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# Efficacy Of Muscle Energy Technique On Hamstring Flexibility And Functional Performance In Patients With Osteoarthritis Knee

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## ABSTRACT

**BACKGROUND:**

Knee osteoarthritis is common due to its weight-bearing function. Reduced hamstring and quadriceps flexibility impairs movement, increases injury risk, and limits mobility. Muscle Energy Technique (MET) improves range of motion and flexibility in a gentle manner.

**OBJECTIVE:**

To determine the efficacy of MET on hamstring flexibility and functional performance in patients with knee OA.

**METHODOLOGY:**

Thirty patients (40–60 years) were divided into Group A (MET + conventional, n=15) and Group B (conventional, n=15). Treatment was given 6 days/week for 3 weeks. Outcomes measured were Active Knee Extension (AKE), WOMAC, and NPRS.

**RESULTS:**

Both groups showed significant within-group improvement ($p \leq 0.05$). Between groups, Group A showed greater improvement: AKE (right) p=0.001, AKE (left) p=0.03, WOMAC p=0.03, and NPRS p=0.001.

**CONCLUSION:**

The result of the present study concluded that there was the effectiveness of muscle energy technique on hamstring flexibility and functional performance in patients with OA knee as well as there was also a reduction in pain patients of OA knee.

**KEYWORDS:**

*Hamstring, Muscle Energy Technique, Flexibility, AKE, WOMAC*

## INTRODUCTION

Osteoarthritis (OA) is a major public health problem and one of the leading causes of pain, disability, and reduced quality of life worldwide[1]. It is a degenerative joint disease affecting synovial joints and is more prevalent in women, particularly after the age of 40 years[2,3].

Disease development is aided by articular cartilage degradation and decreased chondrocyte activity, which may also affect the flexibility of adjacent muscles, especially the hamstrings[4].Flexibility refers to the ability of muscles to lengthen, allowing joints to move through their available range of motion[5]. Adequate flexibility of the hamstring and quadriceps muscles is essential for efficient knee joint movement, while reduced flexibility may lead to musculoskeletal dysfunction, impaired mobility, and increased risk of injury[6,7].

Osteoarthritis is characterized by progressive cartilage degeneration and osteophyte formation at joint margins[8]. Although the exact cause remains unclear, several risk factors such as age, gender, obesity, genetics, bone density, and mechanical stress contribute to the development of OA[9]. Clinically, knee OA presents with symptoms such as pain, stiffness, restricted range of motion, and difficulty performing activities like walking, standing, and climbing stairs[10]. Pain typically increases with activity and may occur even at rest in advanced stages[11]. Morning stiffness lasting less than 30 minutes is also commonly reported[12].

Diagnosis of knee OA is mainly clinical, supported by criteria developed by the American College of Rheumatology (ACR)[13]. Patients frequently demonstrate quadriceps weakness, joint crepitus, and joint enlargement due to osteophyte formation[14,15].

Hamstring tightness is commonly observed in individuals with musculoskeletal disorders due to adaptive shortening of contractile and non-contractile tissues[27-29]. Various stretching techniques are used to improve flexibility; however, there remains uncertainty regarding the most effective and time-efficient intervention.

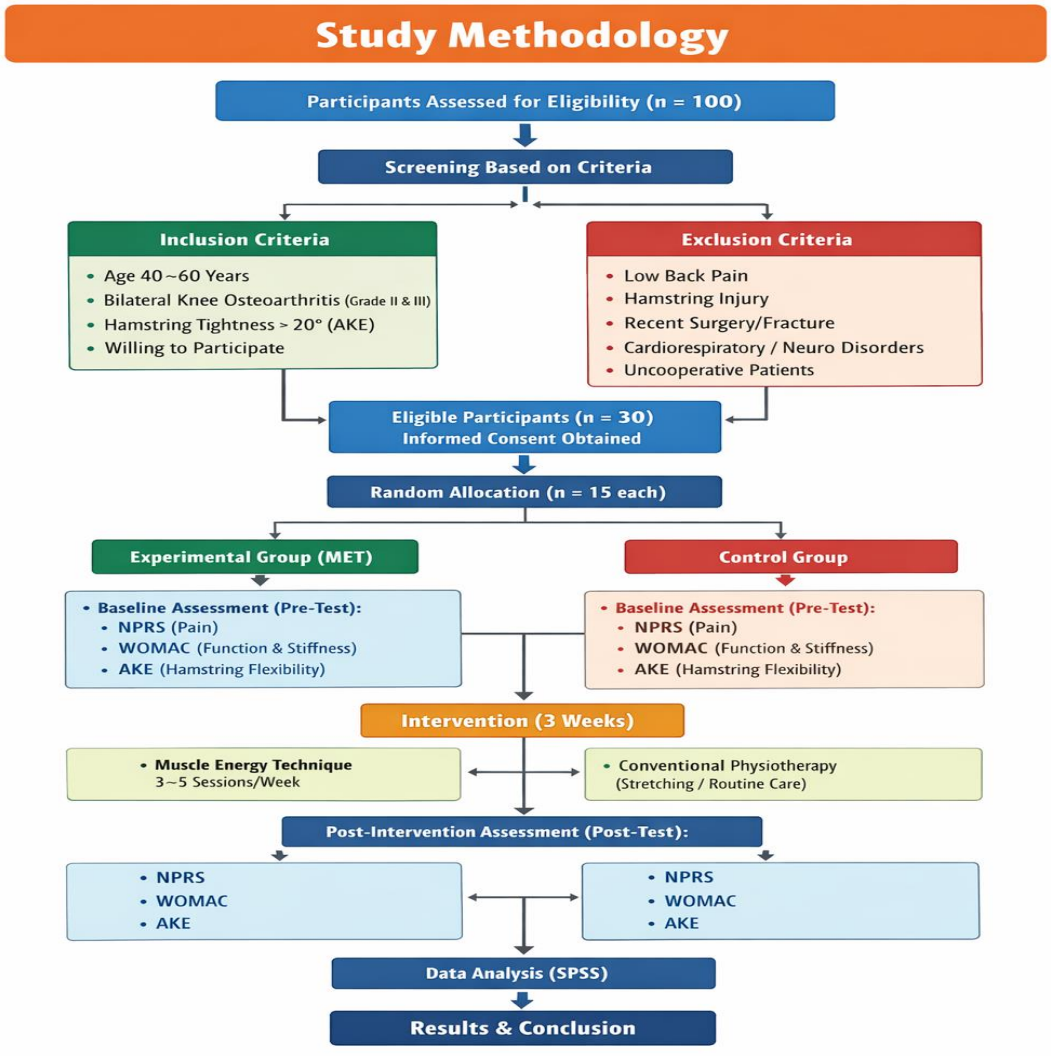
Muscle Energy Technique (MET) is a manual therapy technique that uses voluntary muscle contraction against therapist-applied resistance to improve muscle flexibility, joint mobility, and circulation while reducing pain[18-21,25]. Developed by osteopathic physicians Fred Mitchell Sr. and Fred

Mitchell Jr., MET has been widely used for the management of soft tissue and joint dysfunction[16,17]. The technique improves muscle length and range of motion through neuromuscular and biomechanical mechanisms[22,26]. Studies have also suggested that MET may be more effective than conventional stretching techniques in improving muscle flexibility[23,24].

Assessment of pain and functional limitations in knee OA is commonly performed using validated outcome measures such as the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and the Numerical Pain Rating Scale (NPRS)[30,31,32,33,34]. Considering the influence of hamstring tightness on knee function, interventions targeting muscle flexibility may help improve functional outcomes in patients with knee osteoarthritis[35].

Therefore, the present study aimed to determine the efficacy of Muscle Energy Technique on hamstring flexibility and functional performance in patients with knee osteoarthritis.

# METHODOLOGY



**Procedure**

**Group A: Experimental Group**

Participants received MET for the hamstring in supine lying. The therapist flexed the affected hip and passively extended the knee to the point of resistance (barrier). The patient then performed a gentle isometric knee extension (≈20% effort) against therapist resistance for 7–10 seconds, followed by relaxation and further knee extension to the new barrier.

Each contraction was held for 10 seconds, followed by a 30-second stretch, with 4 repetitions and 3-second rest intervals. Treatment was administered 6 days per week for 3 weeks.

In addition, conventional exercises (SLR, static quadriceps, VMO strengthening) and moist heat pack for 20 minutes were given. Exercises were performed for 10 repetitions, 6 days per week for 3 weeks. Outcome measures (WOMAC, AKET, NPRS) were recorded at baseline and after 3 weeks.

**Group B: Control Group**

Participants received a conventional treatment protocol including straight leg raise (SLR), static quadriceps exercises, vastus medialis oblique (VMO) strengthening, and a moist heat pack for 20 minutes.

SLR was performed in supine with the unaffected limb flexed; the affected leg was raised, held for 10 seconds, and relaxed. Static quadriceps and VMO exercises were performed in long sitting, with a towel roll under the knee for VMO, holding contraction for 10 seconds followed by relaxation.

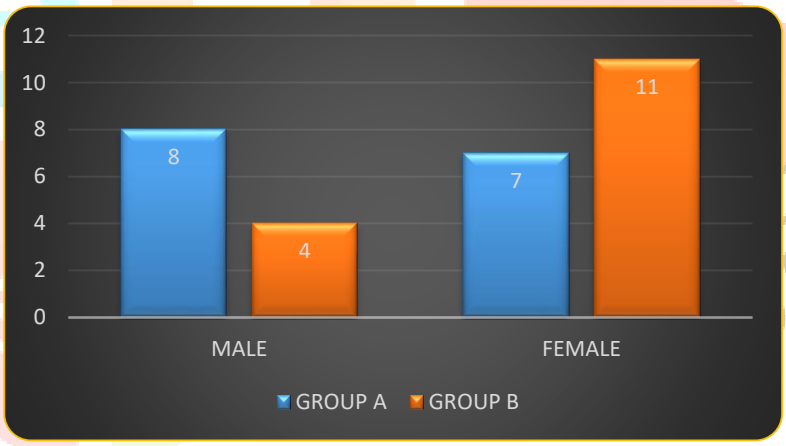
All exercises were performed for 10 repetitions, 6 days per week for 3 weeks. Outcome measures (WOMAC, AKET, and NPRS) were assessed at baseline and after 3 weeks.

# DATA ANALYSIS AND RESULTS

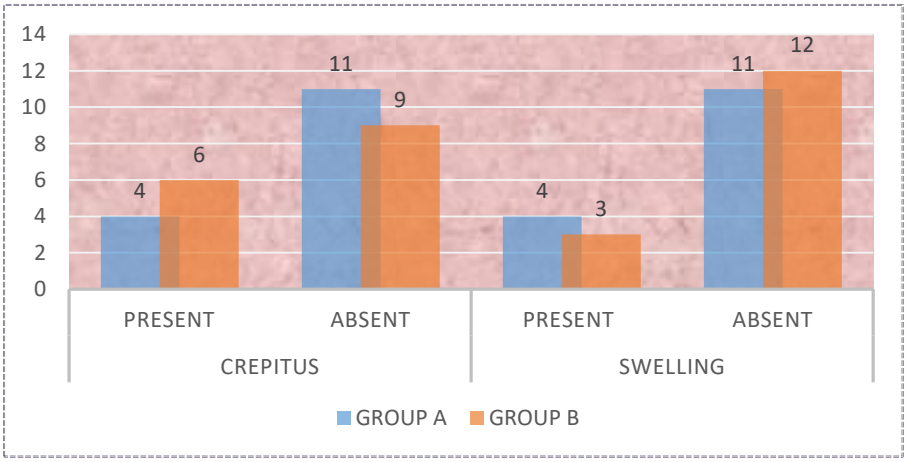
After completion of data collection, all data were entered into IBM SPSS Statistics 21 for statistical analysis. Appropriate statistical tests were applied to analyze the collected data, and the results are presented below.

The present study was conducted to evaluate the effectiveness of Muscle Energy Technique (MET) on flexibility and functional performance in patients with knee osteoarthritis (OA). A total of 30 participants were included in the final analysis, with 15 patients in the experimental group (Group A) and 15 patients in the control group (Group B). Outcome measures were recorded at baseline and after 3 weeks of intervention.

The Shapiro–Wilk test was used to assess the normality of the data. Since the quantitative data were not normally distributed ($p < 0.05$), non-parametric tests were applied for statistical analysis. The Mann–Whitney U test was used for between-group comparisons, while the Wilcoxon Signed Rank Test was used for within-group comparisons. The confidence interval was set at 95%, and the level of significance was set at $p < 0.05$.




**Graph 1: Frequency Distribution of Gender**




**Graph 2: Frequency Distribution of Patients Based on Symptoms**

The table 1 presents the comparison of pre–post intervention differences between Group A (Experimental group) and Group B (Control group) for WOMAC score, Active Knee Extension Test (AKE), and Numerical Pain Rating Scale (NPRS).

Table 1: Comparison of pre–post intervention differences between Group A and Group B

| Outcome Measure | Group A (Mean ± SD) | Group B (Mean ± SD) | Z value | P value |
|---|---|---|---|---|
| WOMAC (Pre–Post Difference) | 13.67 ± 3.06 | 10.07 ± 4.77 | -2.082 | 0.03 |
| AKE Right (Pre–Post Difference) | 8.67 ± 3.02 | 5.73 ± 2.46 | -2.73 | 0.001 |
| AKE Left (Pre–Post Difference) | 8.00 ± 3.25 | 5.67 ± 2.41 | -2.06 | 0.03 |
| NPRS Right Knee (Pre–Post Difference) | 3.00 ± 1.32 | 1.13 ± 0.64 | -3.766 | 0.001 |
| NPRS Left Knee (Pre–Post Difference) | 3.87 ± 1.64 | 1.00 ± 0.65 | -4.273 | 0.001 |

For the WOMAC score, Group A showed a greater improvement (Mean ± SD = 13.67 ± 3.06) compared to Group B (10.07 ± 4.77). The obtained Z value was -2.082 with a p value of 0.03, indicating a statistically significant difference between the groups, suggesting that the intervention in Group A was more effective in improving functional outcomes.

For hamstring flexibility measured using the Active Knee Extension Test (AKE), both right and left sides showed greater improvement in the experimental group. The right AKE improvement in Group A was 8.67 ± 3.02, whereas Group B showed 5.73 ± 2.46 with a Z value of -2.73 and p value of 0.001, indicating a highly significant difference between groups. Similarly, the left AKE improvement was 8.00 ± 3.25 in Group A and 5.67 ± 2.41 in Group B, with a Z value of -2.06 and p value of 0.03, showing a statistically significant difference.

Regarding pain intensity measured using NPRS, Group A demonstrated greater pain reduction than Group B. For the right knee, Group A showed a mean reduction of 3.00 ± 1.32, while Group B showed 1.13 ± 0.64, with a Z value of -3.766 and p value of 0.001, indicating a highly significant difference. Similarly, for the left knee, Group A showed a reduction of 3.87 ± 1.64, compared to 1.00 ± 0.65 in Group B, with a Z value of -4.273 and p value of 0.001, which is also highly significant.

## DISCUSSION

During isometric contraction, only a few muscle fibers are active while others are inhibited. Gentle relaxation to a new limit avoids stretch reflex, highlighting the link between tension–pain and relaxation–analgesia. Lewit noted that trigger points may resolve after MET[10].

Berger et al. reported that reduced motor unit firing with aging leads to decreased quadriceps strength[48]. Ballantyne et al. found that MET increases passive knee extension by improving stretch tolerance, not viscoelastic changes[37].

Choksi et al. showed both MET and conventional therapy improve flexibility and strength, with MET being more effective[15]. Bokil et al. also attributed ROM gains to increased stretch tolerance and found MET superior to PNF[36]. Reid et al. and White et al. reported hamstring tightness in OA knee[38,39].

The experimental group showed greater improvement in functional performance, likely due to increased flexibility. Singh et al. supported that MET enhances quadriceps strength[15]. Agonist contract-relax improved strength, flexibility, and quality of life.

NPRS improved in both groups, with greater reduction in the experimental group due to increased stretch tolerance and stimulation of mechanoreceptors and proprioceptors.

Phadke et al. also found MET more effective than stretching for pain and function[40].Overall, MET improves flexibility, function, and pain in OA knee patients.

## CONCLUSION

The present study demonstrated that Muscle Energy Technique (MET) not only improves hamstring flexibility but also enhances functional performance and reduces pain in individuals with knee osteoarthritis. These results indicate that MET may offer superior benefits compared to conventional treatment methods. Therefore, MET can be considered an effective therapeutic intervention for improving muscle flexibility and reducing functional limitations in patients with knee osteoarthritis.

# REFERENCES


1. Murray CJ, Lopez AD, World Health Organization. *The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020: summary.* Geneva: WHO; 1996.
2. Mohan H. *Textbook of pathology.* New Delhi: JP Medical Ltd; 2018.
3. Woolf AD, Pfleger B. Burden of major musculoskeletal conditions. *Bull World Health Organ.* 2003;81:646–656.
4. Mishra R, Kolasinski SL. Yoga practice enhances management of knee osteoarthritis.
5. Halbertsma JP, van Bolhuis AI, Göeken LN. Sport stretching: effect on passive muscle stiffness of short hamstrings. *Arch Phys Med Rehabil.* 1996;77(7):688–692.
6. Onigbinde A, et al. Effects of glucosamine sulphate iontophoresis on hamstring flexibility of subjects with knee osteoarthritis. *Medicina Sportiva.* 2010;4(3):1405–1410.
7. Lori N. Hamstring exercises for osteoarthritis. *Livestrong.com.* 2013.
8. O'Sullivan SB, Schmitz TJ, Fulk G. *Physical rehabilitation.* Philadelphia: FA Davis; 2019.
9. Choksi P, Tank K. To study the efficacy of muscle energy technique on muscle strength and flexibility in patients. *Indian J Physiother Occup Ther.* 2016;10(3):41.
10. Iorio R, Healy WL. Unicompartmental arthritis of the knee. *J Bone Joint Surg Br.* 2003;85(7):1351–1364.
11. Moskowitz RW. Clinical and laboratory findings in osteoarthritis. In: *Arthritis and allied conditions.* 1979. p. 1161–1180.
12. Schumacher HR, et al. Osteoarthritis, crystal deposition, and inflammation. *Semin Arthritis Rheum.* 1981.
13. Altman R, et al. Development of criteria for the classification and reporting of osteoarthritis. *Arthritis Rheum.* 1986;29(8):1039–1049.
14. Brandt KD. Defining osteoarthritis: what it is, and what it is not. *J Musculoskelet Med.* 2010;27(9):338.
15. Choksi P, Tank K. Efficacy of muscle energy technique on muscle strength and flexibility in knee osteoarthritis. *Indian J Physiother Occup Ther.* 2016;10(3):40.
16. Fryer G. Muscle energy technique: an evidence-informed approach. *Int J Osteopath Med.* 2011;14(1):3–9.
17. Goodridge JP. Muscle energy technique: definition, explanation, methods of procedure. In: *Principles of palpatory diagnosis and manipulative technique.* 1981. p.169.
18. DeStefano LA. *Greenman's principles of manual medicine.* Philadelphia: Lippincott Williams & Wilkins; 2011.
19. Grubb E, et al. Muscle energy. University of Kentucky; 2010.
20. Chaitow L, Crenshaw K. *Muscle energy techniques.* Elsevier; 2006.
21. Seo DI, et al. Reliability of the one-repetition maximum test. *J Sports Sci Med.* 2012;11(2):221.

22. Waseem M, Nuhmani S, Ram C. Efficacy of MET on hamstring flexibility. *Calicut Med J.* 2009;7(2):e4.
23. Ahmed AR. Comparative study of MET and dynamic stretching. *Bull Fac Phys Ther.* 2011;16(1).
24. Parmar S, et al. Effect of isolytic contraction and stretching after hip surgery. *Hong Kong Physiother J.* 2011;29(1):25–30.
25. Greenman PE. *Principles of manual medicine.* Lippincott Williams & Wilkins; 2003.
26. Joshi T, Ashok S, Parag S. Immediate effects of two types of MET on hamstring flexibility.
27. Weerasekara I, et al. Prevalence of hamstring tightness. *J Palliat Care Med.* 2013;1:108.
28. Pratiksha G, Bharati A. Comparison of AKE and static stretching. *Int J Physiother Res.* 2017;5(6):2425–2431.
29. Davis Hammonds AL, et al. Acute running kinematics after hamstring stretch. *J Athl Train.* 2012;47(1):5–14.
30. Hadi MA, et al. Medication review in chronic pain. *Clin J Pain.* 2014;30(11):1006–1014.
31. Quintana JM, et al. Quality of life and joint replacement. *Arch Intern Med.* 2006;166(2):220–226.
32. McConnell S, Kolopack P, Davis AM. WOMAC review. *Arthritis Care Res.* 2001;45(5):453–461.
33. Rodriguez CS. Pain measurement in elderly. *Pain Manag Nurs.* 2001;2(2):38–46.
34. Jensen MP, McFarland CA. Reliability of pain intensity measurement. *Pain.* 1993;55(2):195–203.
35. Sambandam CE, et al. MET vs eccentric training. *Int J Curr Res Rev.* 2011;3(9):122–126.
36. Masekar MB, et al. MET and PNF in knee OA. *Int J Life Sci Pharma Res.* 2021;11(1):L16–22.
37. Ballantyne F, Fryer G, McLaughlin P. MET and hamstring extensibility. *J Osteopath Med.* 2003;6(2):59–63.
38. Reid DA, McNair PJ. Effects of hamstring stretch in OA. *Physiotherapy.* 2010;96(1):14–21.
39. White LC, Dolphin P, Dixon J. Hamstring length in PFPS. *Physiotherapy.* 2009;95(1):24–28.
40. Phadke A, et al. MET in mechanical neck pain. *Hong Kong Physiother J.* 2016;35:5–11.