ORIGINAL RESEARCH PAPER
Volume - 14 | Issue - 02 | February - 2025 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

EFFECTIVENESS OF MUSCLE ENERGY TECHNIQUE IN HAMSTRING TIGHTNESS - AN EVIDENCE BASED STUDY

Physiotherapy

Makwana Aratiben Mohanbhai* B.P.T., *Corresponding Author

Dr. Nehansi Chauhan M.P.T. Neurological Conditions, Assistant Professor, Venus Institute of Physiotherapy, Swarrnim Statup and Innovation University, Gandhinagar.

Dr. Arvind Kumar M.P.T. (Musculoskeletal), Ph.D., Principal and Professor, Venus Institute of Physiotherapy, Swarrnim Startup and Innovation University, Gandhinagar.

ABSTRACT

Background: Hamstring tightness is a common musculoskeletal condition associated with reduced flexibility and increased risk of injury. Muscle energy technique (MET) is a manual therapy approach commonly used by physical therapists to address muscle tightness and improve range of motion. However, the effectiveness of MET in treating hamstring tightness remains unclear. **Aims and Objectives:** This study aims to systematically review and meta-analyze the existing literature to evaluate the effectiveness of muscle energy technique in improving hamstring flexibility and range of motion. **Study Design:** An Evidence Based Study **Methodology:** A comprehensive search of electronic databases (e.g., PubMed, Scopus, Cochrane Library) was conducted to identify relevant studies published up to (insert date). Studies investigating the use of MET as an intervention for hamstring tightness were included. Data extraction included study characteristics, intervention details, outcome measures, and Discussions. Risk of bias assessment was performed using established tools (e.g., Cochrane Risk of Bias Tool). Meta-analysis was conducted using random-effects models to estimate pooled effect sizes and 95% confidence intervals. **Conclusion:** The findings of this systematic review and meta-analysis suggest that muscle energy technique may be effective in improving hamstring flexibility and range of motion. However, due to limitations such as heterogeneity among studies and risk of bias, further high-quality research is warranted to confirm these findings and elucidate optimal treatment protocols. Clinicians may consider incorporating muscle energy technique as part of a comprehensive treatment approach for individuals with hamstring tightness.

KEYWORDS

Hamstring tightness, Muscle energy technique, Manual therapy, Flexibility, Range of motion, Systematic review, Meta-analysis.

INTRODUCTION

To perform all physical tasks, one needs good strength, endurance, and flexibility, and everyone has flexibility that is not the same and even varies between parts of his own body. Due to the high incidence of shortening of the hamstring muscle among students, which can Indirectly affect the decrease in flexibility.[1] Restoring hamstring length is essential to improve flexibility, reduce pain, and enhance mobility. Flexibility allows muscles and tendons to stretch, supporting joint movement, preventing injuries, boosting performance, aiding recovery, and promoting overall agility[2,3] The term "hamstrings" refers to the posterior muscles of the thigh, which include the semimembranosus (SM), semitendinosus (ST), and biceps femoris (BF), long head (BFlh), and short head (BFsh). During conentric contraction, the long hamstring muscle group (SM, ST, BFlh) crosses both the hip and knee joints, causing hip extension, knee flexion, and internal (SM & ST) or external (BF) knee rotation.[4]

The hamstring muscles span two joints and achieve maximum stretch only when both the hip and knee are fully flexed. Conversely, contraction occurs when both are fully extended. Since full stretching and contraction are rare in daily activities, individuals who do not stretch regularly are more prone to hamstring tightness. [6] It is highly prone to adaptive shortening, leading to decreased elasticity, altered length-tension balance, and reduced flexibility. Tight hamstrings can weaken muscles, disrupt quadriceps function, and cause postural issues like reduced lumbar lordosis. [7] Tight hamstrings are linked to low back pain, abnormal gait, and movement disorders in the lumbar spine, pelvis, and lower limbs. Reduced flexibility increases the risk of patella tendinopathy, patellofemoral pain, hamstring strains, and muscle injuries after intense activity. This can also weaken strength, stability, and impact an athlete's emotional well-being. [8,9] It is fairly common in college-bound students between the ages of 18 and 25. Therefore, it's crucial to be conscious of hamstring stretching in order to avoid lower quadrant musculoskeletal issues. [9]

Muscle tightness, caused by passive (postural adaptation, scarring) or active (contraction, spasm) factors, restricts joint range of motion and leads to imbalances. Hamstrings, due to their multi-joint function and tonic posture, are highly prone to shortening, impacting movement efficiency in activities like walking and running. [10] Because of their decreased flexibility, hamstring strains and rips are among the most frequent musculotendinous injuries in sports. Tight hamstring muscles can impair young athletes' sports performance in addition to raising their risk of injury.[11]

Many clinical circumstances, including poor posture, systemic diseases, persistent mild muscle tension, and neuro musculoskeletal injuries can lead to muscle inflexibility which lead to reduced maximal muscle length, lack of flexibility, strength imbalance, insufficient warm-up, exhaustion, low back injury, poor low back posture, and increased muscle and nerve tension are modifiable risk factors; however, muscle composition, age, race, and history of injury are non-modifiable risk factors.[11,12]

Many treatment option are available to treat hamstring tightness like passive and active stretches, Positional release technique, active release technique, muscle energy techniques etc. Multiple Studies have shown the immediate and prolonged effectiveness of Muscle Energy Technique (MET) in Hamstring tightness. MET is useful in reducing pain, stretching tight muscles, decreasing Muscle tone, improving local circulation, strengthening weak musculature and mobilizing joint Restrictions. [13] MET developed by Fred Mitchell Sr. and Jr., involves voluntary muscle contraction against a controlled counterforce to enhance flexibility. Research by Magnusson et al. and Habrertsma et al. attributes increased muscle extensibility post-MET to viscoelastic changes and improved stretch tolerance. Hohns and Wright highlight the role of passive torque in achieving a new range of motion.. [14] So, Understanding the effectiveness of MET in reference of hamstring tightness is crucial due to its impact on mobility and quality of life. With limited treatment options, evidence-based research on MET can enhance therapeutic approaches, support clinical decision-making, improve patient-centered care in relation of advancing musculo-skeletal healthcare practices.

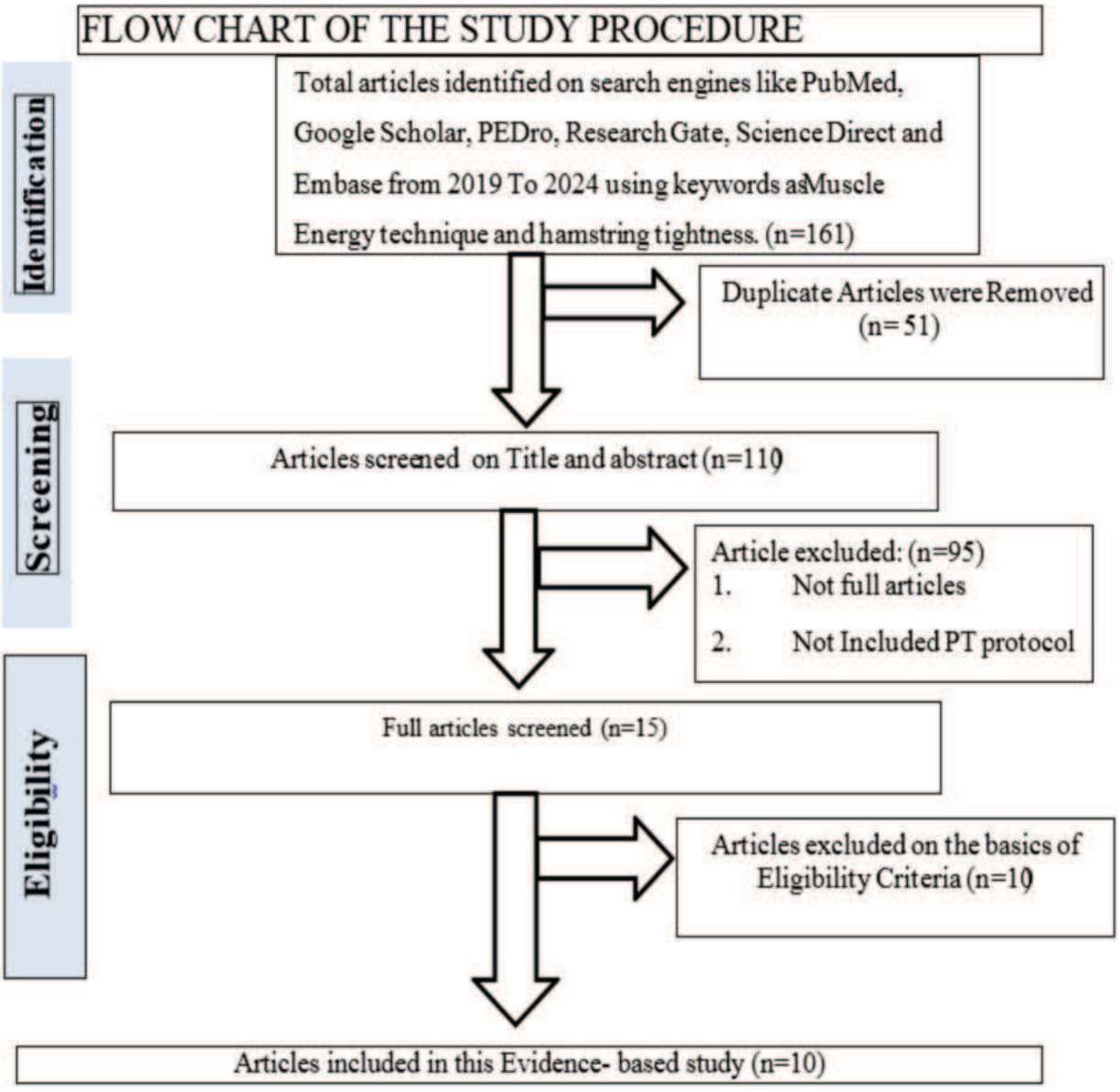
METHODOLOGY

This is an Evidence Based Study, which was conducted according to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analysis) guidelines. Literature Search: A specificd literature search was performed from 2019 to 2024 (Last 5 years). Literature was searched using following search engines: Google Scholar, PEDro, PubMed, Research Gate, Science Direct, Embase. Key Words like MET for Hamstring tightness,Hamstring Tightness, Flexibility, Autogenic or Reciprocal Inhibition MET, Hamstring Stretching, Manual Therapy, Active Stretching Techniques, Osteopathic

Techniques for Hamstrings. Inclusion Criteria of the Studies involving muscle energy technique and hamstring tightness from 2019 to 2024 (Last 5 years) full text access like Systematic reviews, Meta-analysis and Randomized controlled trial,Articles published in English, studies done on Human.

Exclusion Criteria Articles having study design as case control or cohort, Studies done on animals, Studies design case reports.

Data was assessed using 2 parameters like Centre for Evidence-Based Medicine's (CEBM's) Levels of Evidence (15) PEDro scale (16) The CEBM Levels of Evidence scale: It assesses quality based on study design, which categorize the studies in a scale ranging from 1 to 5 with further subdivision for each scale.



METHODOLOGY

Author and Year	Title of the study	Intervention	Outcome measure	Conclusion	Level of Evidence/ PEDro Score
Yeh-Hyun Kang et al., 2023(17)	Effect of Muscle Energy Technique on Hamstring Flexibility: Systematic Review and MetaAnalysis	Total 949 Patients from 19 RCTs and the treatment was used MET an intervention while control Group receive ART, MULLIGAN Technique, Neural tissue Mobilization, Neural slump stretch, WBV, physical therapy, passive and static stretching.	AKE,SRT,SLRT,VAS	MET is more efficacious for hamstring flexibility than stretching or having no treatment.	1a
Ayesh Majeed et al., 2021(18)	Comparison of Static Stretching and Muscle Energy Techniques on Hamstring Tightness in Asymptomatic Females (RCT)	Total 50 subjects where randomly allocated into two groups. Group A(n=25) received hamstring static stretching While Group B(n=25) received Muscle energy technique(Autogenic Inhibition).This treatment were given to each participant for 6 session in 2 weeks.	90-90 test, SLR & Sit and reach test.	Muscle energy techniques particularly autogenic inhibition have better treatment outcome as compared to hamstring static stretching.	1b & PEDro-5/10

Vibhuti Vinodsingh Gaur et al., 2021(19)	Short Term Effects of Muscle Energy Technique vs. Active Release Technique in Improving Hamstring Flexibility and Pain in Patients with Acute Anterior Cruciate Ligament (ACL) Tear (RCT)	Total 60 subjects where randomly allocated into three groups. Group A(n=20)received 5 minute warm-up followed by MET routine for 6 minute While Group B(n=20) received 5 minute warm-up followed by ART routine for 6 minute, while Group C received AKE, this treatment were given for 3 days .	VAS and Sit and reach test	Both stretching Protocols (MET and ART) are equally effective on increasing Flexibility, muscle force and reduction in pain.	1b & PEDro-5/10
Abdul Haseeb Bhutta et al., 2023 (20)	The Effectiveness of Muscle Energy Technique and Hamstring Nordic Lower in Hamstring Tightness Amongst Young Athletes of Pakistan (RCT)	Total 60 subjects where randomly allocated into three groups. Group A(n=20)was received PFS While Group B(n=20) received PIR while Group C (n=20) received Hamstring Nordic Lower this treatment were given for 1 month on daily basis .	Hip Extension PSLR,ASLR,PKE,AKE, vertical jump, agility run test, YMCA sit and reach box test and 100 meter Sprint	Muscle Energy Technique, are effective in releasing hamstring tightness and Improving physical performance in young athletes. However, HNL training alone did not show superior effectiveness compared to the MET techniques.	1b & PEDro-10/10
Ali Raza et al., 2023 (21)	Effectiveness of Hamstring Stretching versus MET on Hamstring Flexibility in Patients with non-specific knee pain (RCT)	Total 30 subjects where randomly allocated into two groups. Group A(n=15) received MET While Group B(n=15) received static stretching, this treatment were given to each participant for 4 sessions in 2 weeks.	NPRS, LEFS, Active stright leg ,ASLR, Anterior knee Extension	Both the techniques muscle energy technique and stretching both are equally effective in reducing non-specific knee pain and improving the flexibility of hamstring muscles.	1b & PEDro-6/10
Sarfraj Khan et al., 2021 (22)	Immediate Effect of Active Release Technique Versus Muscle Energy Technique in Subjective with Hamstring Tightness (RCT)	Total 60 subjects where randomly allocated into two groups. Group A(n=30)received ART While Group B(n=30) received MET , this treatment were given to each participant for one sessions into 1 days.	AKE	A single session of Active release technique is better as compared to muscle Energy technique to improve hamstring flexibility and Range of motion.	1b & PEDro-5/10
Bhutta NI et al., 2023 (23)	Effectiveness of muscle energy techniques and friction massage in hamstring tightness amongst young athletes of Pakistan. (RCT)	Total 60 subjects where randomly allocated into three groups. Group A(n=20) received PFS While Group B(n=20) was received PIR while Group C received Deep Friction Massage, this treatment were given for 20 days .	YMCA sit and reach test, Agility run test, vertical jump test, and 100-meter run test	The METs, particularly PFS, was more effective than FM in improving hamstring flexibility and optimizing muscle length-tension relationships.	1b & PEDro-3/10
Komal Tariq et al., 2020 (24)	Effectiveness of Mulligan's Bent Leg Raise Technique Versus Muscle Energy Technique on pain intensity and Hamstring flexibility in patients with knee osteoarthritis. (RCT single blinded)	Total 114 subjects where randomly allocated into two groups. Group A(n=57) received BLR While Group B(n=57) received PIR , this treatment were given to each participant for 12 sessions in 4 weeks	VAS, AKE, KOS	Mulligans bent leg raise technique showed more improvement than post isometric relaxation muscle energy technique in lowering the pain level and improved knee extension movement and participants functional activities in osteoarthritis patients.	1b & PEDro-10/10
Arun Balasubramaniam et al., 2022 (25)	Myofascial Release Therapy versus Muscle Energy Technique on Hamstring Flexibility in Physically Inactive Students (RCT)	Total 60 subjects where randomly allocated into three groups. Group A(n=20) received MSR While Group B(n=20) was received MET while Group C received PSG, this treatment were given for 24 sessions in 20 weeks.	Sit and reach test	Muscle energy technique and the Myofascial release therapy have shown effectiveness in improving hamstring flexibility.	1b & PEDro-7/10
M. Azizi et al., 2021 (26)	The Immediate Effect of Muscle Energy Technique and Whole Body Vibration on Hamstring Muscle Flexibility and Stiffness in Healthy Young Females (RCT)	Total 56 subjects where randomly allocated into two groups. Group A(n= 28) received MET While Group B(n=57) received WBV , this treatment were given to each participant for 3 days	AKE and Modified Sit & Reach test (for hamstring flexibility) and Biodex system 3 (for stiffness).	That a single session of using WBV and MET could immediately increase the hamstring flexibility and immediately decrease its stiffness.	1b & PEDro-3/10

RESULT

PEDro	Ayesh Majeed et al., 2021	Vibhuti Vinodsingh Gaur et al., 2021	Abdul Haseeb Bhutta, et al., 2023	Ali Raza et al., 2023.	Sarfraj Khan et al., 2021	Bhutta NI et al., 2023	Komal Tariq et al., 2020.	Arun Balasubramaniam et al., 2022. (6/102a)	M. Azizi et al., 2021.
Random allocation	1	1	1	1	1	1	1	1	1
Concealed allocation	0	0	1	0	0	0	1	0	0
Baseline comparability	1	1	1	1	1	0	1	1	0

Blind subjects	0	0	1	0	0	0	1	0	0
Blind therapists	0	0	1	0	0	0	1	0	0
Blind assessors	0	0	1	0	0	0	1	1	0
Adequate followup	1	1	1	1	1	0	1	1	0
Intention-to-treat analysis	0	0	1	1	0	1	1	1	0
Between-group comparisons	1	1	1	1	1	1	1	1	1
Point estimates and variability	1	1	1	1	1	0	1	1	1
TOTAL	5/10	5/10	10/10	6/10	5/10	3/10	10/10	7/10	3/10

DISCUSSION

A systematic review and meta-analysis by Yeh-Hyun Kang et al. (2023) found that muscle energy techniques (MET) were significantly more effective than passive stretching in improving hamstring flexibility. The analysis included 19 randomized controlled trials with 949 patients, supporting the role of autogenic inhibition in MET's effectiveness. These results confirm previous findings that MET offers better flexibility outcomes. Bhutta et al. (2023) compared Muscle Energy Technique (MET) with hamstring Nordic lower (HNL) exercises in young athletes, finding MET significantly improved hamstring flexibility and overall performance. The results align with existing literature on MET's effectiveness in addressing hamstring tightness and enhancing athletic performance.

MET works by encouraging the patient to contract the muscle in question against resistance provided by the therapist, followed by a period of relaxation and passive stretching. This sequence is thought to stimulate the muscle spindle reflex and Golgi tendon organ reflex, which help reset the muscle's length-tension relationship, leading to improved flexibility and reduced tightness [27]. The application of MET can be categorized into two types: post-isometric relaxation (PIR) and reciprocal inhibition (RI). PIR involves the patient contracting the affected muscle without joint movement, whereas RI uses the contraction of the antagonist muscle to relax the tight muscle. Both techniques aim to release tension and reduce the tightness felt in muscles like the hamstrings. MET in improving hamstring flexibility. A study by Paat et al. (2008) found that the use of MET, particularly PIR, resulted in significant increases in hamstring flexibility in participants with tight hamstrings. The study concluded that MET is an effective and safe method to alleviate tightness and improve range of motion, especially when combined with other therapeutic interventions such as stretching and strengthening exercises.[28] Similarly, a review by Khuu et al. (2014) on MET for various musculoskeletal disorders reported that MET is a reliable and beneficial intervention for improving muscle flexibility and reducing pain, with the hamstrings being one of the most common target muscles. Additionally, MET's non-invasive nature makes it a desirable option for individuals seeking alternatives to more aggressive interventions like medications or surgery. It has a low risk of side effects, particularly when administered by trained professionals, and offers the advantage of patient involvement during treatment. Furthermore, MET can be tailored to each patient's unique needs, addressing both the specific muscle group affected and the underlying factors contributing to tightness, such as muscle imbalances or postural dysfunction.[29,30] Kiser et al. (2008) showed that a combination of MET and static stretching was more effective in increasing hamstring flexibility than either technique alone.

CONCLUSION

In conclusion, the outcomes of the systematic analysis furnish compelling evidence buttressing the efficacy of MET in addressing hamstring tightness and ameliorating associated outcomes. Nonetheless, the findings also underscore the imperative for further research to delineate the long-term ramifications of MET interventions and establish standardized protocols for its integration into clinical practice.

REFERENCES

1. Kartiko Pertiwi, J., & Ghufroni, A. (2022). Differences Effect Of Neuromuscular Taping And Post Isometric Relaxation With Neuromuscular Taping And Reciprocal Inhibition On Reducing Pain And Increasing Hamstring Flexibility In Overweight Adolescents.
2. Dr. Shambhavi Potdar, Dr. Sanket Nagrale and Dr. Sucheta Golhar (2020) Immediate effect of active release technique (ART) and muscle energy technique (MET) on hamstrings muscle tightness in adult population - A comparative study.
3. Tai MZ, Bandawde M, Palekar T, Gondkar D. To compare effectiveness of mulligan bent leg raise versus myofacial release in physiotherapy students with hamstring tightness. Indian Journal of Pharmaceutical and Biological Research. 2017 Mar 31;5(01):42-7.
4. Timmins R, Woodley S, Shield A, Opar D. Anatomy of the Hamstrings. Prevention and rehabilitation of hamstring injuries. 2020:1-30.
5. Clanton TO, Coupe KJ. Hamstring strains in athletes: diagnosis and treatment. JAAOSJournal of the American Academy of Orthopaedic Surgeons. 1998 Jul 1;6(4):237-48.
6. Talapalli R, Sheth MS. Comparison of muscle energy technique and post isometric relaxation on hamstring flexibility in healthy young individuals with hamstring tightness. Int J Health Rehab. 2014;3(2):65-8.
7. Ramesh M, Sivasankar P. Comparison of three different physiotherapeutic interventions in improving hamstring flexibility in individuals with hamstring tightness. Int J Health Sci Res. 2014;4(6):129-34.
8. Balakrishnan R, Sudhakar S. Effects of autogenic inhibition METS and reciprocal inhibition METS on hamstring flexibility in subjects with bilateral hamstring tightness. Int J Phys Educ Sports Health. 2024;11(4):77-79. Available from: https://www.kheljournal.com
9. Koli BK, Anap DB. Prevalence and severity of hamstring tightness among college student: A cross sectional study. International Journal of Clinical and Biomedical Research. 2018 Apr 15:65-8.
10. Sathe SS, Rajandekar T, Thodge K, Chavhan A. Comparison between Immediate Effects of Post Isometric Relaxation and Reciprocal Inhibition Techniques on Hamstring Flexibility in Patients with Hamstring Tightness: An Experimental Study. Indian Journal of Forensic Medicine & Toxicology. 2020 Oct 29;14(4):6871-5.
11. Joshi TM, Wani SK, Ashok S. Immediate effects of two different types of muscle energy techniques (MET) on hamstring muscle flexibility in young healthy females: a comparative study. Int J Health Sci Res. 2017;7(5):159-64.
12. Bhutta NI, Haneef K, Rasheed S, Bashir S, Shah S. Effectiveness of muscle energy techniques and friction massage in hamstring tightness amongst young athletes of Pakistan. The Rehabilitation Journal. 2023 Sep 30;7(03):42-7.
13. Sathe SS, Rajandekar T, Thodge K, Chavhan A. Comparison between Immediate Effects of Post Isometric Relaxation and Reciprocal Inhibition Techniques on Hamstring Flexibility in Patients with Hamstring Tightness: An Experimental Study. Indian Journal of Forensic Medicine & Toxicology. 2020 Oct 29;14(4):6871-5.
14. Biswas S, Alagingi NK. Compare the effectiveness of static stretching and muscle energy technique on hamstring tightness among student population. Compare. 2018 Mar;3 (2).
15. 15 McKenney K, Elder AS, Elder C, Hutchins A. Myofascial release as a treatment for orthopaedic conditions: a systematic review. Journal of athletic training. 2013 Jul 1;48(4):522-7.
16. 16 Cioffi I, Farella M. Quality of randomised controlled trials in dentistry. International dental journal. 2011 Feb 1;61(1):37-42
17. Kang YH, Ha WB, Geum JH, Woo H, Han YH, Park SH, Lee JH. Effect of muscle energy technique on hamstring flexibility: systematic review and meta-analysis. InHealthcare 2023 Apr 11 (Vol. 11, No. 8, p. 1089). MDPI.
18. Majeed A, Mansoor SR, Arif AB, Yasin MM, Wasim M, Naeem F. Comparison of static stretching and muscle energy techniques on hamstring tightness in asymptomatic females. Foundation University Journal of Rehabilitation Sciences. 2021 Jan 15;1(1):19-23.
19. Gaur VV, Kapoor AA, Phansopkar PA. Short term effects of muscle energy technique vs. active release technique in improving hamstring flexibility and pain in patients with acute anterior cruciate ligament (ACL) tear-a randomized control trial. J Evol Med Dent Sci. 2021 Jan 18;10(3):137-42.
20. Bhutta AH. THE EFFECTIVENESS OF MUSCLE ENERGY TECHNIQUE AND HAMSTRING NORDIC LOWER IN HAMSTRING TIGHTNESS AMONGST YOUNG ATHLETES OF PAKISTAN".
21. Raza A, Ijaz A, Saqib MS, Zahoor IA, Ahmed I, Abid N. Effectiveness of Hamstring Stretching versus Muscle Energy Technique on Hamstring Flexibility in Patients with Non-specific Knee Pain; A Randomized Clinical Trial: Hamstring Stretching and METs in Knee Pain. The Healer Journal of Physiotherapy and Rehabilitation Sciences. 2023 Jul 30;3(7):671-81.
22. Khan S, Patel B, Limbani B. Immediate effect of active release technique versus muscle energy technique in subjective with hamstring tightness: A rendomized clinical trial. Indian Journal of Physiotherapy & Occupational Therapy Print-(ISSN 0973-5666) and Electronic–(ISSN 0973-5674). 2021 Mar 30;15(2):59-64.
23. Bhutta NI, Haneef K, Rasheed S, Bashir S, Shah S. Effectiveness of muscle energy techniques and friction massage in hamstring tightness amongst young athletes of Pakistan. The Rehabilitation Journal. 2023 Sep 30;7(03):42-7.
24. Tariq K, Shoukat F, Ahmed U. Effectiveness of Mulligan's bent leg raise technique versus muscle energy technique on pain intensity and hamstring flexibility in patients with knee osteoarthritis. Rawal Medical Journal. 2020 May 9;45(2):358.
25. Purushothaman VK. Myofascial Release Therapy versus Muscle Energy Technique on Hamstring Flexibility in Physically Inactive Students–A Randomized Controlled Trial.
26. Azizi M, Shadmehr A, Malmir K, Qotbi N, Pour ZK. The Immediate Effect of Muscle Energy Technique and Whole Body Vibration on Hamstring Muscle Flexibility and Stiffness in Healthy Young Females. Muscles, Ligaments & Tendons Journal (MLTJ). 2021 Jul 1;11(3).
27. Kendall, F.P., McCreary, E.K., & Provance, P.G. (2005). Muscles: Testing and Function with Posture and Pain. Lippincott Williams & Wilkins.
28. Paat, C.M., Miller, M.A., & Buresh, R.J. (2008). Effectiveness of Muscle Energy Technique in the Treatment of Hamstring Tightness. Journal of Orthopaedic and Sports Physical Therapy, 38(5), 321-325.
29. Khuu, S.K., Myburgh, C., & Anderson, J. (2014). Muscle Energy Techniques for Musculoskeletal Disorders: A Systematic Review of Effectiveness. Journal of Bodywork and Movement Therapies, 18(3), 421-426.
30. Kiser, L.S., McAllister, M., & Kiser, B.D. (2008). Combination of Muscle Energy Technique and Static Stretching to Improve Hamstring Flexibility: A Pilot Study. Journal of Bodywork and Movement Therapies, 12(3), 273-279.