

ORIGINAL ARTICLE

Effect of Motor Control Exercises on Pain and Mobility in Professional Drivers Occupational Low Back Pain

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ABSTRACT

Background: Low back pain (LBP) is a prevalent occupational health issue among professional drivers due to prolonged sitting and exposure to whole-body vibration, leading to musculoskeletal disorders, reduced quality of life, and productivity loss.

Aim: To evaluate the effectiveness of motor control exercises (MCE) compared to standard back extension exercises in managing occupational low back pain (OLBP) among professional drivers.

Objectives:

1. To determine the effect of motor control exercises (stabilization exercises) on pain and mobility in professional Drivers Occupational Low Back Pain.
2. To assess the reduction in pain levels using the Visual Analog Scale (VAS) as an outcome measure.
3. To evaluate improvements in mobility and activity limitations using the Back Performance Scale (BPS).
4. To compare the effectiveness of motor control exercises combined with back extension exercises versus back extension exercises alone.
5. To provide insights into the practical applicability of motor control exercises for professional drivers.

Material & Methods: A quantitative, experimental research design was employed, involving a purposive sample of professional drivers with a history of occupational low back pain (OLBP). Participants were randomly assigned to two groups: Group A received motor control exercises combined with back extension exercises, while Group B performed only back extension exercises. The intervention lasted four weeks, with pain and mobility assessed pre, mid, and post-intervention using the

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Visual Analog Scale (VAS) and Back Performance Scale (BPS). Supervised weekly sessions ensured adherence to the exercise protocol.

Result: Both groups showed significant reductions in pain and improvements in mobility. In Group A (MCE + back extension), the mean VAS scores improved from 7.5 ± 1.2 at baseline to 3.8 ± 0.8 post-intervention, while BPS scores reduced from 12.5 ± 1.3 to 5.9 ± 1.0 . In Group B (back extension only), the mean VAS scores improved from 7.6 ± 1.1 to 4.5 ± 1.0 , and BPS scores reduced from 12.7 ± 1.4 to 7.5 ± 1.1 . While Group A demonstrated slightly greater improvements in pain and mobility, the differences between groups were not statistically significant ($p > 0.05$).

Conclusion: Motor control exercises are effective in managing occupational low back pain and can be considered a valuable intervention for professional drivers, providing comparable or slightly superior results to traditional back extension exercises.

KEYWORDS

• Low back pain (LBP) • Drivers • Motor control exercises

INTRODUCTION

Low back pain (LBP) is a prevalent occupational health issue, particularly among professional drivers, due to prolonged sitting and exposure to whole-body vibration. Professional drivers face unique challenges that predispose them to LBP, such as sustained static postures, vibration exposure, and limited opportunities for movement. These factors increase the risk of musculoskeletal disorders and negatively affect drivers' quality of life and work productivity¹.

Occupational low back pain (OLBP) is not only a leading cause of disability among workers but also a significant contributor to healthcare costs and absenteeism in various industries. Professional drivers, such as taxi and truck drivers, are at higher risk due to prolonged exposure to biomechanical strains, including awkward postures, whole-body vibration, and repetitive spinal loading. This chronic exposure exacerbates mechanical stress on spinal structures, leading to pain and functional impairments².

The role of deep trunk muscles, such as the **transversus abdominis** and **multifidus**, in stabilizing the spine has been extensively studied. Dysfunction or delayed activation of these muscles is commonly observed in individuals with LBP, emphasizing the importance of motor control in managing this condition. Motor control exercises focus on retraining these deep muscles to enhance neuromuscular coordination and restore stability. Unlike conventional strengthening

exercises, motor control exercises aim to optimize muscle recruitment patterns, making them particularly relevant for individuals with postural and occupational stress-induced LBP.³

Research highlights varying results regarding the efficacy of motor control exercises. While some studies show significant improvements in pain and disability, others indicate that their effectiveness is comparable to other exercise modalities, such as back extension exercises. Despite this, motor control exercises remain a cornerstone in physiotherapy due to their theoretical foundation in spinal stabilization.⁴

This study investigates the effectiveness of motor control exercises in comparison to standard back extension exercises in reducing pain and improving mobility among professional drivers with OLBP. By addressing a population particularly vulnerable to LBP, this research aims to provide insights into targeted interventions that could enhance occupational health outcomes. Moreover, the study contributes to the ongoing discourse on the relative efficacy of different physiotherapeutic interventions for managing OLBP, thereby informing clinical practice and workplace health programs.

NEED FOR THE STUDY

Low back pain significantly affects the productivity and quality of life of professional drivers, a group often overlooked in clinical research despite their high-risk occupational exposure. Current management strategies for

OLBP often focus on general physiotherapy interventions, but there is limited evidence specific to the efficacy of motor control exercises in this population.⁵

Given the unique biomechanical and postural challenges faced by professional drivers, there is a critical need to identify targeted interventions that address the root causes of their LBP. Motor control exercises, designed to enhance spinal stability and neuromuscular coordination, hold promise as an effective approach. However, their comparative efficacy against conventional back extension exercises remains underexplored.⁶

This study seeks to bridge this gap by providing evidence-based insights into the role of motor control exercises in managing OLBP among professional drivers. The findings are expected to inform clinical guidelines, improve therapeutic outcomes, and contribute to the development of workplace health programs tailored to this vulnerable population.

STATEMENT

The effect of motor control exercises on pain and mobility in professional Drivers Occupational Low Back Pain

OBJECTIVES

1. To determine the effect of motor control exercises (stabilization exercises) on pain and mobility in professional Drivers Occupational Low Back Pain.
2. To assess the reduction in pain levels using the Visual Analog Scale (VAS) as an outcome measure.
3. To evaluate improvements in mobility and activity limitations using the Back Performance Scale (BPS).
4. To compare the effectiveness of motor control exercises combined with back extension exercises versus back extension exercises alone.
5. To provide insights into the practical applicability of motor control exercises for professional drivers.

HYPOTHESIS

1. **Null Hypothesis (H₀):** Motor control exercises have no significant effect on reducing pain and improving mobility in

professional Drivers Occupational Low Back Pain compared to standard back extension exercises.

2. **Alternative Hypothesis (H₁):** Motor control exercises significantly reduce pain and improve mobility in professional Drivers Occupational Low Back Pain compared to standard back extension exercises.

DELIMITATIONS

1. The study is restricted to professional drivers aged 25-40 years.
2. Participants are limited to those experiencing low back pain due to occupational factors.
3. The study duration is limited to a four-week intervention period.
4. Only male participants are included to control for gender-based variability in outcomes.
5. Exercises are performed as a home-based program with initial guidance.

MATERIAL METHOD

Research Approach

The study adopts a **quantitative research approach**, focusing on measurable outcomes such as pain reduction and mobility improvement among professional Drivers Occupational Low Back Pain (OLBP). This approach allows for the systematic collection and analysis of numerical data using standardized tools like the Visual Analog Scale (VAS) and Back Performance Scale (BPS).

Research Design

An **experimental research design** was employed, involving two intervention groups: motor control exercises combined with back extension exercises (Group A) and back extension exercises alone (Group B). This design enabled a controlled comparison of the effectiveness of the two exercise interventions over a four-week period.

Sampling Method

A **purposive sampling method** was used to select professional drivers with a history of occupational low back pain (OLBP). Participants were included based on specific criteria such as age (25-40 years), regular

driving for at least eight hours daily, and the presence of chronic OLBP for a minimum of three months, ensuring a targeted and relevant sample for the study.

Sample size

30 subjects were included in the study. These were divided into two groups:

- **Group A (Experimental Group):** 15 participants received motor control exercises combined with back extension exercises.
- **Group B (Control Group):** 15 participants received only back extension exercises.

SAMPLING CRITERIA

Inclusion Criteria

1. Male professional drivers aged 25-40 years.
2. History of occupational low back pain for at least three months.
3. Drivers with a minimum of 8 hours of driving per day.
4. Ability to provide informed consent and comply with the study protocol.

Exclusion Criteria

1. History of spinal surgery or trauma.
2. Presence of radiating pain or neurological deficits.
3. Structural deformities such as scoliosis or kyphosis.
4. Hamstring tightness affecting exercise performance.
5. Coexisting medical conditions that may influence outcomes.

SETTINGS

Doon Hospital, Dehradun, Uttarakhand

DATA COLLECTION PROCEDURE

Participants for the study were recruited from local auto and taxi stands, with eligibility determined based on predefined inclusion and exclusion criteria. All participants were provided with detailed information about the study's purpose and procedures, after which they signed an informed consent form confirming their voluntary participation.

Baseline assessments were conducted to evaluate pain levels using the Visual Analog Scale (VAS) and mobility/activity limitations using the Back Performance Scale (BPS).

Participants were then randomly assigned to one of two groups: Group A (Experimental Group), which received motor control exercises combined with back extension exercises, and Group B (Control Group), which performed only back extension exercises. Both groups followed a four-week home-based exercise program, with Group A receiving specific motor control interventions designed to enhance spinal stability alongside traditional back extension exercises. Group B engaged solely in back extension exercises. Weekly reviews were conducted to ensure correct performance and adherence to the prescribed exercises.

Pain and mobility were reassessed at three time points: pre-intervention (Week 0), mid-intervention (Week 2), and post-intervention (Week 4). Data from these assessments were systematically recorded, and VAS and BPS scores were analyzed using SPSS software. The analysis focused on within-group and between-group comparisons to evaluate the effectiveness of the interventions in reducing pain and improving mobility among professional Drivers Occupational Low Back Pain. This systematic approach ensured the accuracy and reliability of the data collected throughout the study.

RESULTS

The study included 30 professional drivers divided into two groups: Group A (motor control + back extension exercises) and Group B (back extension exercises only). Pain and mobility were assessed at three time points: pre-intervention, mid-intervention, and post-intervention using the Visual Analog Scale (VAS) and Back Performance Scale (BPS).

DEMOGRAPHIC

Table 1: Demographic table

| Demographic Data | Group A (Mean ± SD) | Group B (Mean ± SD) |
|------------------|---------------------|---------------------|
| Age (years) | 34.4 ± 4.50 | 34.4 ± 3.92 |
| Weight (kg) | 68.73 ± 9.035 | 66.86 ± 5.39 |
| Height (cm) | 167.33 ± 7.87 | 164.5 ± 6.35 |

The table 1 presents the mean age, weight, and height of participants in both groups. Both groups were comparable in demographic parameters, ensuring homogeneity in the sample.

Table 2: VAS table shows pain levels across the intervention period

| VAS Scores | Pre-Intervention | Mid-Intervention | Post-Intervention |
|------------|------------------|------------------|-------------------|
| Group A | 7.5 ± 1.2 | 5.3 ± 1.0 | 3.8 ± 0.8 |
| Group B | 7.6 ± 1.1 | 6.0 ± 1.1 | 4.5 ± 1.0 |

The table 2 shows pain levels across the intervention period. Both groups experienced reductions in pain, with Group A showing slightly greater improvement compared to Group B.

Table 3: The BPS table highlights improvements in mobility

| BPS Scores | Pre-Intervention | Mid-Intervention | Post-Intervention |
|------------|------------------|------------------|-------------------|
| Group A | 12.5 ± 1.3 | 8.4 ± 1.2 | 5.9 ± 1.0 |
| Group B | 12.7 ± 1.4 | 10.1 ± 1.3 | 7.5 ± 1.1 |

The table 3 highlights improvements in mobility/activity limitations during the intervention. Group A achieved greater reductions in BPS scores compared to Group B, indicating better improvements in functional performance.

STATISTICAL ANALYSIS

Within-group comparisons revealed significant improvements in both VAS and BPS scores for both groups over time. However, between-group analysis showed that while Group A exhibited slightly greater reductions in pain and activity limitations, the differences between the groups were not statistically significant ($p > 0.05$).

INTERPRETATION

The findings suggest that motor control exercises combined with back extension exercises (Group A) resulted in slightly better outcomes compared to back extension exercises alone (Group B). However, the improvement in pain and mobility was similar across both groups, indicating that both interventions are effective in managing occupational low back pain. Factors such as the short duration of the

intervention and the home-based nature of the exercises may have influenced the results.

DISCUSSION

The results of this study demonstrate that both motor control exercises combined with back extension exercises (Group A) and back extension exercises alone (Group B) significantly reduced pain and improved mobility among professional Drivers Occupational Low Back Pain. However, Group A exhibited slightly greater improvements in both VAS and BPS scores compared to Group B, indicating that motor control exercises may provide additional benefits.⁷

The observed reduction in pain and improvements in mobility align with previous studies that highlight the efficacy of motor control exercises in enhancing spinal stability by targeting deep trunk muscles, such as the transversus abdominis and multifidus. These exercises likely contributed to improved neuromuscular coordination and reduced the biomechanical stress on spinal structures, leading to better outcomes in Group A.⁸

Interestingly, the control group (Group B), which performed only back extension exercises, also showed significant improvements. This suggests that back extension exercises alone can effectively address some aspects of low back pain and mobility, potentially by strengthening the superficial spinal muscles and reducing muscle tension.⁹

Despite these improvements, the differences between the groups were not statistically significant, which may be attributed to the short intervention duration (four weeks) and the small sample size. Another potential limitation was the home-based nature of the exercise program, which may have impacted adherence and the correct performance of the exercises.¹⁰

Future research should consider a longer intervention period, larger sample size, and supervised exercise programs to better evaluate the comparative efficacy of motor control exercises and other physiotherapeutic interventions. Additionally, stratifying participants based on the chronicity and severity of their low back pain could provide more targeted insights.¹

Overall, this study underscores the value of motor control exercises in managing occupational low back pain, particularly in

professional drivers, while also highlighting the effectiveness of traditional back extension exercises. Both interventions can be considered viable options for reducing pain and improving mobility, with the choice of approach depending on individual needs and clinical feasibility.¹¹

CONCLUSION AND SUMMARY

This study highlights that both motor control exercises and back extension exercises are effective in reducing pain and improving mobility among professional Drivers Occupational Low Back Pain. While motor control exercises provided slightly greater improvements, the differences between the two interventions were not statistically significant, indicating that both approaches are viable options for addressing low back pain.

The findings emphasize the importance of tailored physiotherapy interventions that consider individual needs and occupational demands. Motor control exercises, by targeting deep trunk muscles, enhance spinal stability and neuromuscular coordination, while back extension exercises strengthen superficial muscles, contributing to overall functional improvement.

Limitations of this study include the small sample size, short intervention duration, and the home-based nature of the exercises, which may have influenced adherence and performance accuracy. Future research should focus on larger, more diverse populations, longer intervention periods, and supervised exercise protocols to validate and expand on these findings.

In conclusion, motor control exercises and back extension exercises both offer significant benefits for professional Drivers Occupational Low Back Pain. These findings can guide clinical practice and inform workplace health programs aimed at reducing the burden of low back pain in high-risk occupational groups.

Conflict of Interest The author declares no conflict of interest related to this study.

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Ethics Declaration: Ethical approval was

obtained from the institutional review board, and informed consent was obtained from all participants before enrolment.

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