

Effectiveness Of Strengthening and Stretching of Shortened Quadratus Lumborum on Non-specific Low Back Pain Among Physiotherapy Students

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Background : Non-specific low back pain (NSLBP) is a widespread musculoskeletal condition commonly linked to functional impairments and muscular imbalance, particularly tightness of the quadratus lumborum (QL), a key stabilizer of the lumbar spine. QL shortening can restrict side-flexion, alter lumbopelvic mechanics, and contribute to persistent pain and disability. To address such dysfunction, clinicians frequently use Muscle Energy Technique (MET), which aims to improve muscle extensibility through controlled isometric contractions, and lumbar extension exercises, which enhance spinal mobility, strengthen supporting musculature, and restore functional alignment. Although both interventions are widely practiced, limited evidence directly compares their effectiveness specifically in individuals with NSLBP and QL tightness. Understanding which approach yields superior early improvements in pain, disability, and lumbar mobility is essential for guiding clinical decision-making. Therefore, this study investigates the short-term effects of QL-targeted MET versus lumbar extension exercises in individuals with shortened QL and NSLBP.

Objective : To compare the immediate and short-term effects of MET applied to the QL muscle versus lumbar extension exercises on pain, disability, and lumbar mobility in individuals with shortened QL and NSLBP.

Methods : A total of 42 participants with NSLBP were randomly divided into two groups (n = 21 each). Group A received MET for the QL with core stability warm-up, while Group B performed lumbar extension exercises with core stability warm-up. Both intervention was performed for 2 weeks. The Outcome measures included Numeric Pain Rating Scale (NPRS), Modified Oswestry Disability Questionnaire (MODQ), Finger-to-Floor Test (FTFT), and Modified Schober's Test, assessed pre- and post-intervention.

Results : Both groups showed significant improvement in pain, disability, and lumbar ROM after 2 weeks. However, the MET-QL group demonstrated greater reductions in NPRS and MODQ scores and more improvement in side-flexion ROM, suggesting superior early benefits. No dropouts occurred during the study.

Conclusion : MET applied to the quadratus lumborum was more effective than lumbar extension exercises in reducing pain and disability and improving lumbar mobility in individuals with NSLBP over a 2-week period. Combining MET with core stabilization may produce optimal outcomes. Further studies with larger samples and long-term follow-up are recommended.

Key Words: NSLBP (Non specific Low back pain), MET (Muscle Energy Technique), QL (Quadratus Lumborum), NPRS (Numeric pain rating scale), MODQ (Modified Oswestry Disability Questionnaire), FTFT (Finger-to-Floor test), ROM (Range of Motion),

1. INTRODUCTION:

Non-specific low back pain (NSLBP) is an important global health problem and is associated with considerable levels of pain and disability. The lifetime prevalence of low back pain has been reported to be as high as 84%, whereas chronic

low back pain affects approximately 23% of the population. In addition, approximately 11–12% of individuals may experience disability related to low back pain. NSLBP describes pain in the lower back for which no specific underlying pathology can be identified, such as infection, tumour, osteoporosis, fracture, structural deformity, radicular syndrome, or cauda equina syndrome.¹

Physiotherapists frequently assess and manage individuals with low back pain ; however, they may also experience low back pain themselves. Studies conducted among physiotherapists have reported prevalence rates comparable with those observed in other populations. Younger physiotherapists, particularly those below 30 years of age, have also demonstrated considerable rates of low back pain, with reported prevalence ranging from approximately 30% to 40%.² Based on symptom duration, low back pain is commonly categorized as acute, subacute, or chronic. Acute low back pain is generally associated with a short duration of symptoms, subacute pain persists for approximately 4–12 weeks, and chronic low back pain continues for more than 12 weeks.³

Low back pain may present with different pain characteristics, including dull, sharp, or aching sensations in the lumbar region. Persistent pain may be associated with reduced muscle performance, weakness, and functional limitations, which can further affect physical activity and spinal function.⁴

Several muscles contribute to the stability and movement of the lumbar spine and may be involved in low back pain. These include the multifidus, iliocostalis, longissimus, and quadratus lumborum (QL).⁵ Weakness of the lumbar extensor musculature has also been identified as an important problem associated with chronic low back pain.⁶

The quadratus lumborum is a deep muscle of the posterior abdominal wall. It originates from the medial aspect of the iliac crest and the iliolumbar ligament and attaches superiorly to the inferior border of the 12th rib and the transverse processes of the L1–L4 vertebrae.⁷ The muscle contributes to movements and stabilization of the lumbar spine and pelvis. When both sides contract together, it can contribute to lumbar extension.⁸

Muscle Energy Technique (MET) is a manual therapy approach that developed from osteopathic medicine, with important contributions to its development attributed to T. J. Ruddy and subsequent work by clinicians including Janda.⁹ During assessment of lumbar side bending, restricted movement patterns may suggest shortening or increased tension of the quadratus lumborum.¹⁰ MET involves controlled voluntary muscle contractions followed by positioning or stretching of the targeted muscle. This approach has been proposed to influence local circulation and tissue mobility through the repeated contraction–relaxation process.¹¹ MET has also been described as a technique that may assist in improving muscle length, strength, and mobility of restricted tissues.¹²

Spinal extension exercises are commonly incorporated into rehabilitation programs for individuals with low back pain to improve lumbar muscle strength, endurance, and spinal range of motion. Such exercises are also used in rehabilitation and injury-prevention programs because weakness of the lumbar musculature is frequently associated with low back pain.¹³ Since the lumbar spine primarily moves within the sagittal plane, many therapeutic spinal exercises are performed through flexion or extension movements.¹⁴ Lumbar extension exercises can be performed in prone positions and may be carried out using static, dynamic, or combined dynamic-static methods.¹⁵ Choi et al. Reported that a 12-week lumbar extension training programme following surgery for a herniated disc resulted in substantial reductions in pain and improved return-to-work outcomes compared with the control group.¹⁶

Core stabilization exercises are intended to improve the activation and coordination of the muscles responsible for controlling the trunk and lumbar spine. Hodges and Richardson (1996) proposed that individuals with a history of low back pain may demonstrate altered or delayed activation of the transversus abdominis in response to trunk perturbations, which may contribute to recurrent symptoms.¹⁷ Lumbar stabilization exercises therefore aim to improve trunk muscle activation and control, thereby reducing functional limitations associated with low back pain.¹⁸

The muscles involved in trunk control can broadly be considered according to their roles in local spinal stabilization, global stabilization, and global movement.¹⁹ Stabilization training focuses on improving neuromuscular control, muscle strength, and endurance required to maintain dynamic stability of the lumbar spine and trunk.²⁰

2. LITERATURE REVIEW

- **Ekta et al. (2018)** investigated the effect of stretching the shortened quadratus lumborum in individuals with non-specific low back pain. The study included 30 participants aged 18–25 years who were allocated into two groups. Group A received core stability warm-up and spinal extension exercises, whereas Group B received the same intervention along with quadratus lumborum stretching. Treatment was provided for 30 minutes over two consecutive weeks. Pain and disability were assessed before treatment and at the end of the second week using relevant outcome measures, including the Oswestry Low Back Pain Disability Questionnaire. The authors reported a significant difference between the groups in disability outcomes, suggesting a beneficial effect of incorporating quadratus lumborum stretching into the exercise programme.¹

- **Leah et al. (2003)** investigated the prevalence of low back pain among physiotherapy students in an Australian tertiary institution. The participants, aged 17–22 years, completed a validated self-administered questionnaire that included the Nordic Low Back Pain Questionnaire, questions related to potential risk factors, and items concerning educational exposure. The study obtained a 72% response rate. Reported prevalence of low back pain was 69% over the lifetime, 63% over the previous 12 months, 44% over the previous month, and 28% during the previous week. Final-year students demonstrated greater association with low back pain compared with younger students. Longer exposure to tertiary education was also associated with higher prevalence. Prolonged periods of sitting while looking down and activities involving patient treatment were identified as educational or occupational exposures associated with low back pain.²
 - **Poonam et al. (2020)** examined the immediate effect of Muscle Energy Technique on the quadratus lumborum in individuals with non-specific low back pain. Sixty participants were divided into a control group and an experimental group. The control group received a hot pack, while the experimental group received a hot pack combined with MET applied to the quadratus lumborum. Pain intensity and lumbar range of motion were assessed using the Numeric Pain Rating Scale and Modified Schober's test, respectively, before and immediately after the intervention. The experimental group demonstrated greater improvement in the measured outcomes than the control group, indicating a possible immediate benefit of MET for the quadratus lumborum.³
 - **Smith et al. (2011)** evaluated lumbar extension training performed with and without pelvic stabilization in individuals with low back pain. Forty participants were allocated to lumbar extension with stabilization, lumbar extension without stabilization, or a conventional physiotherapy control condition. The intervention was conducted over 12 weeks, with lumbar extension exercises performed using 8–12 repetitions per set. Pain, disability, and lumbar muscle strength were assessed before and after the intervention using VAS, ODI, and lumbar strength measures. The stabilization group demonstrated increased lumbar strength and reductions in pain and disability. In contrast, the control and non-stabilization groups did not demonstrate comparable changes.⁴
 - **Prachi et al. (2010)** studied the effect of Muscle Energy Technique directed towards the quadratus lumborum in patients with acute low back pain. Forty participants were divided into a control group receiving interferential therapy and an intervention group receiving MET for the quadratus lumborum in combination with interferential therapy. Treatment was provided for eight consecutive days. Pain, disability, and spinal range of motion were evaluated before and after treatment using VAS, the Modified Oswestry Disability Questionnaire, and spinal range-of-motion measures. Greater improvement in pain, disability, and spinal mobility was reported in the intervention group compared with the control group.⁵
 - **Priyanka et al. (2018)** investigated whether adding a supervised exercise programme to Muscle Energy Technique produced additional benefits in individuals with chronic non-specific low back pain. Thirty participants were divided into two groups. One group received MET, while the other received MET combined with a supervised exercise programme. Both groups were treated for two weeks, and pain and functional disability were assessed at baseline and after the intervention using NPRS and ODI. Both groups demonstrated improvement; however, greater changes in pain and functional disability were reported in the group receiving MET together with supervised exercise.⁶
 - **Suh et al. (2019)** Suh et al. (2019) examined the effects of lumbar stabilization and walking exercises in individuals with chronic low back pain. Forty-eight participants were randomized into four groups: flexibility exercise, walking exercise, stabilization exercise, and stabilization combined with walking exercise. The intervention continued for six weeks. Outcomes included pain, disability, depressive symptoms, postural endurance, and lumbar extensor muscle strength. Low back pain during physical activity decreased across all four groups. Improvements in exercise frequency were observed in the stabilization and walking groups, while exercise duration improved in the stabilization group. Postural endurance also increased in the walking and combined stabilization-walking groups.⁷
3. **AIMS** : To compare the effectiveness of lumbar extension exercise versus muscle energy technique on quadratus lumborum to evaluate the variables like pain, lumbar ROM and functional disability in non-specific low back pain among physiotherapist student.

OBJECTIVES

- To evaluate the effect of MET of quadratus lumborum muscle in nonspecific low back pain.
- To evaluate the effect of lumbar extension exercise on nonspecific low back pain.
- To compare effect of MET on quadratus lumborum muscle and lumbar extension exercise on non-specific low back pain.

4. METHODOLOGY

- Study design:- Comparative study
- Study setting:- Chh. Sambhaji Nagar
- Study duration:- 6 month
- Sampling method :- Comparative study
- Sample size:- 42participants (n=21 in each group)

Sample size:-

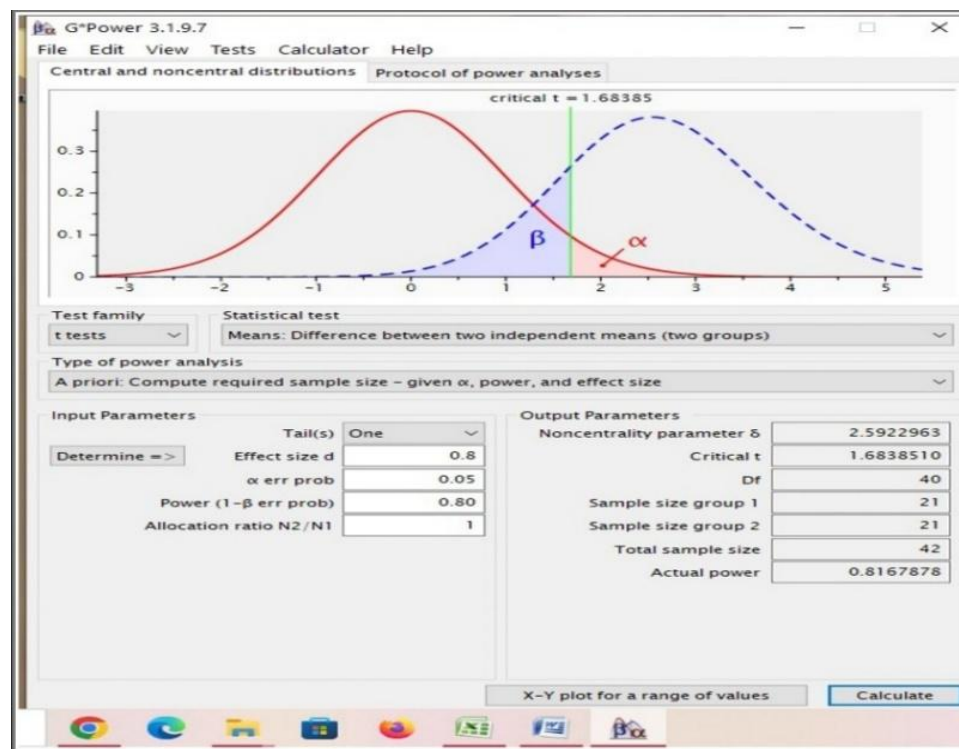


Figure. No :1 Represents Sample size calculation.

For calculation of sample size for present study, G. Power software is used. Alpha = $\alpha=0.05$, Power = 0.80, Large effect size will be consider = 0.80. Using G*Power software sample size each group will be found to be 21 samples. So we will enrol 21 patients in each group.

Statistical Analysis: Data will be entered in Microsoft Excel and analyzed using SPSS version 25.0th Mean and SD will be calculated for quantitative variables and proportions will be calculated for categorical variables. Also data will be represented in form of visual impression like bar-diagram etc. Unpaired-test will be applied to check significant difference between two groups. Paired t-test will be applied to check significance difference between pre and post difference. P- Value of <0.05 will be considered statistically significant.

5. INCLUSION CRITERIA

- Subjects between Age between 18-25years.
- Both male and females participants with clinical diagnosis of acute low back pain.
- Participants with non specific and postural low back pain.
- Participants with lumbar pain and pain at the attachments of quadratus lumborum i.e. Iliac crest and lower ribs.

- Participants with NPRS score of 4-7.
- Participants with restricted lateral flexion
- Participants willing to participate in the study.

6. EXCLUSION CRITERIA

- Participants suffering from specific low back pain like prolapse intervertebral discs with instability or any radicular symptoms, lumbar spondylosis, lumbar canal stenosis, spondylolisthesis, sensory deformity tuberculosis.[11]
- Participants suffering from osteoporosis, psychiatric disorders, pain relief patches / injections / slow releasing hormonal capsules, fracture or dislocation, haematomas or abscesses.
- Any other local or systemic major illness.
- Participants with history of spinal surgery.

7. MATERIAL

- Pen
- Data collection sheet
- NPRS Scale
- Modified Oswestry disability Questionnaire
- Measurement tape
- Yoga mat

8. PROCEDURE

- Ethical permission will be obtained from the ethical committee before commencement of the study.
- Participants will be screened according to the inclusion and exclusion criteria.
- The purpose and procedure of the study will be explained to the participants. Written informed consent and demographic details will be obtained from all participants.
- The participants will be allocated into two groups.
- The outcome measures will include pre-intervention assessment of pain using the NPRS, lumbar range of motion using the Modified Schober's Test and Finger-to-Floor Test, and functional disability using the MODQ

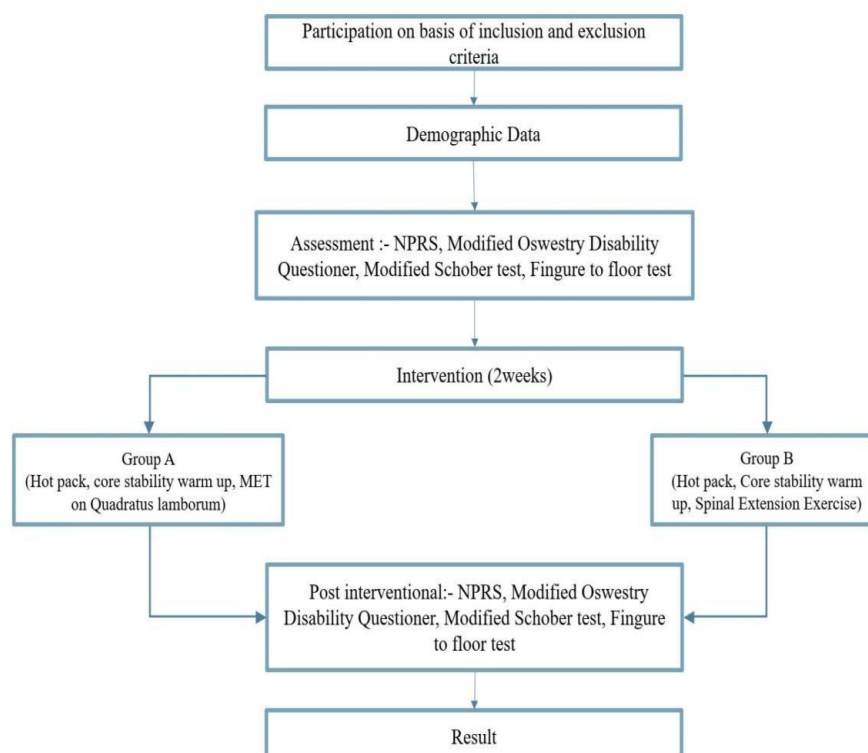


Figure no. 2 . Represents Procedure of study

GROUP A : CORE STABILITY WARM-UP AND MET ON QUADRATUS LUMBORUM

Participants in Group A will receive a moist heat pack on the lower back in the prone position for 20 minutes, followed by core stability warm-up exercises for 5 minutes. Additionally, they will receive Muscle Energy Technique using post-isometric relaxation for stretching of the Quadratus Lumborum.

The isometric contraction will be maintained for 10 seconds followed by a 10-second rest period and repeated 6 times per session. The intervention will be performed for 6 sessions per week for 2 weeks.

- **CORE STABILITY WARM-UP**

1. Curl-Up

The participant will lie in a crook-lying position on the mat. The trunk will be raised upward with the hands positioned either stretched forward in the air or behind the head. The exercise will be performed for 10 repetitions, with each repetition held for 10 seconds. During the curl-up, the hands will be placed beneath the lumbar spine to maintain a neutral spinal position. The participant will be instructed not to flatten the back against the floor, as this produces lumbar flexion and violates the principle of maintaining a neutral lumbar posture. One knee will remain flexed while the opposite leg is extended to stabilize the pelvis and lumbar spine and minimize loss of the neutral lumbar position. The position of the bent leg will be alternated midway through the repetitions.

2. Side Bridge Exercise

The participant will lie in a side-lying position with the elbow positioned directly beneath the shoulder. The knees may be flexed to approximately 90° or the legs may be kept straight according to the prescribed position. The participant will push against the floor through the elbow to elevate the shoulder and lift the hip away from the ground while maintaining a straight alignment from the head to the knee. The position will be held for up to 10 seconds for 6 repetitions and then repeated on the opposite side.

3. Bird-Dog Exercise

The participant will assume a quadruped position on the mat and perform the bird-dog exercise. Initially, the participant will lift one hand from the mat. The exercise will then progress to a two-point kneeling position, in which one hand and the opposite leg are lifted simultaneously. The exercise will then be repeated with the opposite hand and leg. The exercise will be performed for 10 repetitions, with each repetition held for 10 seconds.

- **MET ON QUADRATUS LUMBORUM**

The practitioner will stand behind the participant, who will be positioned in side-lying, at approximately waist level. The participant will extend the uppermost arm overhead and firmly hold the upper end of the treatment table. During inhalation, the uppermost leg will be abducted until strong activity of the Quadratus Lumborum is palpated by the practitioner, usually at approximately 30° of elevation.

The participant will maintain an isometric contraction of the leg in this position, allowing gravity to provide resistance for 10 seconds. Following this, the participant will allow the leg to move slightly behind the body over the edge of the table. The practitioner will then stabilize the pelvis with both hands and apply the required stretch by taking up the available slack and gently moving the pelvis away from the ribs during exhalation. The stretch will be maintained for approximately 10–30 seconds. The contraction followed by stretching will be repeated with the raised leg positioned in front of and behind the trunk to target different fibers of the Quadratus Lumborum. The technique will be performed bilaterally.

GROUP B : CORE STABILITY WARM-UP AND SPINAL EXTENSION EXERCISE

Participants in Group B will receive a moist heat pack on the lower back in the prone position for 20 minutes, followed by core stability warm-up exercises for 5 minutes. Additionally, they will receive lumbar extension exercises in the prone position.

Exercise No. 1

The participant will lie in a prone position on the mat and raise one leg from the surface, followed by the opposite leg. Each leg will be held in the elevated position for 10 seconds. The exercise will be performed for 10 repetitions per set. Initially, the participant will perform 2–3 sets, with a gradual progression up to 10 sets.

Exercise No. 2

The participant will lie in a prone position on the mat and raise both hands from the surface. The elevated position will be maintained for 10 seconds. The exercise will be performed for 10 repetitions per set. Initially, the participant will perform 1–2 sets, followed by gradual progression up to 5 sets.

Exercise No. 3

The participant will lie in a prone position on the mat. Initially, one hand will be lifted from the surface along with the opposite leg. The movement will then be repeated using the opposite hand and leg. The exercise will be performed for 10 repetitions per set. Initially, the participant will perform 2–3 sets, with gradual progression up to 10 sets.

9. OUTCOME MEASURE

1. Numerical Pain Rating Scale (NPRS)
2. Modified Schober's test. The Schober test may be used to measure the amount of flexion occurring in the lumbar spine. A point is marked midway between the two PSISs ("dimples of the pelvis"), which is the level of S2 ; then, points 5 cm (2 inches) below and 10 cm (4 inches) above that level are marked. The distance between the three points is measured, the patient is asked to flex forward, and the distance is remeasured. The difference between the two measurements indicates the amount of flexion occurring in the lumbar spine. Little reported a modification of the Schober test to measure extension as well. After completion of the flexion movement, the patient extends the spine, and the distance between the marks is noted. Little also advocated using four marking points (one below the dimples and three above) with 10 cm (4 inches) between them.
3. Finger to floor test Normal : It should be used only to compare repeated measurements for a single subject and not for comparing one subject with another subject. Test Position : Standing with feet shoulder width apart and arms hanging freely at the sides of the body. Ask the subject to bend to the side as far as possible while keeping both feet flat on the ground with knees extended. At the end of the ROM, make a mark on the leg level with the tip of the middle finger and use a tape measure or ruler to measure the distance between the mark on the leg and the floor.

10. RESULT

Within-Group Comparisons

Group A : MET Stretching

Participants in Group A (n = 21) had a mean age of **22.86 years** (SD = 1.46)

Table1: Variables	N		Mean	Std. Dev	Tests	p-value
NPRS	21	pre_NPRS	5.81	0.750	Paired Samples t-test	< 0.0001
	21	post_NPRS	2.86	0.573		
Schobers	21	pre_Schobers	6.752	1.4421	Paired Samples t-test	< 0.0001
	21	post_Schobers	8.110	1.4467		
MODQ	21	pre_MODQ	0.3247	0.0468	Paired Samples t-test	< 0.0001
	21	post_MODQ	0.1390	0.0431		
Fingure to Floor (Left)	21	pre_FTF (Left)	48.248	3.9500	Paired Samples t-test	< 0.0001
	21	post_FTF (Left)	45.100	3.7175		
Fingur to Floor (Right)	21	pre_FTF (Right)	48.205	4.1853	Paired Samples t-test	< 0.0001
	21	post_FTF(Right)	45.286	4.0052		

Table 1. Presents the results of within-group comparisons for Group A, which received MET Stretching

The paired samples t-test was used to compare pre- and post-intervention outcomes across multiple measures of pain, flexibility, and functional ability.

1. NPRS (Numerical Pain Rating Scale)

The mean NPRS score decreased significantly from 5.81 ± 0.75 to 2.86 ± 0.57 ($p < 0.0001$).

This indicates a marked reduction in pain intensity following the intervention.

2. Schober's Test (Lumbar Flexibility)

The mean Schober's measurement increased significantly from 6.75 ± 1.44 cm to 8.11 ± 1.45 cm ($p < 0.0001$). A higher value indicates improved lumbar spine flexibility, showing that the intervention enhanced spinal mobility.

3. MODQ (Modified Oswestry Disability Questionnaire)

The mean MODQ score decreased from 0.3247 ± 0.0468 to 0.1390 ± 0.0431 ($p < 0.0001$). Lower MODQ values represent reduced disability and better functional ability, indicating that participants experienced significant functional improvement after the intervention.

4. Finger-to-Floor Test (Left)

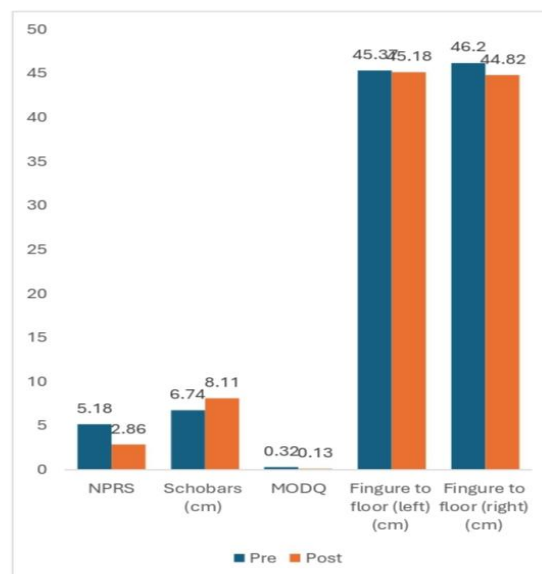
The mean distance reduced from 48.25 ± 3.95 cm to 45.10 ± 3.72 cm ($p < 0.001$). A smaller distance indicates that participants could reach closer to the floor, reflecting enhanced flexibility on the left side.

5. Finger-to-Floor Test (Right)

The mean distance decreased from 48.21 ± 4.19 cm to 45.29 ± 4.01 cm ($p < 0.001$). Similar to the left side, this shows a significant improvement in flexibility on the right side as well.

Overall Interpretation

The intervention produced highly significant improvements ($p < 0.001$) across all measured parameters — pain (NPRS), lumbar mobility (Schober's test), functional ability (MODQ), and flexibility (Finger-to-Floor tests). These results collectively demonstrate that the intervention was effective in reducing pain, enhancing spinal mobility, improving flexibility, and promoting better functional recovery.



Group A: MET Stretching Group

Figure 3. Comparison of Group A between Pre and Post on NPRS, Modified Schobers, MODQ and fingertip to floor test.

Group B : Lumbar Strengthening

Participants in Group B (n = 21) had a mean age of **20.71 years** (SD = 1.27)

Table2: Variables	N		Mean	Std. Dev	Tests	p-value
NPRS	21	pre_NPRS	5.57	0.507	Paired Samples t-test	< 0.001
	21	post_NPRS	3.57	0.676		
Schobers	21	pre_Schobers	6.814	1.2951	Paired Samples t-test	< 0.001
	21	post_Schobers	7.771	1.3233		

MODQ	21	pre_MODQ	0.2933	0.0348	Paired Samples t-test	< 0.001
	21	post_MODQ	0.1905	0.0355		
Fingur to Floor Test (Left)	21	pre_FTF (Left)	46.376	3.5287	Paired Samples t-test	0.076
	21	post_FTF(Left)	45.181	3.3570		
Fingur to Floor Test (Right)	21	pre_FTF(Right)	46.200	3.6696	Paired Samples t-test	0.002
	21	post_FTF(Right)	44.824	2.9928		

Table 2. Presents the results of within-group comparisons for Group B, which received Lumbar Strengthening Group

The paired flexibility samples t-test was conducted to assess pre- and post-intervention differences across pain, , and functional ability variables.

1. NPRS (Numerical Pain Rating Scale)

The mean NPRS score decreased significantly from 5.57 ± 0.51 to 3.57 ± 0.68 ($p < 0.001$). This indicates a substantial reduction in perceived pain intensity following the intervention.

2. Schober's Test (Lumbar Flexibility)

The mean Schober's measurement increased from 6.81 ± 1.30 cm to 7.77 ± 1.32 cm ($p < 0.001$). Higher values reflect improved lumbar spine flexibility, showing that the intervention effectively enhanced spinal mobility.

3. MODQ (Modified Oswestry Disability Questionnaire)

The mean MODQ score dropped significantly from 0.2933 ± 0.0348 to 0.1905 ± 0.0355 ($p < 0.001$). Lower scores denote less disability and better functional status, indicating a significant improvement in daily functional ability.

4. Finger-to-Floor Test (Left)

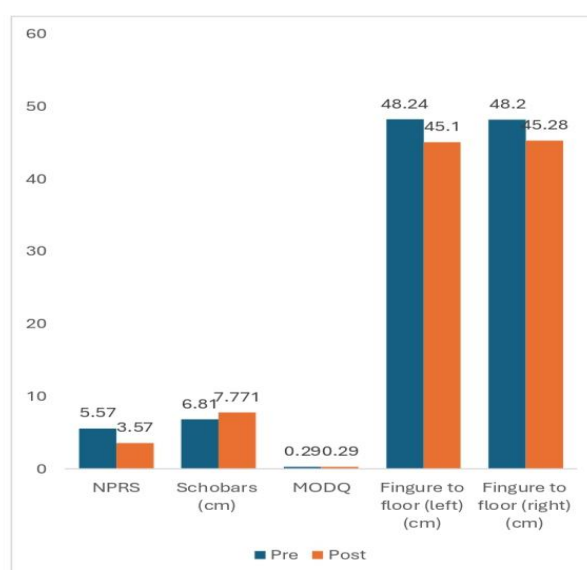
The mean distance decreased from 46.38 ± 3.53 cm to 45.18 ± 3.36 cm, but this change was not statistically significant ($p = 0.076$). This suggests a mild, non-significant improvement in flexibility on the left side.

5. Finger-to-Floor Test (Right)

The mean distance decreased significantly from 46.20 ± 3.67 cm to 44.82 ± 2.99 cm ($p = 0.002$). A smaller distance indicates that participants could reach further, reflecting a significant improvement in flexibility on the right side.

Overall Interpretation

The intervention produced highly significant improvements in pain reduction (NPRS), spinal flexibility (Schober's Test), and functional ability (MODQ). Right-sided flexibility improved significantly, while left-sided flexibility showed a small but non-significant improvement. Collectively, these results demonstrate that the intervention was effective in reducing pain, enhancing spinal mobility, and improving overall functional status among participants.



Group B: Lumbar Extension Group

Figure 4. Comparison of GroupB between Pre and Post on NPRS, Modified Schobers, MODQ and fingertip to floor test.

Between-Group Comparisons

Table 3: Variables	Group	N	Mean	Std. Dev	Tests	p-value	Significance
Change_NPRS	A	21	2.95	0.590	Independent Samples t-test	< 0.0001	Statistically Significant
	B	21	2.00	0.632			
Change_Schobers	A	21	1.3571	0.5315	Independent Samples t-test	0.002	Statistically Significant
	B	21	0.9571	0.1247			
Change_MODQ	A	21	0.1857	0.0211	Independent Samples t-test	< 0.0001	Statistically Significant
	B	21	0.1028	0.0158			
Change_Fingur to Floor (Left)	A	21	3.1476	1.8640	Independent Samples t-test	0.014	Statistically Significant
	B	21	1.1952	2.9283			
Change_Fingur to Floor (Right)	A	21	2.9190	1.8137	Independent Samples t-test	0.008	Statistically Significant
	B	21	1.3761	1.7708			

Table 3 presents the between-group comparison results for changes in various measures between Group A (MET Stretching Group) and Group B (Lumbar Extension Group).

The independent samples t-test was used to compare the mean change scores (pre–post difference) between Group A and Group B for pain, mobility, disability, and flexibility measures.

1. Change in NPRS (Numerical Pain Rating Scale)

Group A showed a greater reduction in pain (mean change = 2.95 ± 0.59) than Group B (mean change = 2.00 ± 0.63). The difference between groups was statistically significant ($p < 0.0001$). This indicates that Group A experienced superior pain relief compared to Group B.

2. Change in Schober's Test (Lumbar Flexibility)

The improvement in lumbar flexibility was higher in Group A (1.36 ± 0.53 cm) than in Group B (0.96 ± 0.12 cm), with a significant difference ($p = 0.002$). Thus, Group A showed better enhancement in lumbar mobility.

3. Change in MODQ (Functional Disability)

Group A demonstrated a larger decrease in disability scores (0.1857 ± 0.0211) compared to Group B (0.1028 ± 0.0158), and the difference was highly significant ($p < 0.0001$). This suggests that Group A achieved greater improvement in functional ability and daily activities.

4. Flexibility – Finger-to-Floor Test (Left & Right)

Left side: Group A showed significantly greater improvement (3.15 cm) compared to Group B (1.19 cm), $p = 0.014$.

Right side: Similar findings were observed on the right side, with Group A improving by 2.92 cm versus 1.38 cm in Group B, $p = 0.008$. These results highlight the better effect of MET

Overall Conclusion

Across all outcomes—pain, lumbar flexibility, functional ability, and trunk flexibility—Group A (MET Stretching) demonstrated significantly greater improvements than Group B. This provides strong evidence that MET Stretching is more effective than the comparison intervention in reducing pain, enhancing spinal and hamstring flexibility, and improving functional performance in young adults.

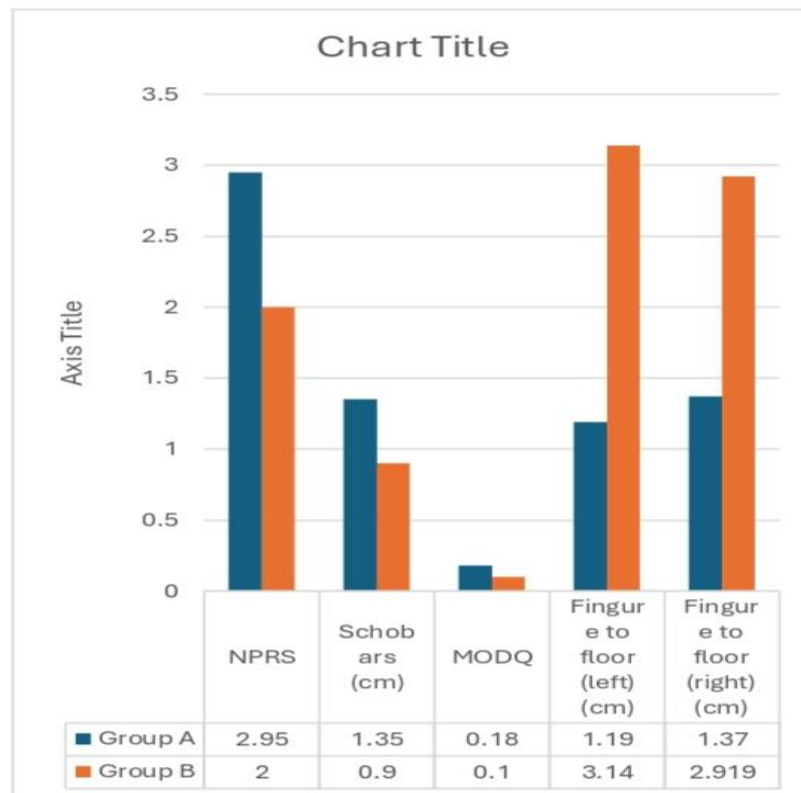


Figure 5. Comparison between GroupA and GroupB

Microsoft Excel and IBM SPSS Statistics version 26 was utilized for conducting the tests and statistical analyses presented in this study.

11. DISCUSSION :

The present study aimed to compare the effectiveness of Muscle Energy Technique (MET) stretching of the Quadratus lumborum muscle with lumbar extension exercises, with both interventions combined with a core stability warm-up, in physiotherapy students with acute nonspecific low back pain. The outcomes assessed were pain (NPRS), lumbar flexibility (Modified Schober's Test), functional ability (MODQ), and trunk flexibility (Finger-to-Floor Test). The intervention was administered for 2 weeks. The results demonstrated that Group A (MET stretching) showed significantly greater improvement in all outcome measures compared with Group B (lumbar extension exercises). These findings suggest that MET stretching may be more effective for reducing pain, improving lumbar and trunk flexibility, and enhancing functional performance in this population.

The greater reduction in pain observed in the MET group may be related to reduced muscle tension, autogenic inhibition, decreased muscle spindle activity, and improved soft-tissue extensibility following MET. QL tightness may contribute to increased lumbar muscle tension and altered lumbopelvic mechanics in individuals with NSLBP.²¹

Shreya Patel et al. reported a greater reduction in NPRS scores following MET compared with PNF in individuals with NSLBP.

Similarly, Kashyap et al. found that QL-specific MET reduced pain and myofascial trigger point irritability in individuals with QL-related low back pain.²²

Al Matif et al., in their systematic review, also reported reductions in pain intensity and functional disability following MET in individuals with chronic low back pain.²³ Chaitow (2013) described the role of MET in reducing muscle hypertonicity and pain through mechanisms involving autogenic inhibition.²⁴

The present study also demonstrated greater improvement in functional disability as measured by MODQ in the MET group. The reduction in muscle tightness and improvement in lumbopelvic movement may have facilitated functional activities and reduced movement-related discomfort.

Regarding disability (MODQ), the present study found that MET led to greater functional improvement than extension exercises, which is again supported by findings from Patel et al. who reported significant improvements in functional scores following MET interventions.²⁵ Dhargalkar et al. also reported improved functional ability following the addition of MET in individuals with chronic NSLBP.²⁶ Wilson et al. found that isometric-based MET could improve functional mobility in individuals with NSLBP.²⁷ However, Selkow et al. reported only mild functional changes following MET, which differs from the greater improvement observed in the present study.²⁸

Both groups showed improvement in the Finger-to-Floor Test, with greater improvement in the MET group. QL tightness can contribute to restriction of forward bending by increasing soft-tissue resistance and influencing thoracolumbar and lumbopelvic movement. MET may reduce these restrictions through post-isometric relaxation and improved muscle flexibility, thereby facilitating trunk flexion.²⁹

Thomas and Shankar reported improved Finger-to-Floor distance following MET applied to tight lumbar muscles, supporting the present findings.³⁰ Bhosale and Burungale also found that MET applied to the QL improved lumbar mobility and reduced pain more effectively than conventional stretching or MFR alone.³¹ These findings are consistent with the greater improvement in FTFT observed in the present study.

A similar pattern was observed for the Modified Schober's Test, where both interventions improved lumbar flexion mobility, but the MET group demonstrated greater improvement. This may be associated with the ability of MET to reduce muscle tension and soft-tissue restrictions affecting lumbar movement. Mazidavi et al. reported significant improvements in lumbar range of motion following MET, particularly in individuals with lateral flexion limitations.³² This supports the mechanism that MET reduces soft-tissue stiffness and enhances thoracolumbar mobility more effectively than extension-based exercises.

Although lumbar extension exercises produced improvements in all outcome measures, the magnitude of improvement was comparatively smaller than that observed with MET. Extension exercises primarily emphasize lumbar extension and spinal movement and may have a less direct effect on QL muscle tightness and soft-tissue restrictions affecting flexion mobility. Dave Smitha et al. (2011) reported that lumbar extension training produced greater reductions in pain and disability when pelvic stabilization was incorporated, whereas general lumbar extension exercises without stabilization showed comparatively limited improvement. This may help explain the smaller improvements observed in the lumbar extension group in the present study.

The greater overall improvement following MET may also be related to the specificity of the intervention. While both groups received a core stability warm-up, MET specifically targeted the QL muscle, whereas the lumbar extension exercises did not directly address QL tightness or control all possible pelvic compensations. The combination of targeted MET and core activation may therefore have addressed both muscular restriction and trunk stability within the short intervention period.

Overall, the findings of the present study indicate that MET stretching of the QL, when combined with a core stability warm-up, may be a useful intervention for physiotherapy students with acute nonspecific low back pain, particularly when muscle tightness is present. Compared with lumbar extension exercises, MET demonstrated greater improvements in pain, functional disability, lumbar flexibility, and trunk flexibility after 2 weeks of intervention.

12.CONCLUSION

The findings of the present study demonstrate that Muscle Energy Technique (MET) applied to the Quadratus Lumborum (QL) combined with core stability is more effective than lumbar extension combined with core stability in improving pain intensity, functional disability, and lumbar range of motion over a two-week intervention period. Participants receiving MET experienced greater reductions in muscle tightness, enhanced mobility in lumbar flexion and lateral flexion, and superior short-term functional improvements.

13.LIMITATIONS

- The sample size was limited to 42 participants (n = 21 per group), which may reduce the generalizability of the findings.
- The 2-week intervention duration was too short to evaluate long-term effects or sustained functional improvement.
- The study relied on subjective outcome measures such as NPRS and MODQ, which may introduce response bias.
- Only the quadratus lumborum muscle was targeted in the MET group, despite other lumbar and pelvic muscles possibly contributing to symptoms.

- Participants' daily activities and lifestyle factors were not controlled, which may have influenced changes in pain and mobility.
- All participants was Physiotherapy students Young adults Between age range of 18-25 years. These result may not be effective in other age group of population.

14.RECOMMENDATIONS

FUTURE SCOPE

- Future studies should include a larger sample size to improve statistical power and generalizability.
- Long-term follow-up is needed to determine whether improvements in pain, disability, and ROM are sustained beyond the 2-week period.
- Research should evaluate other lumbar and pelvic muscles to understand their combined contribution to non-specific low back pain.
- Comparative studies can assess the effectiveness of different MET protocols or variations in lumbar extension exercises.
- Investigations involving different age groups, occupations, or chronicity levels may provide broader clinical applicability.

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