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AN EXPERIMENTAL STUDY ON EFFECTIVENESS OF MUSCLE ENERGY TECHNIQUE AND POSITIONAL RELEASE TECHNIQUE TO MANAGE ILIOPSOAS TIGHTNESS IN NON-SPECIFIC LOW BACK PAIN

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ABSTRACT

Background: Nonspecific low back pain (NSLBP) is a pervasive clinical challenge characterized by discomfort or tension in the lumbar region without an identifiable pathoanatomical cause. Iliopsoas tightness significantly impairs activities of daily living. The research specifically compares the efficacy of MET, PRT and core Stabilisation exercises combined with hamstring stretching in improving iliopsoas tightness, lumbar range of motion and reducing disability. The aim of the present study was to determine the effectiveness of MET versus PRT along with Core Stabilization exercises in reducing pain intensity among students with non-specific low back pain. **Methods:** 78 participants with NSLBP, aged between 18 and 25 years were recruited. Participants were randomly divided into two groups: Group A received Muscle Energy Technique combined with Core Stabilisation exercises and Hamstring Stretching; Group B received Positional Release Technique combined with Core Stabilisation exercises and Hamstring Stretching. The intervention was administered 3 sessions per week on alternative days for 3 weeks. **Results:** Both Groups showed the greatest improvement across all outcome measures. Between-group analysis revealed highly significant differences ($p < 0.001$) in favour of Group A for Modified Thomas Test, Disability (MODI) and lumbar range of motion (ROM). **Conclusion:** The findings suggest that a multimodal physiotherapy approach is effective in the management of NSLBP. MET combined with core stabilisation exercises along with hamstring stretching were found to be the most effective intervention, highlighting the importance of incorporating stabilization training for improving iliopsoas tightness, pain, and functional outcomes.

KEYWORDS: Non-specific low back pain, Muscle Energy Technique (MET), Positional Release technique (PRT), Core stabilisation exercises, Iliopsoas tightness, therapeutic approaches.

INTRODUCTION

Low back pain is a significant global health issue, impacting 80-85% of individuals during their lifetime. It is a prevalent condition associated with work absenteeism, disability, and substantial healthcare expenses.(*Kaiynat*, n.d,. 2025) Non-specific low back pain (NSLBP) constitutes a significant clinical issue, characterized by discomfort or tightness in the lumbar region without a discernible patho-anatomical cause and one of the predominant contributors to years lived with disability (YLD) globally, accounting for approximately 57.6 million YLDs.(B. Kim & Yim, 2020).

In India, the prevalence of NSLBP is estimated at around 45%, with a concerning upward among individuals. Physical variables, including aberrant posture, altered lumbo-pelvic alignment, changes in lumbar spine muscle length and mobility, have been associated with chronic low back pain(Ganesan et al., 2017) (Abbas et al., 2024). This research focuses primarily on the iliopsoas muscle because to its direct attachments to the spine, pelvis and femur and its responsiveness to movements at the spine or hip joint.

Iliopsoas is classified as a postural muscle and has been noted to experience shortening, which can contribute to increased lumbar lordosis and anterior pelvic tilt(Bakhshkandi et al., 2025). The Modified Thomas Test serves as the gold standard for assessing hip flexor length. A positive result from this evaluation indicates significant muscle tightness, which correlates with postural deviations and pain scores typically ranging from 4 to 6 on the Numeric Pain Rating Scale (NPRS) within the affected demographic (Peeler & Anderson, 2007) (G.-M. Kim & Ha, 2015).

Although various physiotherapy interventions exist, addressing the "hip-spine syndrome," in which dysfunction in the hip region contributes to low back pain, is essential(Tikhile & Patil, 2024) (Alarab et al., 2020a). The Muscle Energy Technique (MET) is an active, direct approach that facilitates autogenic inhibition via the Golgi Tendon Organ (GTO) to facilitate structural lengthening of the involved musculature whereas core stabilization exercises along with hamstring stretching plays a crucial role in improving direct muscle imbalance(Chauhan et al., 2022a). In contrast, the Positional Release Technique (PRT) employs an indirect, passive mobility aimed at alleviating aberrant muscle spindle activity by positioning the affected tissues in a state of comfort, thereby promoting relaxation and reducing muscle tension. The therapeutic effect of PRT is believed to arise from the deliberate and sustained shortening of the involved muscle. This manoeuvre reduces tension within the muscle spindle's intrafusal fibres, thereby decreasing the firing rate of group Ia and II afferent fibres. The resultant reduction in excitatory afferent input to the homonymous alpha motor neurons disrupts a positive reflex arc—effectively resetting the aberrant stretch reflex. Consequently, central motor outflow diminishes and muscle tone normalizes therefore local tissue irritability subsides (Van Buskirk, 1990; Wong, 2012) (Chauhan et al., 2022b).

The research specifically examines the efficacy of Muscle Energy Technique (MET) and Positional Release Technique (PRT) along with Core stabilisation exercise (CSE) and hamstring stretching in enhancing range of motion and alleviating disability. CSE, particularly low-load, sustained isometric contractions mainly abdominal drawing-in manoeuvre selectively activates Transverse Abdominis and multifidus muscle while minimizing compensatory strategies. Repeated practice induces neuromuscular plasticity, normalizing recruitment order. Core stabilization exercises alleviate non-specific low back pain through multiple synergistic mechanisms by restoring segmental motor control, correcting abnormal recruitment patterns, enhancing lumbopelvic stiffness, engaging descending pain inhibition, and improving proprioceptive accuracy(B. Kim & Yim, 2020). The comparative data highlight the importance of addressing muscle imbalances in the hips and core to restore functional stability (Xu et al., 2024) (Guo et al., 2025). This study widens the spectrum for clinicians and physiotherapists to offer evidence-based recommendations to choose effective exercise protocols to musculoskeletal rehabilitation.

METHODS

Participants and Study Design

This experimental study was designed as randomized controlled trial and involved 78 patients with NSLBP. They were recruited from the Outpatient department of the Khalsa University, Amritsar and were also recruited through local clinical settings.

Recruited participants gave their written informed consent before participating in the study. This study was carried out in accordance with the Declaration of Helsinki and approved by the Ethics Committee of Khalsa college, Amritsar. It is registered in Clinical Trial Registry of India, CTRI/2026/01/120616. The sample size was calculated with the help of G* Power (3.1.9.2). The significance level was set as α =0.05, the effect size = 0.57 and the power of 0.80.

ELIGIBILITY CRITERIA

Inclusion criteria

Both males and females with age group of 18–25 years.
Patients with a history of non-specific low back pain without radicular symptoms since 3 months.
Patients having pain intensity between 4-6 on the NPRS localized to the lumbar region.
Positive Modified Thomas test.
Had low physical activity levels (<600 MET-MIN/WEEK) as assessed by the global physical activity questionnaire (GPAQ)

Exclusion criteria

- Patients with a history of spine surgery or fracture, or medical conditions.
- Patients with a history of medication use that affected pain or exercise tolerance (such as opioids or muscle relaxants).
- Patients with Lumbar spondylosis with radiculopathy, spondylolisthesis, disc prolapse, or rheumatic disease.

Outcome measures included

Numerical Pain Rating Scale

The NPRS was used to capture the patient's level of pain. Patients were asked to indicate the intensity of current, best, and worst levels of pain over the past 24 hours using an 11-point scale ranging from 0 (no pain) to 10 (worst pain imaginable)(Duraiyarasan et al., 2024).

Modified Thomas Test

The Modified Thomas Test is used to assess the flexibility of the iliopsoas muscle. One knee is held to the chest while the other leg hangs freely off the table as the subject rests supine at the edge of the table. A positive test for iliopsoas tightness is indicated if the hanging thigh remains elevated over the table, indicating

limited hip extension. When conducted using standardized procedures, the test exhibits good to outstanding intra- and inter-rater reliability (ICC > 0.80). Additionally, it exhibits strong construct and concurrent validity and a strong correlation with the goniometric evaluation of hip extension. In a clinical setting, it is a precise and trustworthy way to determine whether iliopsoas tightness is causing anterior pelvic tilt and low back problems(Peeler & Anderson, 2007).

Prone Bridge Test

To evaluate the endurance of the core muscles, especially the anterior trunk stabilizers, the Prone Bridge Test (Plank Test) is performed. With a neutral spine and a straight line from head to heels, the person takes a prone position, supporting their body on their forearms and toes. The position is maintained for as long as feasible, and the amount of time measured in seconds until the subject terminates because of exhaustion or loses appropriate alignment is noted. It is sensitive to weaknesses observed in people with low back pain and especially assesses the isometric endurance of the core muscles. The test demonstrates good reliability when performed using standardised procedures and is clinically useful for assessing trunk stability and monitoring rehabilitation progress(Bohannon et al., 2018).

Roland-Morris Disability Questionnaire (RMDQ)

The Roland-Morris Disability Questionnaire is a self-reported outcome measure designed to assess functional disability associated with low back pain. It consists of 24 items related to daily activities affected by back pain, such as walking, bending, sitting, and self-care. Each item is scored 1 (yes) or 0 (no), with total scores ranging from 0 (no disability) to 24 (maximum disability). RMDQ has excellent internal consistency (Cronbach's α = 0.84–0.96) and reliability (ICC = 0.91), making it a sensitive tool to monitor functional progress(Alarab et al., 2020a).

Universal Goniometer

Goniometry is a standardized clinical method to quantify joint range of motion (ROM). A universal goniometer consists of two arms and a central fulcrum for precise angle measurement. In this study, it is used to assess hip extension ROM to evaluate iliopsoas flexibility. The axis is placed over the greater trochanter, the stationary arm aligned with the mid-axillary line, and the moving arm along the lateral femur toward the lateral epicondyle. Goniometric measurements show excellent reliability (ICC > 0.90) and high validity, ensuring accurate pre- and post-intervention comparison(Hanks & Myers, 2023)

78 patients who were recruited after screening, divided randomly (using a lottery system) into two groups:

- Group A (Muscle Energy Technique and Core Stabilisation exercises along with Hamstring Stretching) (n=39)
- Group B (Positional Release Technique and Core Stabilisation exercises along with Hamstring Stretching) (n=39)

Group A

Muscle Energy Technique and Core Stabilisation exercises along with Hamstring Stretching, total duration of 46 minutes.

Subjects received the Muscle Energy Technique (MET) for the bilateral iliopsoas muscles exercise program for about 45 minutes. This involved a precisely controlled, submaximal (15-20%) isometric contraction held for 7–10 seconds, followed by a passive stretch to a new restrictive barrier. received muscle energy technique for iliopsoas.

Procedure: Patient lies in supine lying at the end of the treatment table with one leg fully flexed at the hip and knee and held throughout in this position, while the other leg is allowed to reach the limit of its stretch, as gravity pulls it towards the floor, the therapist resist the attempt by the patient to flex the hip for 30 seconds. Patient keep on deep breathing while performing technique, after isometric contraction on exhalation the thigh should be taken to new restricted barrier and hold for 30 seconds, 3 repetitions, 2 sets for 3 weeks on alternate days on Monday, Wednesday and Friday:

- Core Stabilization Exercises and Hamstring Stretching to both Groups.
- Double Bridge Exercise: Patient position: Supine lying with knee flexed at 90-degree feet hip width apart, arms beside the body. The therapist stands lateral to the participants at the level of pelvis to give verbal instructions. 7 repetitions with 10 second hold, 2 set.
- Single bride exercise: Patient position: the patient is in supine position with one knee flexed and contralateral lower limb extended the pelvis is lifted off the table using only supporting limb while maintaining pelvic alignment. 7 repetitions with 10 second hold, 2 set bilaterally
- Knee flexion and double bridge: Patient's position: patient maintains the double bridge position and alternatively lifts one foot from the table, performing knee flexion, while preventing pelvic displacement. 7 repetitions with 10 second hold, 2 set.
- Knee bend and single bridge: patient position: the patient performs a single leg bridge using supporting limb while non supporting limb repeatedly bends and extends at knee without allowing pelvic movement. 7 repetitions with 10 second hold, 2 set bilaterally.
- Anti-bridge movement: patient position: the participants maintain a double bridge position with the pelvis elevated and trunk aligned. 7 repetitions with 10 second hold, 2 set.
- Hamstring Stretching: Position of patient is supine lying, one leg resting on couch and other was flexed hip and knee 90-90 position, while extending knee

stretch was applied for 30 seconds, 3 reps and 2 sets, this stretch was applied bilaterally.

- **Group B**
- Positional Release Technique and Core Stabilisation exercises along with Hamstring Stretching, total duration of 52 minutes.

Participants received the Positional Release Technique (PRT) for the bilateral iliopsoas. The therapist passively moved the hip into a "position of ease" typically involving significant flexion to shorten the muscle which was held for 90 seconds to facilitate neurological silencing of the muscle spindles for 3 weeks on alternate days on Monday, Wednesday and Friday.

Procedure: The process involved finding the amount of hip flexion that reduces palpated pain in the tender point markedly, at which time fine turning is introduced in which small amounts of side flexion on rotation are introduced to assess the effects on tenderness.

When tenderness drops by at least 70% the position is maintained for not less than 90 second before slowly returning the patient to neutral position.

Statistical Analysis

Descriptive statistics, including mean, standard deviation, were calculated for the demographic characteristics. Further, inferential statistics, paired and unpaired T-test, were applied to assess within-group and between-group differences across baseline and 3-week intervals. The findings are presented in the form of tables followed by a detailed description, comparison, and interpretation of the results. The level of significant (p value) was set as $p \leq 0.05$.

RESULTS

Table 1: Descriptive analysis of demographic characteristics among all groups.

VARIABLES	GROUP-A (Mean ± SD)	GROUP-B (Mean ± SD)
Age (Years)	21.56 ± 2.33	21.87 ± 2.34
Height (cm)	163.64± 6.20	163.85± 6.62
Weight (kg)	64.38± 6.50	63.00 ± 5.51
BMI (kg/m²)	24.31 ± 2.83	23.59 ± 2.87

Table 1. Presents the baseline demographic characteristics of participants in Group A and Group B. Data are expressed as mean ± standard deviation (SD). Independent samples t-tests were conducted to compare the groups. The data is shown with mean ± standard deviation (SD). Independent sample t-tests were performed to determine if there were any statistically significant differences between the two groups. There were no differences between Group A and Group B with respect to age (21.56 ± 2.33 vs. 21.87 ± 2.34 years, t = 0.582, p = 0.562), height (163.64 ± 6.20 vs. 163.85 ± 6.62 cm, t = 0.141, p = 0.888), weight (64.38 ± 6.50 vs. 63.00 ± 5.51 kg, t = 1.015, p = 0.313), or body mass index (24.31 ± 2.83 vs. 23.59 ± 2.87 kg/m², t = 1.111, p = 0.270). These findings indicate that the two groups were well-balanced and comparable at baseline for the measured demographic variables.

Table 2: Within-Group Comparison of all the parameters in Group A (Muscle Energy Technique along with core Stabilisation exercises and hamstring stretching).

Outcome Measure Group A	Pre Intervention (Mean ± SD)	Post Intervention (Mean ± SD)	p-value
NPRS	5.18 ± 0.85	2.72 ± 1.02	.0001**
Modified Thomas Test (in degrees) Right	16.821±2.024	8.487±2.163	.0001**
Modified Thomas Test (in degrees) Left	15.949±2.089	7.462±2.150	.0001**
Prone Bridge Test	26.231±4.826	43.051± 4.904	.0001**
Lumbar flexion	3.80 ± 0.78	5.29 ± 0.73	.0001**
Lumbar Extension	1.51 ± 0.43	2.69 ± 0.49	.0001**
Lateral Lumbar Flexion- Right	16.154 ± 2.787	20.051 ± 3.043	.0001**
Lateral Lumbar Flexion- Left	16.410 ± 1.517	19.590 ± 2.173	.0001**
Roland Morris Disability Questionnaire (RMDQ)	9.359 ± 1.630	5.813 ± 1.630	.0001**

Table 2. Demonstrates the results of the within-group comparison (of Group A) of the Numerical Pain Rating Scale (NPRS) scores, Modified Thomas Test scores at right and left side, Prone Bridge Test score, Lumbar flexion, extension, lateral flexion and RMDQ scores before and after the intervention for Group A and statistically significant improvements in all outcome measures following the intervention ($p < 0.001$). Pain intensity decreased (NPRS: 5.18 to 2.72), while muscle flexibility improved bilaterally, with approximately 50% reduction in Modified Thomas Test values. Core strength increased markedly (Prone Bridge Test: 26.23 to 43.05). Lumbar range of motion improved in flexion, extension and lateral flexion. Functional disability also showed a significant reduction (RMDQ: 9.36 to 5.81), indicating overall enhancement in clinical and functional outcomes.

Statistical analysis using a paired t-test revealed a p-value of 0.0001 indicating a highly significant reduction in pain levels post-intervention ($p < 0.05$).

Table 3: Within-Group Comparison of all the parameters in Group B (Positional Release Technique along with core Stabilisation exercises and hamstring stretching).

Outcome Measure Group B	Pre Intervention (Mean ± SD)	Post Intervention (Mean ± SD)	p-value
NPRS	5.10 ± 0.79	3.51 ± 1.05	.0001**
Modified Thomas Test (in degrees) Right	16.769 ± 2.133	12.385 ± 2.540	.0001**
Modified Thomas Test (in degrees) Left	16.128 ± 2.308	11.077 ± 2.851	.0001**
Prone Bridge Test	25.718 ± 5.062	36.846 ± 5.163	.0001**
Lumbar flexion	3.79 ± 0.77	4.88 ± 0.86	.0001**
Lumbar Extension	1.59 ± 0.48	2.45 ± 0.48	.0001**
Lateral Lumbar Flexion- Right	15.308 ± 2.250	17.436 ± 2.250	.0001**
Lateral Lumbar Flexion- Left	16.385 ± 1.462	17.872 ± 2.080	.0001**
Roland Morris Disability Questionnaire (RMDQ)	9.077 ± 1.645	6.282 ± 1.075	.0001**

Table 3: The results of the within-group comparison showed statistically significant improvements in all outcome measures following the intervention ($p < 0.001$). A significant reduction in pain intensity was observed (NPRS: 5.10 ± 0.79 to 3.51 ± 1.05). Muscle flexibility improved bilaterally, as evidenced by decreased Modified Thomas Test values (right: 16.77 ± 2.13 to 12.38 ± 2.54; left: 16.13 ± 2.31 to 11.08 ± 2.85). Core stability showed a significant increase (Prone Bridge Test: 25.72 ± 5.06 to 36.85 ± 5.16 s). Lumbar range of motion demonstrated significant enhancement in flexion (3.79 ± 0.77 to 4.88 ± 0.86), extension (1.59 ± 0.86 to 2.45 ± 0.48), and lateral flexion bilaterally (right: 15.31 ± 2.25 to 17.44 ± 2.25; left: 16.39 ± 1.46 to 17.87 ± 2.08). Functional disability significantly decreased (RMDQ: 9.08 ± 1.65 to 6.28 ± 1.08), indicating improved functional capacity and clinical outcomes. Statistical analysis using a paired t-test revealed a p-value of 0.0001 indicating a highly significant reduction in pain levels post-intervention ($p < 0.05$).

Table 4: Between-Group Comparison of all the parameters at the baseline.

Outcome Measure	Group A Pre Intervention (Mean ± SD)	Group B Pre Intervention (Mean ± SD)	p-value
NPRS	5.18 ± 0.85	5.10 ± 0.79	0.628
Modified Thomas Test (in degrees) Right	16.82± 2.02	16.76 ± 2.133	0.914
Modified Thomas Test (in degrees) Left	15.949 ± 2.089	16.128 ± 2.308	0.720
Prone Bridge Test	26.231 ± 4.826	25.718 ±5.062	0.648
Lumbar flexion	3.80 ± 0.78	3.79 ± 0.77	0.637
Lumbar Extension	1.51 ± 0.43	1.59 ± 0.48	0.426
Lateral Lumbar Flexion- Right	16.154 ± 2.787	15. 308 ± 2.250	0.144
Lateral Lumbar Flexion- Left	16.410 ± 1.517	16.385 ± 1.462	0.940
Roland Morris Disability Questionnaire (RMDQ)	9.359 ± 1.630	9.077 ± 1.645	0.449

Table 4 Represents the baseline comparison of outcome measures between Group A and Group B included NPRS score, Modified Thomas test score for right and left side, Prone Bridge Test score, Lumbar range of motion including flexion, extension, right and left lateral flexion and RMDQ score among participants in Group A and Group B prior to the interventions. No statistically significant differences were observed between the groups across all variables ($p > 0.05$), Both groups demonstrated comparable values in pain intensity (NPRS: 5.18 ± 0.85 vs 5.10 ± 0.79), muscle flexibility (Modified Thomas Test—right: 16.82 ± 2.02 vs 16.76 ± 2.13; left: 15.95 ± 2.09 vs 16.13 ± 2.31), and core endurance (Prone Bridge Test: 26.23 ± 4.83 vs 25.72 ± 5.06 s). Lumbar range of motion, including flexion, extension, and bilateral lateral flexion, was also comparable between groups. Functional disability scores (RMDQ: 9.36 ± 1.63 vs 9.08 ± 1.65) showed no significant difference.

Table 5: Between-Group Comparison of all the parameters after 3 weeks of treatment.

Outcome Measure	Group A Post Intervention (Mean ± SD)	Group B Post Intervention (Mean ± SD)	p-value
NPRS	2.72 ± 1.02	3.51± 1.05	0.02**
Modified Thomas Test (in degrees) Right	8.487± 2.163	7.462± 2.150	0.0001**
Modified Thomas Test (in degrees) Left	7.462± 2.150	11.07 ± 2.851	0.0001
Prone Bridge Test	43.051 ± 4.904	36.846 ± 5.163	0.0001**
Lumbar flexion	5.29 ± 0.73	4.88 ± 0.86	0.029
Lumbar Extension	2.69 ± 0.49	2.45 ± 0.44	0.034
Lateral Lumbar Flexion- Right	20.051± 2.250	17.436± 2.062	0.0001
Lateral Lumbar Flexion- Left	19. 590 ± 17.872	17.372 ± 2.080	0.0001*
Roland Morris Disability Questionnaire (RMDQ)	5.513 ± 1.604	6.282 ± 1.075	0.015*

Table 5 Presents the post-intervention comparison of outcome measure NPRS score, Modified Thomas test score for right and left side, Prone Bridge Test score, Lumbar range of motion including flexion, extension, right and left lateral flexion and RMDQ score among participants in Group A and Group B after the intervention Statistical analysis revealed a significant between-group difference across all variables ($p < 0.05$), indicating differential treatment effects. Group A demonstrated lower pain intensity (NPRS: 2.72 ± 1.02 vs 3.51 ± 1.05) and greater improvement in muscle flexibility, as evidenced by reduced Modified Thomas Test values. Core endurance was higher in Group A, while lumbar range of motion parameters, including flexion, extension, and bilateral lateral flexion, were comparatively greater. Additionally, functional disability scores were lower in Group A (RMDQ: 5.51 ± 1.60 vs 6.28 ± 1.08), indicating superior functional outcomes. The difference between the two groups was statistically significant ($p<0.05$).

DISCUSSION

The present study was conducted to compare the effectiveness of Muscle Energy Technique combined with Core Stabilization Exercises, along with hamstring stretching and Positional Release Technique on iliopsoas with core Stabilisation exercise along with hamstring stretching on pain, iliopsoas tightness, lumbar range of motion, core strength and disability in individuals with nonspecific low back pain. The findings of this study demonstrated that both groups showed statistically significant improvements; however, Group A (Muscle Energy Technique along with core Stabilisation exercises and hamstring stretching) exhibited the greatest overall improvement as compared to Group B (Positional Release Technique along with core stabilization exercises and hamstring stretching).

The current study showed that both MET and the PRT could be of advantage in the treatment of non-specific low back pain associated with prolonged sitting. There was a critical difference in the intensity of pain within the groups and between the groups after the 3 week of treatment. Decline in pain intensity, as documented with improvement in lumbar ROM was more in the MET group than the PRT group. As found from the RMDQ scale, relief from discomfort was accomplished with both Group A and Group B, in this study was considerably more established in the MET group as the intervention induced local vasodilation. Additionally, MET promoted hyperemia by increasing the local blood supply to the affected tissues, thus it decreases stiffness and restores the ROM. While Core Stabilisation exercise helps in increasing strength of the core muscles.

Significant reduction in the pain intensity in both groups could have occurred due to decrease in the intrafusal and extrafusal fibre disparity and reset of the inappropriate proprioceptive activity. A study(Collebrusco, 2014) has provided a conceptual model of how different manipulative techniques like isometrics and stretching maybe effective in the treatment of somatic dysfunction. It could also have been due to stimulation of joint and muscle proprioceptors. This might have produced pain relief according to the Gate Control Theory especially as PRT, though invented as a structural technique can be physiologically seen as a way of setting proprioceptors, primarily at tendon-osseous junctions. Kaorr has given a conceptual model, how various manipulative methodologies such as isometric and stretching might be effective in the somatic dysfunction treatment.

Iliopsoas muscle tightness represents a clinically significant factor that adversely affects activities of daily living. The observed improvements functional disability and lumbar range of motion can be attributed to the complementary mechanisms of Iliopsoas Muscle Energy Technique and Positional Release Technique. MET reduces iliopsoas tightness as a contributor to increased anterior pelvic tilt and lumbar lordosis via autogenic inhibition. A controlled isometric contraction activates Golgi tendon organs, inducing post-contraction relaxation and restoring normal muscle length (Chaitow, 2006; Greenman, 2003). In contrast, PRT passively positions the involved tissue into maximal slack, reducing aberrant muscle spindle afferent (Ia/II) discharge and decreasing reflexive alpha motor neuron excitation, thereby breaking the cycle of chronic muscle guarding and tenderness (Van Buskirk, 1990; Wong, 2012). Thus, MET corrects biomechanical shortening

while PRT attenuates reflex irritability, synergistically reducing nociceptive drive and facilitating core stabilization exercises.

The use of MET and PRT probably worked in the resolution of inflammation and spasm of the iliopsoas muscle due to its effects similar to the soft-tissue techniques such as stretching of soft tissue in affected area, moving of fluids out of inflamed area reflex relaxing or tonifying muscle. (Chauhan et al., 2022b) Schenk et al. performed a randomized controlled trial to decide the adequacy of MET in enhancing lumbar extension in symptomatic subjects and found that there was increase in ROM in experimental group. The study results on the current study are likewise agreeing with the study results of Schenk et al(Schenk et al., 1997).

Core Strength, assessed using the Prone Bridge Test, showed significant improvement in both groups, with the greatest correction observed in Group A. The findings of study(Ak et al., n.d.) reveals that muscle energy technique and core stability exercises are effective in the management of pain associated with patients with non-specific low back pain. Akodu et al.(9) who carried out a study on the effect of Stabilisation exercise on muscle thickness of lumbar multifidus (LM) in patient with chronic low back pain. The finding showed that there was improvement in lumbar multifidus muscle thickness and this implies that increased contracted LM muscle was associated with greater improvement in CLBP patients. The reduction in pain by core stability exercises can be attributed to the strengthening of the deep muscles of the back, lumbar multifidus and transversus abdominal muscles and trunk Stabilisation from the spine and subsequently reduce low back pain. (Kehinde et al., 2014).

This finding also aligns with the study(Alarab et al., 2020b), who reported that LBP exercises with PRT have higher effect than PRT without exercises on pain, also it was concluded that PRT with exercises increases the abdominal strength and endurance more efficiently than the PRT without exercises. The superior results in Group A may be attributed to CSE may enhance activation of local trunk muscles and improve coordination of the trunk muscles, which is important for improving the stability of the lumbar segment and reducing spinal overload along with effect of MET in reducing the spasm of the iliopsoas muscle.

The results of the present study support the concept of a Muscle Energy Technique and Positional Release Technique to manage Iliopsoas tightness in subjects with Non-Specific Low Back Pain. Overall, the present study confirms that combining Muscle Energy Technique with core stabilization exercises produces superior outcomes compared to Positional Release technique with core stabilization exercises demonstrating the greatest effectiveness.

CONCLUSION

The present study investigated the effects of iliopsoas muscle energy technique (MET) combined with core stabilization exercises and hamstring stretching on pain, functional disability, lumbar range of motion, and iliopsoas tightness in college students with non-specific low back pain (NSLBP). The findings demonstrate that the combined intervention produced statistically significant improvements across all outcome measures. Specifically, participants exhibited reductions in pain intensity, improvements in functional disability as measured by the Modified Oswestry Disability Index (MODI), increased lumbar range of motion in all planes, and decreased iliopsoas tightness quantified by the Modified Thomas Test.

Furthermore, core stabilization training alone proved significantly effective in treating NSLBP by enhancing lower back muscle function, suggesting that CSE serves as a foundational component of rehabilitation in this population. These results support the clinical utility of integrating MET, CSE, and hamstring stretching as a multimodal conservative approach for managing NSLBP in young adult populations. However, the absence of a control or comparison group limits causal attribution. Future randomized controlled trials should isolate the individual contributions of each intervention component and include long-term follow-up assessments.

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