

Effectiveness of Core Muscle Strengthening in Bus Drivers having Low Back Pain using McGill Pain Questionnaire: Experimental Study

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Abstract

Background: This study was developed to determine the effectiveness of core muscle strengthening exercises in reducing low back pain among bus drivers.

Purpose: The purpose of the study is to determine the effectiveness of core muscle strengthening exercises in reducing low back pain among bus drivers.

Materials and Methods: The research project was conducted as a Quasi experimental study in Saveetha college of physiotherapy, Thandalam Chennai and RK Multispecialty physiotherapy clinic, Ayanavaram, Chennai. The interventional group received core muscle strengthening exercise for 6 weeks. Following the six-week treatment period, a post-test analysis was performed using the McGill Pain Questionnaire. **Study period:** from November 2022 to July 2023.

Results: The values were statistically analysed using paired 't-test and the Unpaired 't-test. The statistical analysis made with the quantitative data revealed a statistically significant difference before and after the intervention. The pre-test mean value of the Mc gill questionnaire scale was 55.53 and the post-test value was 19.60. This shows that the result value obtained for disability is less after the intervention.

Conclusion: From this result, it has been concluded that there is significant reduction in low back pain among bus drivers after the intervention.

Key Words: Low back pain, Core strengthening exercises, McGill Pain Questionnaire.

Introduction

Discomfort felt between the inferior gluteal folds and the 12th rib is referred to as "low back pain" (LBP), whether or not it is accompanied by leg pain.¹ One of the most frequent medical disorders in primary care is low back pain. Acute back pain has a rapid start

and lasts less than six weeks, while low back pain lasts between six and twelve weeks.² Chronic back pain appears for a length longer than or equivalent to twelve weeks. It is expected that between 70% and 85% of people may experience low back discomfort at some point in their lives. Ninety percent of these

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individuals will have several episodes. There is evidence that low back pain can impair function significantly, making it challenging to complete daily chores, and be dangerous.³ Low back pain can result from muscular strains brought on by stretching, disc injuries, sciatica, spinal stenosis, aberrant spinal curves like scoliosis and kyphosis, as well as other disorders including arthritis and spondylitis.⁴

Workplace musculoskeletal conditions, especially low back pain, have a major financial impact on both the individual and the community. Low back pain has drawn the greatest attention among the different work-related musculoskeletal conditions that may be related to professional driving. Male truck drivers had a four times higher risk than sedentary employees of getting a herniated lumbar disc, and motor coach drivers were more likely to experience back or neck pain than non-drivers, reporting it 80% more frequently.⁵

It's significant that ergonomic and psychosocial risk variables are connected to occupational musculoskeletal disorders in professional drivers.⁶ The most frequently stated physical concerns are prolonged periods of sitting, whole-body vibration, ergonomic mismatch among drivers, the type of car seat, and driving mechanics. Personal traits like age, gender, height, weight, and body mass index have an impact on the illnesses associated with drivers' work.⁷

The primary muscle group in charge of preserving spinal stability is the core muscles, which can be separated into two categories based on their functions and characteristics. The main muscles in this group are the transversus abdominis, lumbar multifidus, internal oblique muscle, and quadratus lumborum. The transversus abdominis and lumbar multifidus work together to form a co-contraction mechanism, and each lumbar spinal segment and the lumbar multifidus are physically related. The abdominal draw-in that is caused by a contraction stabilizes and keeps the segments of the spine in a neutral position.⁸ The rectus abdominis, quadratus lumborum, internal and external oblique muscles, erector spinae, and hip muscle groups make up the weak abdominal muscles. By connecting the pelvic girdle to the thoracic segments rather than being directly linked to the spine, these muscles provide

the spine more control. Therefore, the fundamental function of this group of muscles is to keep the spine stable. Stronger core muscles have a greater ability to produce torque, which can be used to counteract forces acting on the spine.⁹ Exercises for segmental stabilization that emphasize the transversus abdominis and lumbar multifidus enhance spine stability. Subjects learned to contract their muscles while gradually extending breathing normally for 10 seconds while executing 10 contractions. Dynamic activities were then performed by the participants.¹⁰

Aim

The purpose of the study is to determine whether core strengthening activities can help bus drivers with low back pain

Material and Methods

Quasi experimental study was carried out with 30 subjects who have given their informed consent after being selected based on inclusion and exclusion criteria. The subjects were assigned into a single group through convenient sampling and the treatment protocol was given accordingly.

Study period: from November 2022 to March 2023.

Inclusion Criteria:

1. Bus drivers with low back pain
2. Subjects above 30-55 years of age
3. Driving more than 8 hours per day
4. Working for >5 years

Exclusion Criteria:

1. Drivers with history of road accidents
2. Any recent nerve injury
3. Recent fractures and surgeries.

Outcome Measure:

The three main classes of word descriptors sensory, emotional, and evaluative that patients employ to describe their subjective pain experiences constitute the foundation of the McGill Pain Questionnaire.

In order to assess the characteristics of pain experience, it also includes a scale for severity and

other factors. The purpose of the questionnaire was to collect quantitative data about clinical pain that could be statistically analysed. The administration of the questionnaire and the numerous metrics that can be generated from it are both described in this study. The three main metrics are the following: (1) the pain rating index, which is based on two separate numerical values that can be applied to each word description; (2) the number of words selected; and (3) the present pain intensity, which is based on a scale of 1 to 5.

Procedure

The subjects (n=30) received core strengthening exercises for 1 session 5 days/week for 6 weeks. Subjects were reassessed by a physiotherapist after the end of the 4th week to measure the degree of low back pain.

The Mc Gill pain questionnaire was used to evaluate how much pain each study subject was experiencing. All the subjects underwent pre- test measurements with a Mc Gill questionnaire. The post-test measurements were taken at the end of 6th week of intervention with the questionnaire.

Treatment protocol: Core strengthening exercises.

1. Pelvic bridges:

Pelvic bridges activate gluteal muscles to lift the hips which helps in core training by training the gluteus muscles and hip muscles. The subject is asked to lie on their back, bend both the knees and with feet hip width apart on the ground. The subject is instructed to place hands at the sides with palms facing inward. Then ask to raise the hips till the knees and shoulders are aligned. The position is held for 10 to 30 seconds and repeated for 10 times per session.

2. Crunches:

Crunches are the traditional core strengthening exercises. The subjects are instructed to lie on their back initially, then kneeling down with feet and hip wide apart on the ground. Spine and head are placed in an order with arms crossed across the chest. The subjects are then instructed to relax neck shoulders maintaining core stability. Then the back, pelvis and feet are maintained flat, tucking the chin and lifting

the upper back, returning to the starting position by lowering the upper back gradually. The position is held for 10 to 30 seconds and repeated for 10 times per session.

3. Straight leg raise:

Straight leg raising exercises are effective core strengthening exercises that use hip performance in increasing the core strength. The subjects are instructed to lie on the mat and spread their legs comfortably. Then lift the straight leg six inches off the ground with a 3 second hold while taking slow, deep breath. The patients are guided to exhale while slowly lowering to the ground. Relax and repeat the same with the other leg. This exercise is to be repeated 10 times per session.

4. Cat and Camel:

The Cat Camel exercise works on stretching and strengthening core muscles as well as mobilizing and stretching the trunk. The subjects should begin with a quadruple position with knees and wrists positioned beneath shoulders. Hip, spine, and shoulder are aligned with spine in neutral.

- Cat pose: The subjects are asked to draw the back towards the floor with neck lifted towards the ceiling with a curvature of spine with a deep inhalation.
- Camel pose: Now exhale with chin and tailbone tucked in as if looking towards the floor. Spine is raised towards the ceiling making a hump.

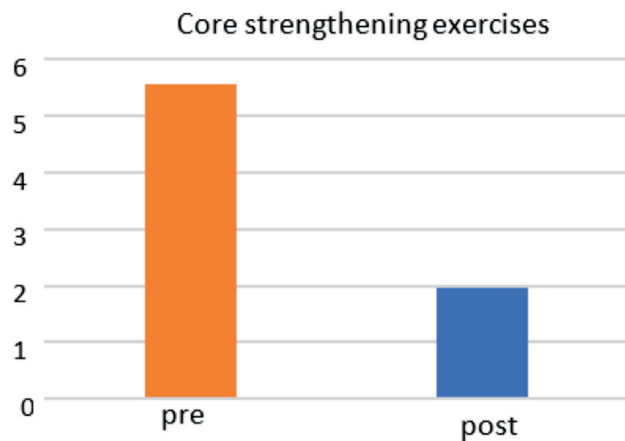
Repeat both the cat and camel pose for 10 times while holding each position for 10 to 30 seconds per each session.

5. Squats:

The subjects are instructed to begin the exercise with feet slightly wider than hip width apart and slightly pointed outward. Abdominals are engaged and weight is shifted to the heels with hips back and chest up, lowering into a squat. Then the heels are pushed to stand back up to the starting posture keeping the chest and core firm squeezing the gluteus muscles. Relax and repeat the exercise for 10 times per session.

Data Analysis

Using tabular and inferential statistics, the gathered data was evaluated. The mean and standard deviation (SD) were utilized for all parameters. The statistically significant differences between pre-test and post-test measures were examined using a paired t-test. The significance level of $p < 0.0001$ was determined to be statistically significant.



Graph - Pre and post-test mean values of McGill Questionnaire

Results

The statistical analysis made with the quantitative data obtained from the Mc Gill pain questionnaire revealed statistically noteworthy differences between the measurements taken before and after the test in bus drivers with low back pain. The pre-test mean value of the group before the intervention was 55.53 and the post-test measurement obtained after the intervention was 19.60.

Discussion

The pre and post-test values of the intervention group were analyzed statistically. The statistical analysis revealed a significant difference between pre-test and post-test measurements. The post-test mean value of the Mc gill questionnaire scale among bus drivers with low back pain was 19.60. This shows that the result value for pain has been significantly low compared to the pre-test value. Identical research studies have been done, and the similar findings are as follows:

During the first three months of low back pain intervention, core exercises outperformed general

exercise that showed reduced VAS scoring (from 10 to 7) significantly at the end of the intervention, according to Wang et al's comprehensive review.¹¹ relearning the motor control of blocked muscles may be more crucial for LBP patients than core strengthening, according to Akuthota and Nadler. In this instance, it's possible that performance gains come from better neuronal recruitment and coordination rather than particular gains in stability or strength in the core.¹²

Over the course of the 12-week research by Wang, Xin, the lumbar muscle endurance of the experimental group was superior in which core training program was given. [200.80 92.98] The VAS score did not differ substantially, however the core group's Roland Morris Disability Questionnaire score at week 12 was considerably lower (3.33 0.58) The results of this study showed that the CMFST significantly decreased the prevalence of LBP, enhanced lumbar muscle endurance, and alleviated LBP-related dysfunction during military training.¹³

The findings of Goldby et al., who found that targeted core exercise; spinal stabilization for 10 weeks reduced pain in CLBP patients using VAS, and those of Koumantaki's Research demonstrated that individuals with low back pain continued to experience a significant pain reduction three months after using stabilization-enhanced core exercise.¹⁴ Through a decreased risk of segmental buckling, Nadler et al.'s research looked at how core strengthening affects hip muscle imbalance and LBP in trained athletes. The subjects underwent core-strengthening program that included isolated abdominal strengthening squats and lunges, leg presses and strength training with free weights which showed rapid reduction in VAS after the intervention along with increased strength when observed using force plate dynamometer.¹⁵ According to the study conducted by Cosio-Lima, Core strengthening exercises along with swiss ball training for 5 weeks showed increased muscle activity but no increase in the strength when observed using EMG for analysing muscle activity.¹⁶

The impact of a core strengthening program on 45 rowers over the course of eight weeks, two days per week, for 30 to 40 minutes, was examined by Tse et al. which showed that the core group's side flexion

tests had significantly improved; thereby increasing the ROM.¹⁷

Therefore, this study is evident showing that core strengthening exercises are effective in reducing pain and improving the strength which can be assessed using Mc Gill pain questionnaire. According to the findings, the core strengthening program may be an efficient way to manage bus drivers with low back pain and encourage a healthy lifestyle.

Conclusion

From this result, it has been concluded that Core strengthening exercises are effective in reducing low back pain among bus drivers and improving the strength of the low back muscles, thereby leading to faster recovery.

Ethical clearance: The ISRB committee of a private hospital and institution in Chennai has provided its clearance for the conduct of human research that complies with all applicable national laws, institutional regulations. (Application Number 03/049/2022/ISRB/SR/SCPT).

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