DOI: 10.21088/potj.0974.5777.18125.6

Physiotherapy and Occupational Therapy Journal
Volume 18 Number 1, January - March 2025

ORIGINAL ARTICLE

Exploring the Efficacy of Muscle Energy Technique and Positional Release Technique for Alleviating Low Back Pain of Mechanical Origin

K. Saraswathi[1], S. Ramachandran[2], Selvaraj Sudhakar[3], R. Kaushik[4], S. Pavithra[5]

How to cite this article:

***K. Saraswathi, S. Ramachandran** et al.* Exploring the Efficacy of Muscle Energy Technique and Positional Release Technique for Alleviating Low Back Pain of Mechanical Origin. Physio. and Occ. Therapy Jr. 2025; 18(1): 45-54.

ABSTRACT

Background: Within the human body, mechanical low back pain is among the most prevalent ailment, next only to the common cold. Back discomfort contributes to tardiness, reduced efficiency, healthcare costs, lost wages, and a host of psychological issues. Muscle energy approach combines the exactitude of passive mobilization with manual therapy to treat movement dysfunction. A passive manual treatment method called positional release is utilized to enhance function and lessen discomfort

Aim : The aim of the study is to compare the effectiveness of MET versus PRT on pain and disability index in individual with mechanical low back ache.

Objective: The objective of the study is to compare the effectiveness of MET and Positional release technique on pain and lumbar ROM in mechanical low back pain

Methodology: This comparative experimental research investigation (pre- and post-intervention) was conducted in the outpatient department of ACS Hospital, Chennai. This research investigation intended to assess and contrast the efficacy of Manual Therapy (MET) and Progressive Resistance Training (PRT) in alleviating pain and impairment in patients with mechanical low back pain. A cohort of 30 individuals was selected based on predefined inclusion and exclusion criteria. Employing a basic random sample technique, thirty participants were randomly allocated into two groups of fifteen throughout a duration of six weeks, with three

AUTHOR'S AFFILIATION:

[1] Lecturer, Faculty of Physiotherapy, Dr. MGR. Educational and Research Institute, Velappanchavadi, Chennai, Tamil Nadu, India.

2.Professor, Faculty of Physiotherapy, Dr. MGR. Educational and Research Institute,Velappanchavadi, Chennai, Tamil Nadu, India.

[3] Professor, Faculty of Physiotherapy, Dr. MGR. Educational and Research Institute, Velappanchavadi,Chennai, Tamil Nadu, India.

[4]Lecturer, Faculty of Physiotherapy, Dr. MGR. Educational and Research Institute, Velappanchavadi, Chennai, Tamil Nadu, India.

[5]PG Student, Faculty of Physiotherapy, Dr. MGR. Educational and Research Institute, Velappanchavadi, Chennai, Tamil Nadu, India.

CORRESPONDING AUTHOR:

K. Saraswathi, Lecturer, Faculty of Physiotherapy, Dr. MGR. Educational and Research Institute, Velappanchavadi, Chennai, Tamil Nadu, India.

E-mail: drsaraswathik1985@gmail.com

➢ **Received:** 06-01-2025 ➢ **Revised:** 08-01-2025 ➢ **Accepted:** 20-02-2025

sessions each week. Pain and disability were assessed by the Visual Analogue Scale (VAS) and the Modified Oswestry Low Back Pain Disability Questionnaire. Comparisons of pre-test and post-test mean values yielded a statistically significant difference ($p < 0.001$), demonstrating that the Muscle Energy Technique is superior than the Positional Release Approach for lower lower back pain of mechanical origin.

Result: Upon analysing the Pre-test and Post-test data from Group A and Group B, as measured by the Visual Analogue Scale (VAS) and the Modified Oswestry Low Back Pain Disability Questionnaire, a statistically significant difference in mean scores is seen, with a p-value of < 0.001.

Conclusion: This study demonstrates the finding that the Muscle Energy Technique is substantially more efficacious as opposed to the Positional Release Technique for individuals suffering from mechanical low back pain.

KEYWORDS

• Low back ache • Muscle energy technique • Positional release technique • Modified oswestery questionnaire • VAS

INTRODUCTION

A significant number of people encounter low back discomfort during their lifetime, and this widespread problem frequently motivates them to consult healthcare professionals for treatment.[1] It frequently coexists with discomfort originating from the musculoskeletal framework.[2] The phenomenon is identified as localized pain in the leg, potentially occurring or not, that stretches from the twelfth rib to the lower gluteal fold.[3] Low back pain that cannot be recognized or associated with a particular medical condition, such as a tumour, infection, osteoporosis, lumbar spine fracture, structural deformity, radicular pain, etc., is known as vague low back pain, likewise referred to as mechanical low back pain.[4]

Those afflicted with mechanical low back pain frequently shun physical exertion, apprehensive that a lack of activity could precipitate lumbar muscular atrophy. This weakening of the muscles may, in turn, aggravate their existing pain.[5]

The most prevalent locales of discomfort for mechanical low back pain are the buttocks, the segmental lower back, and on rare occasions the upper limbs. The sensations experienced in the back are intricately influenced by the stress placed upon the spine, varying with movements such as bending forward, arching backward, sitting, or rotating. This discomfort, known as mechanical low back pain, arises from the spine, intervertebral discs, or the surrounding soft tissues. Conditions contributing to this pain include spinal compression, lumbar spondylosis, herniated discs, lumbosacral muscle tension, and both acute and chronic injuries.[6] Adults in India have a prevalence of low back pain of roughly 70.65%, while the global prevalence is between 36% and 64%[7].

Nationwide, mechanical low back pain remains the predominant reason individuals seek medical attention. This condition is anticipated to impose a staggering $75 billion burden on the US economy each year, with an astonishing 85% of the population experiencing mechanical low back pain at some stage in their lives. In 2010, it was estimated that 9.4% of individuals reported back discomfort, with a higher prevalence among males at 10.1%, compared to 8.7% for females.

Excessive flexion causes a deformation in the lumbar spine that gets worse with time, regardless of age.[8] The muscle energy technique was created by osteopathic physicians and is currently utilized by many manual therapists. You can use the muscle energy technique on every joint in your body. It is mostly applied to people with restricted ranges of motion. A good conservative treatment for lumbopelvic pain is MET. MET application offers numerous benefits, one of which is its quick application time. It is an isometric contraction at modest force in a pain-free position. To sum up, the patient will not experience any pain or injury from this procedure. In order to assist patients in resisting muscle contraction, the therapist applies a resistive force counter.[9]

Lengthening tight muscles and improving joint mobilization are the objectives. In situations when high velocity low amplitude is not recommended, this technique can be employed because there is very little chance of difficulties because no pushing is involved.[10]

In a refined application of Muscle Energy Technique (MET), the patient's muscles were utilized to establish a singular, regulated posture, precisely aligned against a counterforce that the therapist skillfully applied upon request. This method is renowned for its capacity to reduce the tone of a muscle or muscle group shortly following an isometric contraction, thus embodying the essence of post-isometric relaxation. The resultant relaxation is orchestrated by the sensory feedback from the muscle spindle, which, in conjunction with the Golgi tendon organ, exerts a subtle inhibitory effect on the antagonist muscles.[11]

Positional release technique is a whole body assessment and therapy approach that addresses related dysfunction by using comfortable positions and tender areas. Removing the physical barriers that prevent certain body motions is the goal of the positional release technique.[12] Strain counter strain is another name for the soft tissue treatment known as positional release. It entails improving circulation and bringing muscle tone to rest. After that, the area is positioned to release the tension in the injured muscle, which in turn reduces pain.[13] It is a passive and indirect form of care.[14] This treatment involves placing tissues in a comfortable position for a brief amount of time—90 seconds—in order to cure excessive muscle tension or spasm and aid the restoration of normal tissue length.[15]

This method, which is used to relieve somatic dysfunction that is either too acute or too delicate, works by having the muscles shorten and sending a signal to the brain that reduces the contraction of the muscles.[16] An device used to measure a feature or attitude of pain is the visual analogue scale (VAS)[17]. VAS typically has a length of one centimeter in the horizontal direction, with word descriptors at the end. The patient was asked to indicate on the line the point that, in their opinion, best captured how they felt about their current situation. To ascertain the VAS score, one must measure in centimetres from the left-hand extremity to the specific point indicated by the patient.[18]

In 1980, the Oswestry Low Back Questionnaire was first described. Ten items total, covering various facets of function, make up the questionnaire.[19] Every item has a score between 0 and 5, where a higher number denotes a more severe handicap. The Medical Research Council group in the UK changed the MOLBPDQ in 1989 by eliminating the sex life questionnaire.[20] The objective of this research is to assess the efficacy of MET and positional release techniques in enhancing lumbar range of motion and alleviating pain in individuals suffering from mechanical low back pain.

HYPOTHESES

Null Hypothesis: There is no significant difference in Muscle energy technique and Positional technique on individual with mechanical low back ache.

Alternate Hypothesis: There is a significant difference in Muscle energy technique and Positional technique on individual with mechanical low back ache.

MATERIALS AND METHODS

This research was intently configured as an experimental study with pre- and post-intervention evaluations. The research was conducted in the Physiotherapy OPD of ACS Medical College and Hospital, for a duration of six weeks. following ethical approval obtained from the Institutional Ethical Committee of Dr. M.G.R. Educational and Research Institute, Chennai, a cohort of 30 individuals voluntarily participated after signing a written informed consent form, in compliance with the inclusion criteria. The study participants were included and excluded as given in Table 1. The participants were then assigned to two groups by a simple lottery sampling technique. All participants were apprised of the study's aims, and their signed agreement was secured. Group A underwent muscular energy methods, whereas Group B got positional release techniques, both conducted over the course of six weeks involving three treatment sessions every single week. Pre- and post-assessments were performed on the Visual Analogue Scale (VAS) and the modified Oswestry Low Back Pain Disability Questionnaire.

Table 1: Inclusion and Exclusion Criteria

Parameters for qualification	Parameters for disqualification	Parameters for disqualification
• Patients must possess a clinical diagnosis of mechanical low back pain, ensuring a precise understanding of their condition. • Symptoms should have manifested within the last three weeks, allowing for an acute assessment of their situation. • Eligible individuals are aged between 18 and 35 years, encompassing both male and female participants.	• A rich tapestry of past traumas • Intervertebral disc abnormalities • Underlying systemic conditions • Individuals utilizing muscle relaxants • Patients with osteoporosis	• A rich tapestry of past traumas • Intervertebral disc abnormalities • Underlying systemic conditions • Individuals utilizing muscle relaxants • Patients with osteoporosis

Group A: Muscle Energy Technique for Erector Spinae

Patient Position: The patient was positioned on a treatment couch, facing away from the therapist, with their legs suspended over the side and their hands clasped behind their neck. Therapist Position: The therapist placed their knees on the sofa next to the patient, notably on the side where lateral bending and rotation were used.

Technique: The therapist positioned one hand anterior to the patient's axilla on the indicated side for rotation, extending the hand across the patient's neck to rest on the contralateral shoulder. The patient was instructed to do flexion, lateral bending, and rotation over the therapist's knees. The therapist's hand assessed regions of tension, ensuring that several pressures were focused at the site of greatest strain. Upon achieving a comfortable degree of flexion, the patient was directed to look towards the rotation while holding their breath for 7-10 seconds, while using a little force to return to an upright posture against the therapist's strong resistance. Subsequently, the patient was instructed to exhale completely and relax, focussing their attention on the region where lateral bending and rotation were exerted (i.e., towards the resistance barrier). The therapeutic impact was enhanced by post-isometric relaxation. The patient fully exhaled, enabling the therapist to lead them farther into the resistance until a new barrier was encountered as shown in Fig. 1.

Figure 1: Muscle Energy Technique for Erector Spinae

Treatment Duration: Every muscle contraction lasted 10 seconds, subsequent to a 20-second relaxation interval, repeated nine times, amounting to a total of 270 seconds. The comprehensive therapy included eight sessions executed over eight successive days.[21]

Group B: Positional Release Technique for Erector Spinae

Patient position: The patient's body was placed in a prone posture, with the trunk laterally bent towards the side displaying soreness.

Therapist Position: The physical therapist was positioned next to the site of discomfort, putting a knee on the couch to support the patient's injured leg on the therapist's leg.

Technique: The patient's hip was stretched and adducted, establishing a comfortable posture with little rotation for precise adjustment. The posture was meticulously and progressively modified until a decrease in discomfort was seen, and it was sustained for 90 seconds before being gradually reverted to a neutral alignment as shown in Fig. 2.

Figure 2: Positional Release Technique for Erector Spinae

Treatment Duration: Each position was held for 90 seconds, including an overall total of three repetitions, resulting in 270 seconds. The therapy consisted of eight sessions conducted over eight days.[22]

RESULT

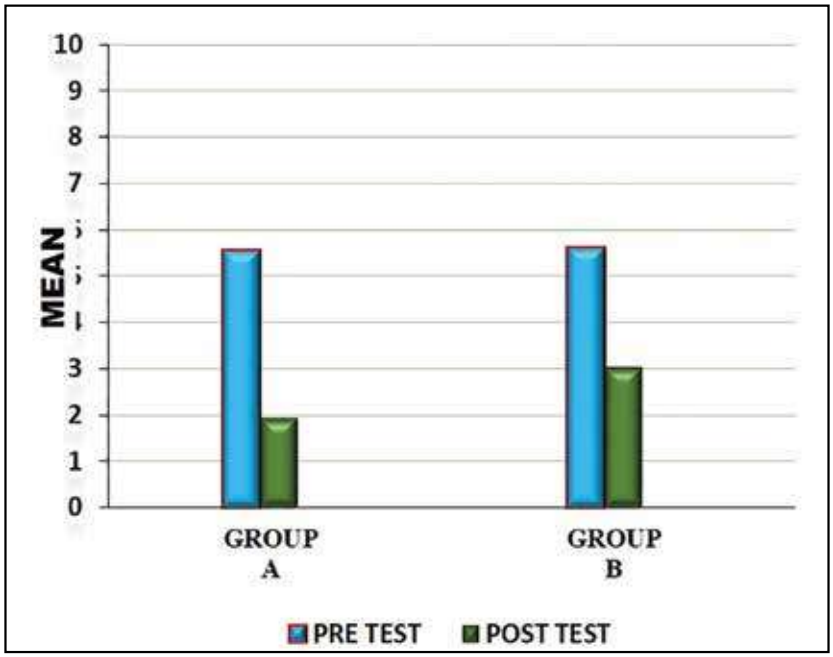
The Shapiro-Wilk test was used to confirm the normality of the data distribution with a significance level established at a p-value of less than 0.05 and a 95% confidence interval used to all analyses. The distinction of the average values between Group A's participants and Group-B of participants on the Visual Analogue Scale Score, that gauges pain intensity, reveals a substantial decrease in post-test mean values in both groups of participants. Notably, Group-A, which applied the Muscle Energy Technique, recorded a mean value of 1.93, demonstrating superior effectiveness compared to Group-B's mean value of 3.00, associated with the Positional Release Technique, at a significance level of $P \leq 0.001$(as shown in Table 2). This causes the null hypothesis to be rejected.

Table 2: Comparison of visual analogue scale score within Group–A and Group–B Between Pre-test and Post-test

Group	Pre-test		Post-test		t - test	Significance
	Mean	S.D	Mean	S.D		
Group-A	5.53	1.12	1.93	.703	18.92	.000***
Group-B	5.60	.985	3.00	.534	12.16	.000***

(***- P ≤ 0.001)

The above table reveals the Mean, Standard Deviation (S.D), t-value and p-value between pre-test and post-test within Group–A & Group–B and there is a statistically highly significant difference between the pre test and post test values within Group–A and Group–B (***- P ≤ 0.001) as shown in Graph-I.



Graph 1: Comparison of Visual Analogue Scale Score within Group–A and Group–B Between Pre-test and Post-test

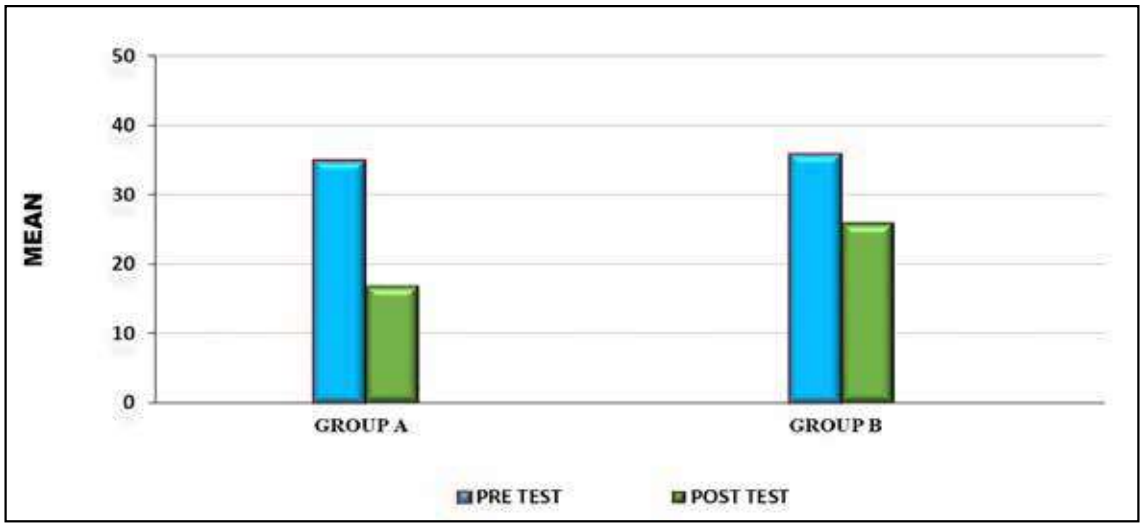
In addition, when evaluating the mean values from the Oswestry Low Back Pain Disability Questionnaire, a significant decrease in post-test scores is observed in both groups. Group A's mean value of 17.26 is lower and thus more effective than Group B's mean value of 26.46, again at P ≤ 0.001, The null hypothesis is subsequently rejected as a result. Moreover, a comparison of pre-test and post-test scores within both groups on the VAS and the Modified Oswestry Low Back Pain Disability Questionnaire shows a highly significant difference in mean values at P ≤ 0.001.

Table 3: Comparison of Oswestry Low Back Pain Disability Questionnaire Score Within Group–A & Group–B Between Pre & Post-test Values

Group	Pre Test		Post Test		t - test	Significance
	Mean	S.D	Mean	S.D		
Group-A	35.66	4.68	17.26	1.70	18.69	.000***
Group-B	36.33	2.48	26.46	1.68	-57.19	.000***

(***- P ≤ 0.001)

The above table reveals the Mean, Standard Deviation (S.D), t-value and p-value between pre-test and post-test within Group–A & Group–B and there is a statistically highly significant difference between the pre test and post test values within Group A and Group B (***- P ≤ 0.001) according to Table 3 and Graph-II.



Graph II: Comparison of Oswestry Low Back Pain Disability Questionnaire Score within Group–A & Group–B Between Pre and Post-test Values

DISCUSSION

Discomfort associated with mechanical low back pain is attributed to the spine's fundamental predisposition to static stresses, which stem from muscular forces, the effects of gravity, and abnormalities in standard kinetic operations.[23] The involvement of erector spinae strains is a notable factor in the aetiology of low back pain.[24]

Patients with mechanical, subacute, and acute low back pain benefit from improved function and decreased disability when MET produces hypertonic muscle relaxation[25]. The type of muscular energy strategy that was employed was called post isometric relaxation, which describes the muscle's subsequent decrease in tone following a brief interval of time spent performing an isometric contraction. The goal of the muscular energy approach was to get hypertonic muscle to relax, allowing the muscle to then stretch.

Evidence suggests that the application of the positional release technique can diminish pain levels and promote increased muscle strength and mobility among those with mechanical low back pain.[26] The therapeutic advantages appear to stem from a synergy of neurological and circulatory alterations that occur when a problematic region is positioned in its most comfortable, relaxed, and pain-free alignment, making it an effective intervention for mechanical low back pain.

Given that muscle energy and positional release techniques produce effects similar to soft tissue stretching, including the facilitation of fluid drainage from inflamed regions and the induction of reflexive muscle relaxation and tonification, it can be inferred that these approaches have been effective in reducing both inflammation and spasms in the erector spinae muscle.

An assessment of pain, utilizing the Visual Analog Scale (VAS), and a disability index measured by the Modified Oswestry Disability Questionnaire (MODQ) was carried out both prior to and following the therapy. The study included thirty participants, who were categorized into two groups: Group A, which included 15 subjects receiving muscular energy techniques, and Group B, which also consisted of 15 subjects undergoing positional release techniques. This study is composed three sessions per week over approximately six weeks, during which both groups (Muscle Energy Technique and Positional Release Technique) demonstrated a statistically significant difference from one another, as well as a notable reduction in pain intensity and

stability exercises. Furthermore, Edrish Saifee Contractor and his team demonstrated that a four-week course of MET for those with adhesive capsulitis markedly improved their functional performance.[34]

After 6 weeks of intervention, the study has concluded with the help of the data analysis statistically it shows the significance effect on Group – A muscle energy technique, which is P ≤ 0.001. Hence alternate hypothesis is proved.

Those afflicted with mechanical low back pain frequently resort to the muscle energy technique and the positional release technique. Research indicates that both techniques are effective in significantly decreasing disability and discomfort. The ultimate findings of my study demonstrated that individuals with mechanical low back pain showed slightly enhanced performance when applying the muscle energy technique.

CONCLUSION

The research findings highlight that patient experiencing mechanical low back pain made significant strides in both Group A and Group B. However, those in Group A, who received the Muscle Energy Technique, achieved greater relief from pain and disability compared to those in Group B, who were treated with the Positional Release Technique. While both techniques were beneficial, the Muscle Energy Technique distinctly outperformed the Positional Release Technique in reducing pain and enhancing the quality of life for individuals suffering from mechanical low back pain.

Conflict of Interest: Conflict of interest declared none.

Funding: No funding received

Ethics Declaration: Ethical approval was obtained from the Institutional Ethical Committee of Dr. M.G.R. Educational and Research Institute, Chennai.

REFERENCES

1. Rodrigo Dalke meucci *et al.,* Prevalence of Chronic Low Back Pain, Revista de saude publica, 2015 49, 73. https://doi.org/10.1590/S0034-8910.2015049005874
2. Marico Antonio Dos Santos; low back pain & risk factors during the third infancy, Fisioterapia em Movimento, 2019, 32. 10.1590/1980-5918.032.AO10
3. Joshua Scottwill *et al,* Mechanical low back pain, American family physician., 2018, 98(7), 421 – 428.https://pubmed.ncbi.nlm.nih.gov/30252425/
4. Balague Federico *et al.*, Non specific low back pain, The lancent 2012 482 – 491. https://doi.org/10.1016/S0140-6736(11)60610-7
5. Joo Soo Yoon *et al.,* The effects of Swissball and stabilisation exercise on pain & bone mineral density of patient with chronic low back pain., J Physio Ther Sci, 2013 aug 25 (8) : 953 – 956. https://doi.org/10.9734/jpri/2021/v33i36A31934
6. John Peloza., lower back pain symptoms, diagnosis and treatment 2017. javascript:void(0)
7. Wu A., March L. *et al.,* Global low back pain prevalence & years lived with disability from 1990 to 2017 : Ann Trans Med 2020;8 (6), 299 – 313. https://doi.org/10.21037%2Fatm.2020.02.175
8. Everett C. hills, Mechanical low back pain, Physical medicine & Rehabilitation feb 2022. https://emedicine.medscape.com/article/310353-overview.
9. Heba Embaby *et al.*, Effects of MET in treating post partum coccydina., physical therapy & Rehabilitation., 2017, 2055 – 2386. 10.7243/2055-2386-4-5
10. P. Naik Prashanth., Comparison of MET and PRT in acute low back pain, Indian journal of physiotherapy and occupational therapy june 2010. https://www.researchgate.net/profile/DeepakAnap/publication/223202765_1_Effect_of_Acetic_acid_iontophoresis_on_calcific_Tendinitis_of_Gluteus_medius_and_minimus_-_A_case_study/links/0912f4fdc0d54edc63000000/1-Effect-of-Acetic-acid-iontophoresis-on-calcific-Tendinitis-of-Gluteus-medius-and-minimus-A-case-study.pdf#page=36
11. E. Fahmy *et al.,* Efficacy of spinal extension exercise program versus MET in treatment of chronic mechanical low back pain, The Egyptian journal of neurology, psychiatry and neurosurgery, 2019., 55(1), 1-6. https://doi.org/10.1186/s41983-019-0124-5
12. Jagatheesan Alagesan; Unnati. S. Shah., Effect of positional release therapy & taping on unilateral upper trapezius tender points – RCT, international journal of health & pharmaceutical sciences ISSN22780564. https://scholar.google.com/citations?view_op=view_citation&hl=en&user=TCF0E2MAAAAJ&citation_for_view=TCF0E2MAAAAJ:PVjk1bu6vJQC

13. K.Kirupa et. al., A comparative study between positional release technique and stretching with isometric exercises for acute trapezitis patient,, NOVYI MRI research journal, ISSN NO: 0130 – 7673. https://dx.doi.org/10.16965/ijpr.2022.122
14. Manivannan M Kaandeepan *et al*., Comparing the effectiveness of PRT technique & passive stretching on hamstring muscle through sit to reach test in normal female subjects, physiotherapy and occupational therapy, 2011, 5 (3), 58. https://www.researchgate.net/profile/Lata-Parmar-3/publication/261098235_Ashish_V_Gupta_Lata_Parmar_To_Assess_the_Relation_Between_Walking_Capacity_and_Cardio-respiratory_Function_in_Post_Polio_Residual_Paralysis_-_Indian_Journal_of_Physiotherapy_and_Occupational_Therapy_J/links/54b3b69e0cf26833efcea27c/Ashish-V-Gupta-Lata-Parmar-To-Assess-the-Relation-Between-Walking-Capacity-and-Cardio-respiratory-Function-in-Post-Polio-Residual-Paralysis-Indian-Journal-of-Physiotherapy-and-Occupational-Therapy.pdf#page=62
15. Timothy speicher *et al*., Top 10 positional release therapy techniques to break the chain of pain, Athletic therapy today 2006 11(6): 69 – 71. https://digitalcommons.sacredheart.edu/pthms_fac/14/
16. Emad Eldin Mohamed, Conventional therapy versus positional release therapy in the treatment low back dysfunction., international journal of physical therapy & research, 2017 vol 5 (5). https://dx.doi.org/10.16965/ijpr.2017.201
17. Anne F Mannion *et al*., pain measurement in patients with low back pain, Nature clinical practice Rheumatology, 2007 3 (11), 610 – 618. https://www.nature.com/articles/ncprheum0646#citeas:~:text=610%E2%80%93618%20(2007).-,https%3A//doi.org/10.1038/ncprheum0646,-Download%20citation
18. Anne M Boonstra *et al*., Reliability & validity of the visual analogue scale for disability in patients with chronic musculoskeletal pain, International journal of rehabilitation research 2008, 31(2), 165 to 169. https://journals.lww.com/intjrehabilres/abstract/2008/06000/reliability_and_validity_of_the_visual_analogue.8.aspx#:~:text=10.1097/MRR.0b013e3282fc0f93
19. Jeremy CT Fairbank, the oswestry disability index, spine 2010, 25(22) 2940 – 2953. https://doi.org/10.3171/2013.7.SPINE13288
20. Julie M fritz, James J Irrang., A comparison of modified oswestry low back pain disability questionnaire & the Quebec back pain disability scale, physical therapy 2001 81(2), 776 – 778. https://doi.org/10.1093/ptj/81.2.776
21. Franke H, Fryer G, Ostelo RW, Kamper SJ. Muscle energy technique for non-specific low-back pain. Cochrane Database Syst Rev. 2015 Feb 27;2015(2):CD009852.doi:PMC10945353. https://doi.org/10.1002/14651858.CD009852.pub2.
22. Memon Fa, Memon sh. assessing the impact of positional release technique and muscle energy technique on low back pain-a randomized controlled trial. Pakistan Journal of Rehabilitation. 2023; 12(2): 45–54. https://doi.org/10.36283/pjr.zu.12.2/007
23. Woby S.R., *et al*. Adjustment to chronic low back pain – the relative influence for fear avoidance beliefs, catastrophizing and appraisals of control, Behaviour Research and Therapy 42.7 2004 761–774 https://doi.org/10.1016/S0005-7967(03)00195-5
24. Essential of orthopaedics & applied physiotherapy, Jayant joshi 431 2002
25. Mellin G. Decreased joint and spinal mobility associated with low back pain in young adults, J Spinal Disord 1990; 3: 238 – 243. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Mellin+G.+-Decreased+joint+and+spinal+mobility+associated+with+low+back+pain+in+young+adults%2C+J+Spinal+Disord+1990&btnG=#:~:text=include%20citations-,Decreased%20joint%20and%20spinal%20mobility%20associated%20with%20low%20back%20pain%20in,G%20Mellin,-Clinical%20Spine%20Surgery
26. bhojan kannabiran, *et al*. A comparative study on effectiveness of two manual therapy techniques on pain and lumbar range of motion in individuals with mechanical low back ache, ECorthopaedics2.12015:36–42. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=bhojan+kannabiran%2C+et al.++A+comparative+study+on+effectiveness+of+two+manual+therapy+techniques+on+pain+and+lumbar+range+of+motion+in+individuals+with+mechanical+low+back+ache&btnG=#:~:text=A%20Comparative%20Study%20of,Orthopae-

dics%2C%202015%20%2D%20ecronicon.net

27. Eric Wilson, Otto payton *et al*., muscle enegy technique in patients with acute low back pain: a pilot control trial, 2003: 502 – 512, 33(9) https://www.jospt.org/doi/10.2519/jospt.2003.33.9.502
28. Marzouk A Ellythy., Efficacy of muscle energy technique versus myofascial release on function outcome measures in patients with chronic low back pain, 2012 https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Marzouk+A+Ellythy.%2C+Efficacy+of+muscle+energy+technique+versus+myofascial+release+on+function+outcome+measures+in+patients+with+chronic+low+back+pain%2C+2012&btnG=#:~:text=%5BPDF%5D,Efficacy%20of%20muscle%20energy%20technique%20versus%20myofascial%20release%20on%20function%20outcome,MA%20Ellythy,-Bull%20Fac%20Ph
29. Taimoor Ameen *et al*., Comparison of effectiveness of muscle energy technique with strain counter strain technique on the patients of Non specific Neck Pain, 2022. https://doi.org/10.54393/tt.v3i1.36
30. Richa Mahajan, Chitra Kataria, Kshitija Bansal, Comparative Effectiveness of muscle energy technique and Static stretching for treatment of subacute mechanical neck pain. . Comparative effectiveness of muscle energy technique and static stretching for treatment of subacute mechanical neck pain
31. Deepali Sharma, Siddhartha Sen., Effects of MET on Pain and Disability in subjects with SI Joint dysfunction, 2014. Effects of muscle energy technique on pain and disability in subjects with SI joint dysfunction
32. Prachi N Patil., *et al*., Effectiveness of muscle energy technique on quadratus in acute low back pain- RCT Indian journal of physiotherapy, 2010. Effectiveness of muscle energy technique on quadratus lumborum in acute low back pain-randomized controlled trial
33. Mitushi Kishor Deshmukh, Pratik Arun, *et al*., Effect of Muscle energy Technique on Piriformis tightness in Chronic Low back Pain with radiation, Journal of Evolution of Medical and Dental Sciences 9(44),2020. 10.14260/jemds/2020/722
34. Shah Atika Suri, Misra Anand, Comparative study on the effectiveness of Maitland mobilization technique versus Muscle energy technique in treatment of Adhesive Capsulitis, 2013. Comparative study on the effectiveness of Maitland mobilization technique versus muscle energy technique in treatment of shoulder adhesive capsulitis