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Original Article

The Effects of Static Stretching and Muscle Energy Technique (MET) for Young Adults with Hamstring Tightness

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ABSTRACT

Background: Hamstring tightness is a common issue among young adults, often leading to decreased flexibility and a higher risk of injury, particularly in individuals who are physically active. The efficacy of Muscle Energy Techniques (METs) and static stretching in treating this condition has been debated, with mixed outcomes reported in the literature.

Objective: This study aimed to compare the effects of METs and static stretching on hamstring flexibility in young adults, providing evidence-based insights for clinical practice in physical therapy.

Methods: A Randomized Clinical Trial was conducted with 60 healthy adults (age 18-32 years) experiencing prolonged hamstring tightness, split into two groups: an experimental group receiving METs and a control group undergoing static stretching. Data were collected using the Active Knee Extension Test (AKET) and the Straight Leg Raise (SLR) Test to evaluate hamstring flexibility pre- and post-intervention. The study took place in multiple clinical settings, and participants were randomly assigned to either intervention. Statistical analysis was performed using SPSS version 25, with a significance level set at $p<0.05$.

Results: Both groups showed significant improvements in hamstring flexibility. The experimental group demonstrated an increase in AKET from a mean of 43.36 (pre-treatment) to 84.83 (post-treatment), and in SLR from a mean of 64.23 to 85.93 ($p<0.001$). The control group also showed improvement, with AKET rising from a mean of 47.50 to 75.76, and SLR from 62.76 to 75.43 ($p<0.001$).

Conclusion: The study concluded that both METs and static stretching are effective for improving hamstring flexibility. METs may have a slight edge in efficacy, but static stretching also significantly enhances flexibility, supporting its continued use in clinical practice. These findings can guide physical therapists in selecting appropriate treatment strategies for hamstring tightness in young adults.

Keywords: Hamstring Tightness, Muscle Energy Techniques, Static Stretching, Flexibility, Physical Therapy, Randomized Clinical Trial.

INTRODUCTION

Hamstring tightness is a significant condition affecting individuals across a broad spectrum of ages, with a notable prevalence in young adults. This condition demands a comprehensive understanding of the hamstring anatomy, which includes the semitendinosus, semimembranosus, and bicep femoris muscles (1). These muscles, essential for knee flexion and hip extension, are particularly prone to injuries due to their biarticular nature, performing functions across two joints and being largely composed of type II fibers. The clinical manifestation of hamstring tightness is often identified by the inability to extend the knee beyond a specific angle during hip flexion, a condition that is not limited to any specific demographic. Its prevalence is observed across all age groups, with a higher incidence reported in females. Sports that necessitate rapid acceleration and direction changes are also associated with a heightened risk of hamstring injuries (2).

The impact of hamstring tightness extends beyond the musculoskeletal system, contributing to conditions such as lumbopelvic issues. This tightness can lead to alterations in posture and pelvic region mechanics, increasing the risk of various injuries including hamstring strains, low back pain, and patellofemoral pain syndrome (3). The physiological basis for this tightness can be attributed to factors like muscle overuse, poor posture, and participation in certain sports activities, which contribute to conditions like hamstring syndrome and back pain (4, 5).

Addressing this prevalent condition has led to the exploration of various treatment methodologies. The Muscle Energy Technique (MET) is one such method, involving muscle contractions followed by static stretching, aimed at improving musculoskeletal function (6-8). This technique, along with static stretching, a treatment recognized for its benefits in improving muscular extensibility and range of motion, has been extensively studied. These treatments have been compared in various studies, some concluding that MET is superior in enhancing hamstring flexibility, while others finding no significant difference in effectiveness between MET and other stretching techniques (9, 10).

The current research aims to delve deeper into the efficacy of Static Stretching and MET in treating young adults with hamstring tightness. Conducted as a Randomized Clinical Trial with a significant participant group, this study focuses on identifying the most effective treatment modality for this demographic. This research not only seeks to ascertain the best treatment approach but also aims to enhance the understanding of factors causing hamstring tightness in young adults. This is crucial for the development of more effective treatment protocols and informed decision-making in physiotherapy practices. The comprehensive review of existing literature and empirical studies forms a robust foundation for this study, setting the stage for a significant contribution to the field (11-13).

MATERIAL AND METHODS

In this Randomized Clinical Trial, we investigated the efficacy of physiotherapeutic interventions in treating prolonged hamstring tightness in healthy adults. The study was conducted across multiple settings, including the Physiotherapy Clinic of ILM College, Tariq Hospital, Musarrat Razzaq Trust Hospital, and Asghar Clinic, catering to a diverse group of participants. A total of 60 subjects, both males and females aged between 18 and 32 years, were included in the study (14), with their selection facilitated by the EPI Tool, a statistical software tailored for epidemiological calculations. The simple random sampling technique ensured an unbiased selection of participants, who were identified as healthy adults experiencing prolonged hamstring tightness. Exclusion criteria were stringent: athletes, individuals with recent hip trauma or surgery, neurological conditions, or leg length discrepancies were not considered for participation (15, 16).

Data collection comprised two principal assessments: the Active Knee Extension Test (AKET) and the Straight Leg Raise (SLR) (17, 18). These tests were pivotal in evaluating hamstring tightness and in excluding subjects with severe hamstring complications, spinal or lower limb pathologies, or recent lower limb surgeries or traumas. For the AKET, participants lay supine, extending one leg while bending the other at the knee. A goniometer was positioned on the lateral epicondyle of the femur, and measurements were taken at the peak of the active knee extension. The SLR involved a similar position, with the straightened leg being raised to assess hip flexion. The goniometer, placed on the greater trochanter of the femur, helped record the angle at the maximum point of hip flexion.

The study employed two primary interventions: Muscle Energy Techniques (METs) and Static Stretching. In METs, participants, while lying on their backs, contracted their hamstring against resistance for 5-10 seconds with one leg extended and the other bent at the knee. This was followed by a relaxation phase and a gentle increase in stretching, repeated five times. Static stretching involved positioning the leg into an SLR position while lying supine and maintaining this position for 30 seconds, repeated five times (14-16).

Adherence to ethical standards was paramount throughout the research process. Participants were assured of their safety, and the study's objectives and methods were thoroughly explained. Informed consent was obtained in accordance with ethical guidelines, and participants' anonymity and data confidentiality were rigorously maintained. The ethical committee of the university granted approval for the study, ensuring all ethical guidelines were met (19).

Data analysis was conducted using SPSS version 25, a statistical software package. This involved evaluating the data collected from the AKET and SLR tests, along with other relevant participant information. The analysis aimed to provide a comprehensive understanding of the efficacy of the two interventions, contributing valuable insights into the most effective treatment modality for prolonged hamstring tightness in the specified demographic.

RESULTS

In the conducted study, demographic data were analyzed for both the experimental and control groups to ascertain the baseline characteristics of the participants. The experimental group had an average age of 22.13 years (SD = 2.33), ranging from 18 to 27 years. The average body weight was recorded at 64.10 kg (SD = 18.66), with participants weighing between 42 and 98 kg. The mean height stood at 162.70 cm (SD = 12.84), with the shortest and tallest participants measuring 143.2 cm and 182.8 cm, respectively. The Body Mass Index (BMI) averaged at 23.76 (SD = 4.11), spanning from 16.00 to 30.30 (Table 1).

The control group presented similar demographic characteristics, with an average age of 22.43 years (SD = 2.63) and a range between 18 and 29 years. The weight mean was slightly higher at 65.16 kg (SD = 12.34), with a range of 45 to 86 kg. Participants in the control

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group were, on average, taller with a mean height of 169.16 cm (SD = 8.15) and a range from 143.2 cm to 179.8 cm. The average BMI was 22.67 (SD = 3.52), with values ranging from 16.6 to 30.70 (Table 1).

Assessing the effectiveness of the treatment modalities, the Active Knee Extension Test (AKET) was performed pre- and post-treatment. Before the treatment, the experimental group had an average AKET of 43.36, with the control group showing a slightly higher mean of 47.50, both with a significance level of 0.040. Following the treatment, the experimental group exhibited a substantial increase in the AKET mean to 84.83, a significant improvement with a p-value of less than 0.001. The control group also improved, but to a lesser extent, with a post-treatment AKET mean of 75.76, again with a significance level of less than 0.001, indicating a significant improvement from the pre-treatment condition (Table 2).

Furthermore, the Straight Leg Raising (SLR) test results also highlighted significant changes pre- and post-treatment. Initially, the experimental group had an average SLR of 64.23, with the control group close behind at 62.76; both groups showed a significance level of 0.047. Post-treatment results revealed more pronounced improvements in the experimental group, which achieved an average SLR of 85.93, with the control group reaching an average of 75.43. Both groups exhibited a significance level of less than 0.001, suggesting notable enhancements in flexibility following the interventions (Table 3).

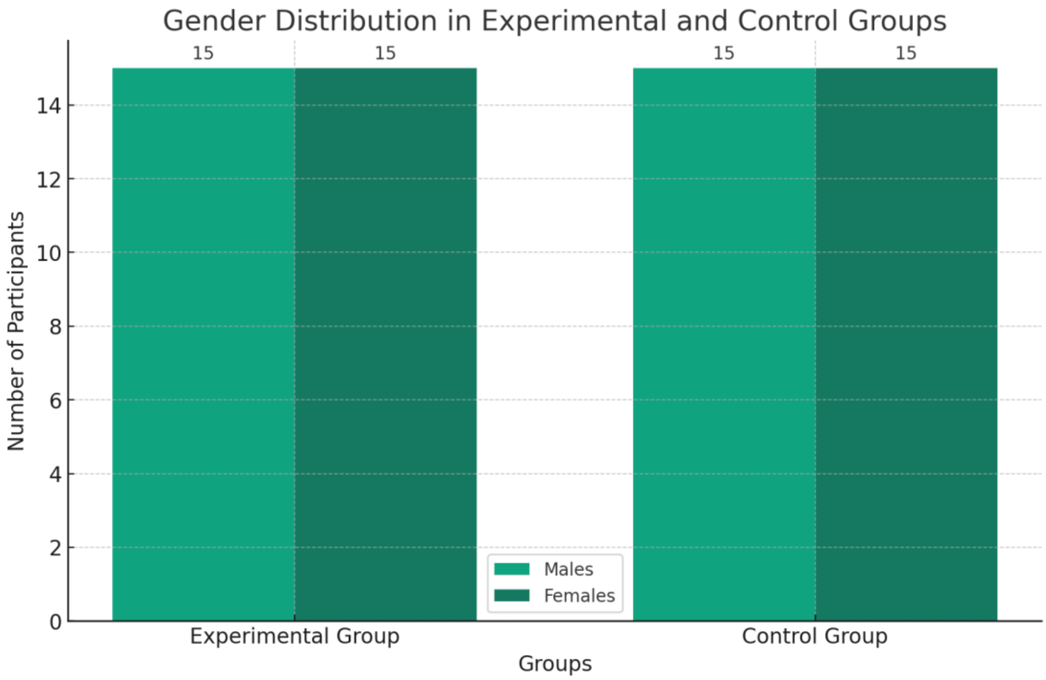

Figure 1 Gender Distribution in the Experimental and Control Groups

These results indicate that both interventions were effective in improving hamstring flexibility, with the experimental group showing a greater degree of improvement in both the AKET and SLR post-treatment. The substantial increases in the mean values and the associated significance levels suggest that the treatment modalities utilized in this study were beneficial for alleviating prolonged hamstring tightness in the healthy adult participants.

The bar graph visually represents the gender distribution in the Experimental and Control Groups, where each group comprises an equal number of males and females, 15 each, totalling 30 participants per group. The graph distinctly shows two sets of bars for each group, labelled "Males" and "Females," with corresponding data labels on top of each bar, effectively illustrating the balanced gender representation in both groups.

Table 1 Demographic Representation of Age, Height, Weight, and BMI

Group	Measurement	Mean	Std. Deviation	Minimum	Maximum
Experimental Group	Age	22.13	2.33	18.00	27.00
	Weight	64.10	18.66	42.00	98.00
	Height	162.70	12.84	143.2	182.8
	BMI	23.76	4.11	16.00	30.30
Control Group	Age	22.43	2.63	18.00	29.00
	Weight	65.16	12.34	45.00	86.00
	Height	169.16	8.15	143.2	179.8
	BMI	22.67	3.52	16.6	30.70

Table 2 Across the Group Comparison of Pre-Treatment AKET and Post-Treatment AKET (Independent T-Test)

Variable	Groups	Mean	Significance (2-Tailed)
Pre-Treatment AKET	Experimental Group	43.36	0.040
	Control Group	47.50	0.040
Post-Treatment AKET	Experimental Group	84.83	0.000
	Control Group	75.76	0.000

Table 3 Across the Group Comparison of Pre-Treatment and Post-Treatment Straight Leg Raising (Independent T-Test)

Variable	Groups	Mean	Significance (2-Tailed)
Pre-Treatment Straight Leg Raising	Experimental Group	64.23	0.047
	Control Group	62.76	0.047
Post-Treatment Straight Leg Raising	Experimental Group	85.93	0.000
	Control Group	75.43	0.000

DISCUSSION

The exploration of the comparative effectiveness of Muscle Energy Techniques (METs) and static stretching in mitigating hamstring tightness in young adults has captured the attention of professionals in physical therapy and sports medicine due to the complexity and prevalence of the condition. The present study was conducted with the objective of ascertaining the most effective modality to alleviate this widespread issue, particularly in young adults who are frequently engaged in physical activities and sports where hamstring flexibility is critical (20-22).

METs, as a manual therapy that involves an active muscle contraction against a controlled resistance, is posited to not only enhance muscle flexibility but also promote joint mobility. In contrast, static stretching is characterized by holding a muscle in an elongated, tensioned state for a specified period (17). The contention between these interventions lies in their efficacy in increasing hamstring flexibility. Prior investigations have indicated that the active engagement of patients in METs, which necessitates their participation in the treatment, could potentially result in superior outcomes compared to static stretching, presumably due to METs' activation of the neuromuscular system that may facilitate more sustained flexibility gains.

In the context of the current study, a cohort of 60 patients fulfilling the inclusion criteria were stratified into two groups. The experimental group, with an average age of 22.13 years, underwent MET, while the control group, averaging 22.43 years in age, was subjected to static stretching. The results indicated that the combination of MET with static stretching significantly ameliorated hamstring muscle stiffness, supported by a p-value of 0.05, thus endorsing the alternative hypothesis (18).

This study corroborates the findings of previous research, which advocate the efficacy of METs in enhancing hamstring flexibility (23). Similar another study examined the flexibility of hamstrings in young females using MET and passive stretching. Utilizing the Active Knee Extension Test among other evaluative tools, they discovered that both techniques significantly improved flexibility without a discernible difference between the two, evidenced by their reported p-value (23).

Another investigation by Adel Rashad Ahmed assessed the impact of METs and static stretching on hamstring tightness in healthy individuals. Their findings also indicated improvements in flexibility, with METs showing marginally better outcomes than static stretching (24). However, they concluded, in alignment with the outcomes of the current study, that both techniques were efficacious in enhancing hamstring flexibility in a healthy demographic.

While the current study offers valuable insights, it is not without limitations. The relatively modest sample size limits the generalizability of the findings to the broader population. Furthermore, the study employed a restricted array of outcome measures; incorporating more comprehensive functional scales could enhance future research. Moreover, the study's demographic focus on the Pakistani population necessitates caution when extrapolating the findings to other ethnicities or nationalities (25).

To reinforce the validity of these findings, future research endeavors could benefit from larger sample sizes and a more diverse array of outcome measures. Additionally, further investigations comparing different stretching techniques and their efficacy in reducing hamstring tightness could provide deeper insights, aiding clinicians in tailoring more effective treatment regimens. It is also recommended that subsequent studies consider longitudinal follow-ups to ascertain the long-term benefits of METs and static stretching in the management of hamstring tightness.

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CONCLUSION

The conclusion of this Randomized Clinical Trial suggests that both Muscle Energy Techniques (METs) and static stretching are effective interventions for improving hamstring flexibility in young adults. The study's findings resonate with existing literature, highlighting the potential of METs to yield slightly superior results in flexibility gains, though static stretching also significantly contributes to improving muscle extensibility. This research bears clinical implications for the management of hamstring tightness, suggesting that physical therapists may employ either method with the expectation of positive outcomes. However, considering the nuances of individual patient responses to treatment, the integration of patient preference and clinical judgment is essential in choosing the appropriate intervention. The study underscores the necessity for further research with larger and more diverse populations, as well as the adoption of comprehensive functional outcome measures to bolster the evidence base and refine physiotherapeutic practices.

REFERENCES

1. Santos GK, de OLIVEIRA RG, de OLIVEIRA LC, de OLIVEIRA CFC, Andraus RA, Ngomo S, et al. Effectiveness of muscle energy technique in patients with nonspecific low back pain: a systematic review with meta-analysis. European journal of physical and rehabilitation medicine. 2022;58(6):827.

2. Al Matif S, Alfageer G, ALNasser N, Alabbas G, Al Sawidan H, ALhareth H. Effectiveness of muscle energy technique on pain intensity and disability in chronic low back patients: a systematic review. Bulletin of Faculty of Physical Therapy. 2023;28(1):24.

3. D'souza AJ, Mohandas L, Patrao AI. A study to assess the effect of post isometric relaxation versus isolytic contraction on range of motion in individuals with hamstring tightness. Critical Reviews™ in Physical and Rehabilitation Medicine. 2022;34(2).

4. Khan N, Nouman M, Iqbal MA, Anwar K, Sajjad AG, Hussain SA. Comparing the Effect of Stretching and Muscle Energy Technique in the Management of Lower Cross Syndrome. Pakistan Journal of Medical & Health Sciences. 2022;16(07):31-.

5. rights are reserved by Vijay A, Selvan N. Impact of Muscle Energy Technique on Hamstring Muscle Flexibility in Recreational Athletes. Acta Scientific Orthopaedics (ISSN: 2581-8635). 2022;5(6).

6. Moradi MR. The effect of a muscle energy session on increasing knee extension in People with shortness of knee posterior muscles: National University; 2020.

7. Lee J-y, Sim H-p, Choi Y-j. The effect of muscle energy technique and instrument assisted soft tissue mobilization in adults with shortened hamstring on the range of motion, muscle strength and muscle thickness. The Journal of Korean Academy of Orthopedic Manual Physical Therapy. 2021;27(1):21-30.

8. Kalanekar TA, Koley S. A comparative study of Mulligan's bent leg raise versus muscle energy technique in asymptomatic individuals with hamstring tightness. EAS J Orthop Physiother. 2020;2:6.

9. Dinesh D, Sudhakar S. Effects of Muscle Energy Technique and Proprioceptive Neuromuscular Facilitation Stretch Technique on Hamstring Muscle Flexibility in Recreational Athletes. Journal of the Scientific Society. 2022;49(2).

10. 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;15(2):59-64.

11. Nazary-Moghadam S, Yahya-Zadeh A, Zare MA, Mohammadi MA, Marouzi P, Zeinalzadeh A. Comparison of utilizing modified hold-relax, muscle energy technique, and instrument-assisted soft tissue mobilization on hamstring muscle length in healthy athletes: Randomized controlled trial. Journal of Bodywork and Movement Therapies. 2023;35:151-7.

12. Purushothaman VK. Myofascial Release Therapy versus Muscle Energy Technique on Hamstring Flexibility in Physically Inactive Students–A Randomized Controlled Trial. 2022.

13. Sathe SS, Rajandekar T, Thodge K, Gawande V. Comparison between Immediate Effects of MET and Passive Stretching Techniques on Hamstring Flexibility in Patients with Hamstring Tightness: An Experimental Study. Indian Journal of Forensic Medicine & Toxicology. 2020;14(4).

14. 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;3(7):671-81.

15. Kang Y-H, Ha W-B, Geum J-H, Woo H, Han Y-H, Park S-H, et al., editors. Effect of Muscle Energy Technique on Hamstring Flexibility: Systematic Review and Meta-Analysis. Healthcare; 2023: MDPI.

Journal of Health and Rehabilitation Research 2791-156X JHRR

16. 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;11(3).

17. Niewiadomy P, Szuścik-Niewiadomy K, Kochan M, Kuszewski MT. The Relationship between Active and Passive Flexibility of the Knee Flexors. Muscles, Ligaments & Tendons Journal (MLTJ). 2021;11(2).

18. Santonja-Medina F, Santonja-Renedo S, Cejudo A, Ayala F, Ferrer V, Pastor A, et al. Straight leg raise test: Influence of lumbosant© and assistant examiner in hip, pelvis tilt and lumbar lordosis. Symmetry. 2020;12(6):927.

19. Rojhani-Shirazi Z, Salimifard MR, Barzintaj F. Comparison of the effects of static stretching and muscle energy technique on Hamstring flexibility, pain, and function in athletes with Patellofemoral pain. Journal of Advanced Pharmacy Education & Research| Jan-Mar. 2021;11(S1).

20. Banerjee SB, Mukhi S. Immediate effect of non ballistic active knee extension in neural slump position versus muscle energy technique on hamstring flexiblity in young adults-comparitive study. Indian Journal of Physiotherapy & Occupational Therapy Print-(ISSN 0973-5666) and Electronic–(ISSN 0973-5674). 2020;14(3):245-52.

21. 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;1(1):19-23.

22. Look M. Is Myofascial Decompression Through Cupping Therapy a More Effective Method to Increase Passive SLR and Active Knee Extension Measurements in Healthy Adults with Tight Hamstrings Compared to Static Stretching: A Meta-Analysis: California State University, Fresno; 2021.

23. Gibson AL, Wagner D, Heyward V. Advanced fitness assessment and exercise prescription, 8E: Human kinetics; 2019.

24. Ahmed AR. A comparative study of muscle energy technique and dynamic stretching on hamstring flexibility in healthy adults. Bulletin of Faculty of Physical Therapy. 2011;16(1):1-6.

25. Sauver JLS, Grossardt BR, Leibson CL, Yawn BP, Melton III LJ, Rocca WA, editors. Generalizability of epidemiological findings and public health decisions: an illustration from the Rochester Epidemiology Project. Mayo Clinic Proceedings; 2012: Elsevier.