



PREVALENCE OF MOTOR CONTROL IMPAIRMENT ALONG WITH DISABILITY IN STUDENTS WITH RECURRENT LOW BACK PAIN

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ABSTRACT

Background: The annual prevalence of low back pain is 42.4% in young adults. After recovering from low back pain 69% of the population experienced a recurrence of low back pain within 12 months.

Aim: To determine the prevalence of motor control impairment in patients with recurrent low back pain.

Methods: A descriptive cross sectional study was conducted in an outpatient physiotherapy department in Parul Sevashram Hospital, Gujrat. The study included 160 subjects (91 females and 69 males) suffering from recurrent low back pain with an average age of 22.91 ± 3.01 years from various medical colleges at Parul University. The level of disability was assessed using the Modified Oswestry Disability Index and 3 active movement tests were used for motor control impairment assessment – Pelvic tilt, Prone Knee Bend, and Sitting Knee Extension.

Results: Based on the Modified Oswestry Disability Index, Mild disability was seen in 54.4% of subjects. Moderate disability was seen in 25.6% of subjects and severe disability was seen in 20% of subjects. Extension control impairment was seen in 8.75% of subjects followed by Rotational control impairment in 15% of subjects. Flexion control impairment was seen in 20.62% of subjects. 26.25% of subjects had flexion and rotational impairment. 1.87% of subjects had Extension and rotation components. 9.38% of subjects had Flexion and extension impairment. 18.13% of subjects suffered from flexion extension and rotational control impairment.

Conclusion: This study concluded that maximum subjects suffered from Flexion Control impairment followed by subjects suffering from both flexion and rotational control impairment.

Keywords: Recurrent Low back pain, Motor control impairment, Prevalence, Movement control tests, Students

INTRODUCTION

Low back pain (LBP) is a highly prevalent condition that affects a significant proportion of adults worldwide. Studies indicate that between 60% to 80% of adults will experience low back pain at some point in their lifetime [1]. In India, the annual prevalence of low back pain is as high as 42.4% among young adults, highlighting the need for effective prevention and treatment strategies [2].

Recurrences are common and can have a substantial impact on an individual's quality of life. Recurrent low back pain is defined as pain that has occurred at least twice within the past year, with each episode lasting for at least 24 hours, and measuring at least 20mm on a 100mm visual analog scale. Furthermore, there should be at least a 30-day pain-free period between episodes. The cumulative probability of a recurrence of an

episode of LBP is 38% by 3 months, 56% by 6 months, and 69% by 12 months [3].

Recent studies have shown that low back pain is not limited to older individuals, and surprisingly, a significant percentage of adolescents also suffer from this condition. According to research, nearly 39.8% of adolescents experience low back pain, which is a significant proportion of the younger population [4]. Medical schools' demanding curriculum can lead to a sedentary lifestyle and increase the risk of lower back pain (LBP). In India, the undergraduate medical program lasts for five and a half years and includes 3820 hours of study time. This prolonged sitting while studying can increase the chances of developing LBP [5]. According to a study conducted by Tatiane Mota da Silva et al, 69% of participants experienced a recurrence of low back pain within one year

after recovery. Of those, 40% experienced activity-limiting low back pain, and 41% sought healthcare for their low back pain. The median time to recurrence was found to be 139 days. The study also identified several predictive factors for the recurrence of low back pain within 12 months, including frequent exposure to awkward postures, sitting for longer than 5 hours per day, and having more than two previous episodes [6].

Motor control impairment (MCI) is a subgroup of students with recurrent low back pain characterized by a loss of neuromuscular control in the lumbar spine [7]. According to O'Sullivan, MCI is a prevalent condition in individuals with recurrent low back pain. Tailored treatment programs that focus on specific motor impairments can be beneficial to such individuals [8]. By identifying the prevalence of MCI in patients with recurrent low back pain, healthcare providers can develop effective treatment strategies that address the underlying cause of the condition, thereby improving patient outcomes. Also identifying the impairment in an early stage can contribute to preventive interventions, potentially reducing the risk of chronic low back pain.

Impaired movement control (MC) and a lack of awareness of maladaptive movement patterns perpetuate low back pain. Back pain patients have reduced MC and excessive

movement acts as a pain provocateur. Maximum students constantly attain a wrong sitting posture which further leads to the recurrence of lower back pain. Detecting the prevalence of specific movement control impairment and training the individual for correction of the impairment will further reduce the burden of recurrence of low back pain. Hence a need for a study to determine specific impairments for a focused treatment approach.

MATERIALS AND METHODS

This study was conducted in the outpatient department of physiotherapy at Parul Sevashram Hospital in Vadodara, Gujrat, to investigate the prevalence of motor control impairment in students with recurrent low back pain. The study also sought to assess the level of disability and motor control impairment in this population.

The sample size was calculated using Yamane's formula: $n = N / (1 + N(e)^2)$ where n = sample size, N = population size, and e = Margin of error. A sample size of 160 from a total population of 267 at a 95% confident interval was calculated. A total of 160 subjects were included in the study, with 91 females and 69 males from various medical colleges within Parul University (Physiotherapy, Homeopathy, and Nursing departments). Participants were required to meet specific inclusion criteria, including experiencing recurrent episodes of low back pain at least twice a year, lasting for 24

hours, and measuring at least 20mm on a 100mm visual analog scale. Exclusion criteria included previous history of spinal surgery or lacking English comprehension to complete the outcome measure. All participants provided informed consent before the study's commencement. The Modified Oswestry Disability Index was used to assess the level of disability and a total of eight motor control tests were used to assess motor control impairment, the three most reliable tests were chosen to assess the presence of motor control impairment.

Pelvic Tilt was used to assess extension control impairment, Prone Knee Bend was used to assess rotational control impairment, and Sitting Knee Extension was used to assess flexion control impairment. Participants were allowed three trials for each test [11].

Motor Control Tests –

1. Pelvic Tilt - Dorsal tilt of the pelvis actively in upright standing.

Normal - Actively in upright standing; keeping the thoracic spine

in neutral, the lumbar spine moves towards Flexion.

Abnormal - Pelvis does not tilt or lower back moves towards Extension or compensatory Flexion in the thoracic spine.

2. Prone Knee Bend – Prone lying active knee flexion.

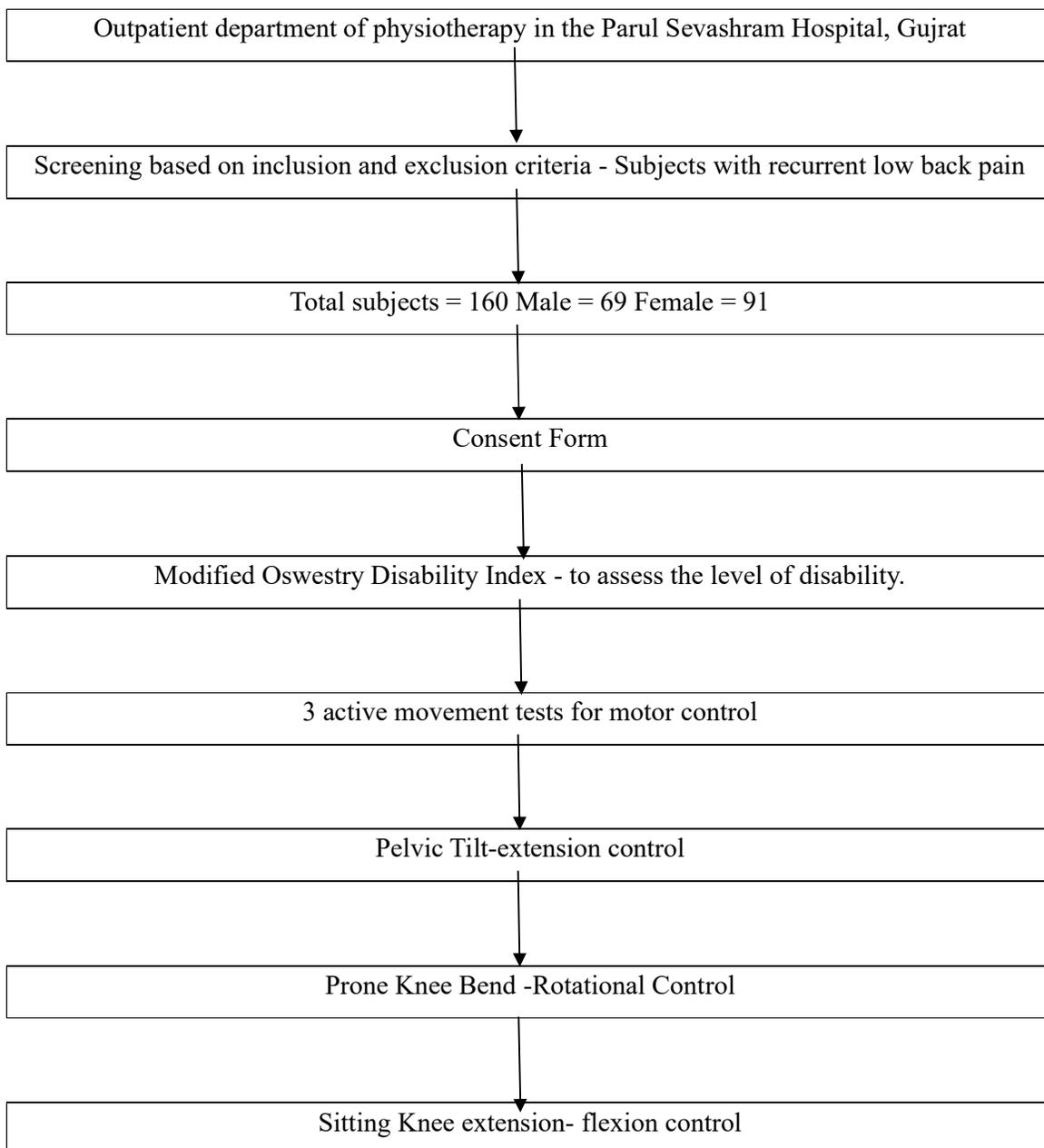
Normal – Prone lying active knee flexion at least 90° without (rotation) movement of the lower back and pelvis.

Abnormal - Pelvis rotates with knee flexion.

3. Sitting Knee Extension - Upright sitting with corrected lumbar lordosis; extension of the knee without movement (flexion) of the lower back.

Normal – Upright sitting with corrected lumbar lordosis; extension of the knee without movement of Low back region (30–50° Extension normal).

Abnormal - Low back moving in flexion. The patient is not aware of the movement of the back.

PROCEDURE**Statistical Analysis –**

After gathering the data, it was arranged in Microsoft Excel, and statistical analysis of the findings was carried out via the Data Analysis feature of Microsoft Excel version 2312.

RESULTS

Out of 160 students, 69 (43.13%) were males and 91 (56.87%) were females. The mean age was 22.9 ± 3.01 years. Based on the Modified Oswestry Disability Index, Mild disability was seen in 54.4% of

subjects. Moderate disability was seen in 25.6% of subjects and severe disability was seen in 20% of subjects. Out of Motor control impairments, the most prevalent was Flexion control impairment seen in 20.62% of subjects followed by Rotational control impairment seen in 15% of subjects, and the least extension control impairment seen in 8.75% of subjects. 26.25% of subjects had

combined flexion and rotational impairment. Another 9.38% of subjects had Flexion and extension impairment. The least found combined impairment seen in 1.87% of subjects was the Extension and rotation component. 18.13% of subjects suffered from flexion-extension and rotational control impairment.

Table 1: Demographic Data

Demographic Data	Mean \pm SD (n=160)
Age	22.9 \pm 3.01 years
18-21 Years	53
22-25 Years	74
26-30 Years	33
Male	69
Female	91

Table 2: Percentage of Disability - Modified Oswestry Disability Index

Severity of Disability	Percentage (%) (n=160)
Mild Disability	54.4%
Moderate Disability	25.6%
Severe Disability	20%

Table 3: Individual Motor Control Impairments in a Subject

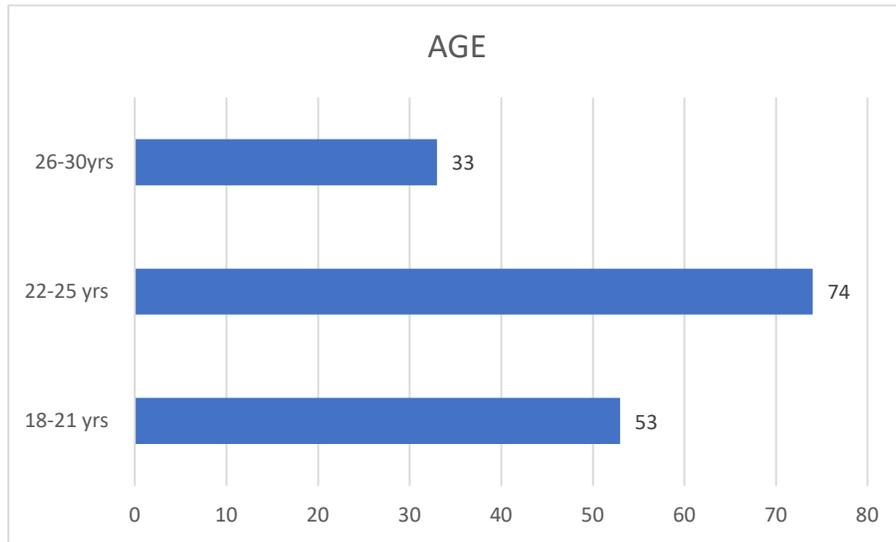
Types of Motor Control Impairment	Percentage (%) (n=160)
Flexion Control Impairment	20.62%
Extension Control Impairment	8.75%
Rotational Control Impairment	15%

Table 4: Combined Motor Control Impairments in a Subject

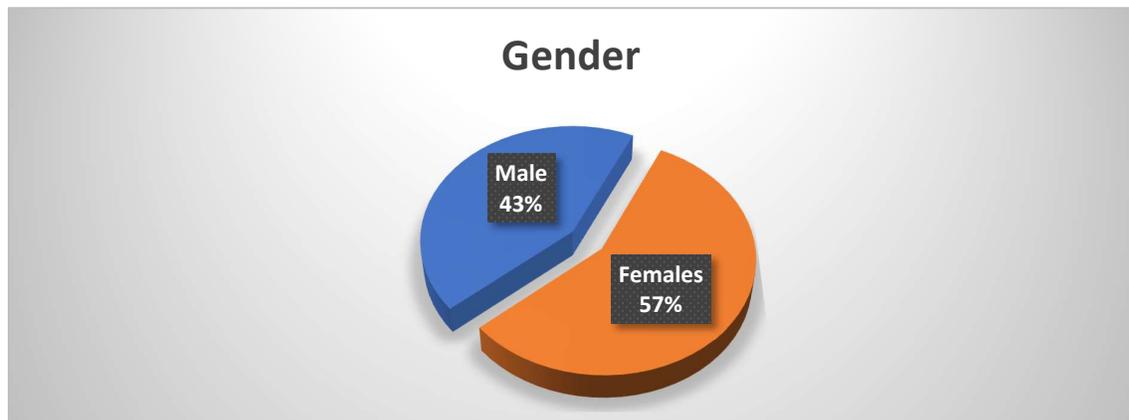
Types of Motor Control Impairment	Percentage (%) (n=160)
Flexion + Extension Control Impairment	9.38%
Extension + Rotational Control Impairment	1.87%
Rotational + Flexion Control Impairment	26.25%
Flexion + Extension + Rotational Control Impairment	18.13%

Table 5: Total Motor Control Impairments Present in a Subject

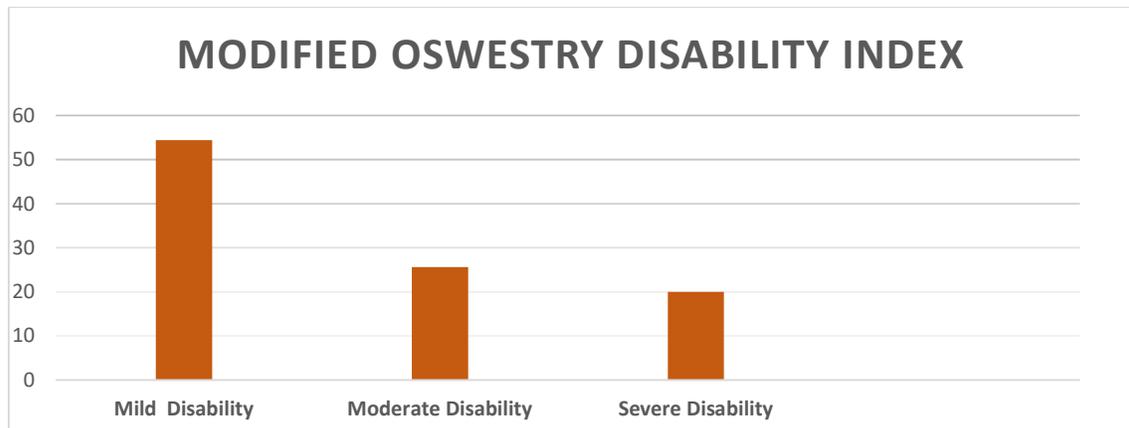
No. of Impairments Present	Percentage (%) (n = 160)
Single Impairment (any 1 of 3)	44.38%
Double Impairment (any 2 of 3)	37.50%
Triple Impairment (all 3)	18.12%



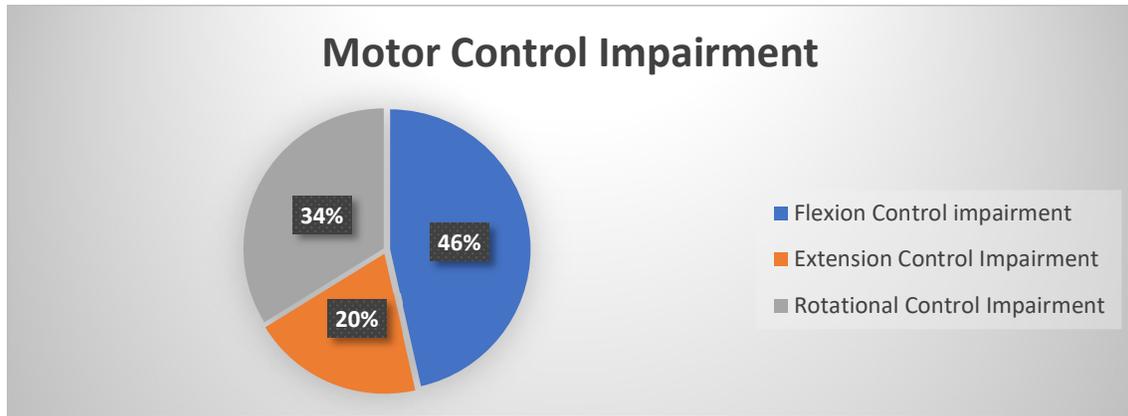
Graph 1: Demographic Data – Age



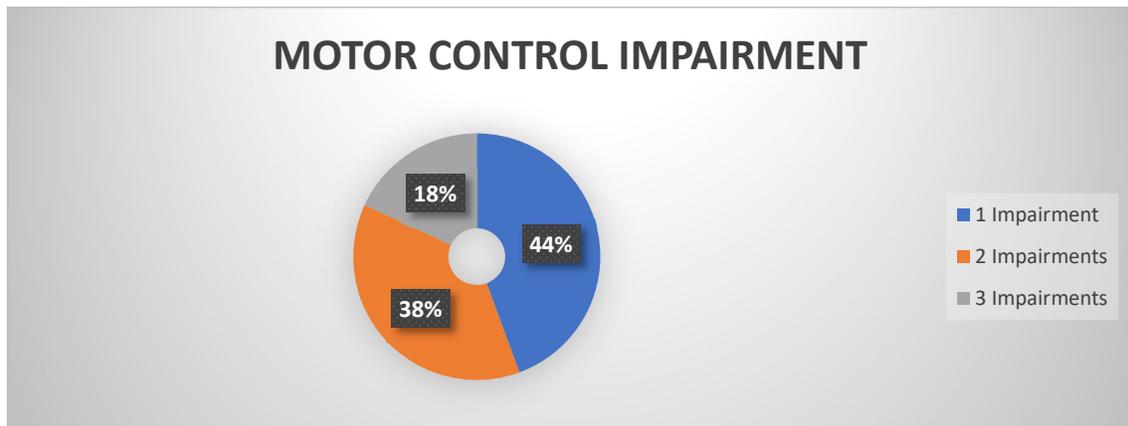
Graph 2: Demographic Data – Gender



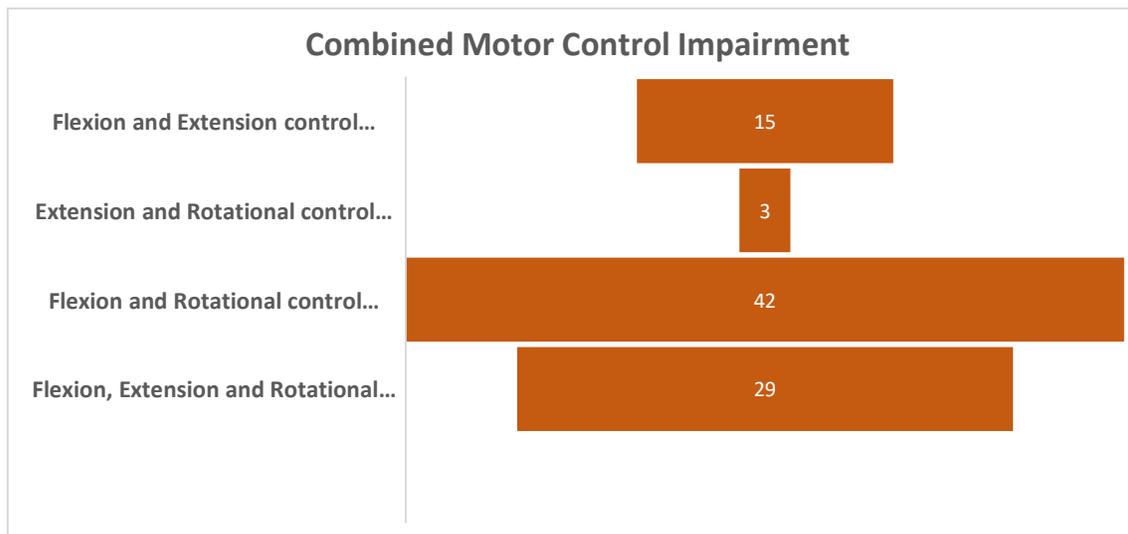
Graph 3: Disability Measured by Modified Oswestry Disability Index



Graph 4: Motor Control Impairment – Individual Impairment



Graph 5: Combination Of Motor Control Impairment



Graph 6: Combined Motor Control Impairment

DISCUSSION

This study provides new insights into motor control impairments in patients with recurrent low back pain. This study reflects that women (57%) are more affected than men (43%) which is similar to the study done by Sushil et al that suggests that the point prevalence of LPP is found to be 54.8% among Indian women [9]. Another study conducted by Nupur Aggarwal et al showed that the overall prevalence of LBP among students over the past year was 47.5% Prevalence among males and females is 45.3% and 50%, respectively closely aligning with the current study [5].

A study conducted by Henry Tsao et al suggested that coordination of the deep and superficial trunk muscles is changed in recurrent low back pain (LBP). The activity of the lumbar multifidus muscles is delayed and reduced during postural and functional tasks. In contrast, the activity of the more superficial trunk muscles is often increased. Delayed and reduced activity of this muscle and concurrent increased activity of the large superficial muscles lead to changes in spinal loading and movement, thus contributing to the recurrence of low back symptoms further leading to disability and suggesting the loss of motor control impairment in subjects with recurrent low back pain [10].

The current study indicates that flexion control impairments are more prevalent than

extension and rotational control impairments. The study findings imply that the individuals faced difficulty in maintaining a neutral segmental lordosis, resulting in segmental flexion at the unstable motion segment, posterior pelvic tilt, and extension of the upper lumbar and thoracic spine.

A study conducted by P. B. O'Sullivan coincides with the current study suggesting the flexion pattern appears to be the most common. The movement control tests reveal an inability to control a neutral segmental lordosis, with a tendency to flex at the unstable motion segment segmentally, posteriorly tilt the pelvis, and extend the upper lumbar and thoracic spine [12].

For the extension control impairment, in the standing position, subjects commonly exhibit an increase in segmental lordosis at the unstable motion segment sometimes with an increased level of segmental muscle activity, and the pelvis is often positioned in anterior pelvic tilt. Extension activities reveal segmental hinging at the affected segment with a loss of segmental lordosis. reveal an inability to co-contract segmental lumbar multifidus with the deep abdominal muscles in a neutral lumbar posture with a tendency to 'lock' the lumbar spine into extension and brace the abdominal muscles. Attempts to isolate deep abdominal muscle activation are commonly associated with excessive activation of the lumbar erector

spinae, external oblique, and rectus abdominis [12].

For rotation control impairment, specific muscle testing reveals an inability to bilaterally activate segmental lumbar multifidus in co-contraction with the deep abdominal muscles, with the dominance of activation of the quadratus lumborum, lumbar erector spinae and superficial lumbar multifidus on the side ipsilateral to the shift and an inability to activate the segmental lumbar multifidus on the contra-lateral side to the lateral shift [12].

Furthermore, the study revealed that patients had difficulty activating lumbar multifidus in co-contraction with deep abdominal muscles at the unstable motion segment within a neutral lordosis. Additionally, it was observed that many patients were unable to assume a neutral lordotic lumbar spine posture, particularly in high-sitting knee extension [13].

These findings have significant implications for the diagnosis and management of low back pain and should be considered when developing effective treatment strategies based on the activation and inhibition of the particular muscle group involved in the motor control impairment present.

CONCLUSION

This study concluded that flexion control impairment is the most prevalent movement control impairment followed by rotational control impairment and the least being

extension control impairment. The combination of flexion and rotational control impairment was seen in most students the least being extension and rotational control impairment. Future Prospects include involving larger participants and different populations.

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