized controlled trial. *Manual Therapy*, 2017, 26, 212–220.
21. Lehtola V, et al. Movement control exercises in subacute non-specific low back pain: a randomized controlled trial. *BMC Musculoskeletal Disorders*, 2016, 17, 1–10.
22. Aasa B, Berglund L, Michaelson P, Aasa U. Motor control exercise compared with high-load lifting exercise in patients with chronic low back pain: a randomized controlled trial. *Spine*, 2015, 40 (23), 1–10.
23. Saner J, et al. Movement control exercise versus general exercise to reduce disability in patients with low back pain: a randomized controlled trial. *BMC Musculoskeletal Disorders*, 2015, 16, 1–9.
24. Costa LOP, et al. Motor control exercise for chronic low back pain: a randomized placebo-controlled trial. *Physical Therapy*, 2012, 92 (3), 363–377.