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Effectiveness of Muscle Energy Technique Versus Conventional Therapy on Hamstring Tightness Among Sportspersons: A Comparative Study

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Abstract

Background: *Hamstring tightness is a frequent musculoskeletal concern among athletes, often contributing to limited flexibility, decreased performance levels, and a higher likelihood of sustaining injuries. Muscle energy technique (MET) has gained attention as a therapeutic approach aimed at enhancing muscle length and improving overall function.* ***Objective:*** *This study aims to evaluate and compare the effectiveness of the MET with that of traditional physiotherapy methods in alleviating hamstring tightness in sportspersons.* ***Methods:*** *A total of thirty individuals between 18 and 40 years of age who were presented with hamstring tightness were selected using random sampling at the Maharishi Markandeshwar Institute of Physiotherapy and Rehabilitation, Mullana, Haryana. Participants were randomly assigned to two groups: Group A received MET intervention, while Group B was treated with conventional physiotherapy, including static stretching and cryotherapy. The intervention lasted for 15 days. Outcome measures included the Active Knee Extension (AKE) Test and the Back-Saver Sit and Reach (BSSR) Test, recorded pre- and post-intervention. Data was analyzed using SPSS (version 21.0) with the Wilcoxon signed-rank test.* ***Results:*** *Both MET and conventional therapy groups showed statistically significant improvements in AKE and BSSR scores ($p = 0.001$). The MET group demonstrated slightly greater mean improvement in flexibility compared to conventional therapy.* ***Conclusion:*** *MET and conventional therapy are effective in reducing hamstring tightness; however, MET provides a more efficient and quicker improvement in muscle flexibility among sportspersons.*

Keywords: Muscle energy technique, conventional therapy, hamstring tightness, sportspersons, flexibility, physiotherapy

INTRODUCTION

The hamstring muscles play a vital role in functional mobility and athletic performance, especially in sports that require running, jumping, and rapid directional changes. The tightness of the hamstring muscles limits hip flexion and knee extension, leading to decreased stride length, lower back strain, and increased susceptibility to muscle strain injuries [1, 2].

The muscle energy technique (MET), developed by Fred Mitchell Sr. and Jr., is a form of active manual therapy in which the patient voluntarily contracts a muscle against the therapist's controlled counter-resistance [3]. MET aims to restore joint range, reduce pain, normalize muscle tone, and improve circulation [4, 5]. Its physiological basis

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lies in post-isometric relaxation (PIR**)** and reciprocal inhibition (RI**)** mechanisms, which facilitate the elongation of shortened muscle fibers [6].

Conventional physiotherapy for hamstring tightness typically includes static stretching and cryotherapy, both of which are widely recognized for improving flexibility and reducing soreness [7, 8]. However, the comparative efficacy of MET versus traditional methods in sportspersons remains insufficiently documented.

Given the functional importance of hamstring flexibility in sports, this study aimed to compare the effectiveness of MET and conventional physiotherapy techniques in reducing hamstring tightness among active sportspersons.

MATERIALS AND METHODS

This randomized controlled comparative study was conducted between September 2023 and April 2024. The study was approved by the Institutional Ethical Committee of the Maharishi Markandeshwar Institute of Medical Sciences and Technology, Mullana, Ambala, Haryana (Project No. IEC-2695). Written informed consent was obtained from all the participants. Thirty male and female sportspersons aged 18–40 years with hamstring tightness for at least six weeks' duration were recruited from the university campus. Participants with recent lower limb surgery, neurological disorders, or acute pain were excluded. Participants were randomly assigned to two equal groups (n = 15 each) using a manual lottery system.

- *Group A:* Muscle energy technique
- *Group B:* Conventional therapy

Group A: MET Protocol

Participants received MET using the PIR principle.

- The limb was positioned at the initial point of resistance.
- The participant performed an isometric contraction of the hamstring against the therapist's counterforce (10–20% of maximal effort) for 10–12 s.
- After relaxation, the therapist gently stretched the muscle to a new barrier and held it for 20–30 s.
- The sequence was repeated 3–4 times.

Group B: Conventional Therapy

Participants underwent:

Static stretching: Hamstring muscles were stretched gently and held for 30 seconds, repeated 3–4 times.

Cryotherapy: Application of a cold pack for 15 min prior to stretching sessions to reduce soreness and facilitate tissue extensibility [8].

Both groups received treatment daily for 15 consecutive days.

Active knee extension (AKE) Test: Used to measure hamstring flexibility by recording the angle of knee extension in the supine position.

Back-Saver Sit and Reach (BSSR) test: Used to assess trunk and hamstring flexibility.

Assessments were made before and after the 15-day intervention.

Statistical Analysis

The data were analyzed using SPSS version 21.0. Normality was assessed using the Shapiro–Wilk test. As the data were not normally distributed, the Wilcoxon signed-rank test was used for within-group analysis. Statistical significance was set at $p<0.05$.

RESULTS

Demographic Data

Thirty participants (19 males, 11 females; mean age = 20.5 ± 2.8 years) completed the study. Body mass index (BMI) and height followed a normal distribution ($p>0.05$), whereas age and weight did not. Male participation (63%) exceeded female participation (37%).

Within-Group Comparisons

The within-group analysis presented in Table 1 demonstrates that both treatment approaches, MET and conventional physiotherapy, resulted in significant improvements in hamstring flexibility. In the MET group, the AKE angle decreased from a pre-treatment median of 28° (IQR 25–30) to a post-treatment median of 20° (IQR 19–20), indicating enhanced flexibility. Similarly, the BSSR scores improved markedly from a median of 15 cm (IQR, 10–16) to 0 cm (IQR, 0–0). These changes were statistically significant ($p = 0.001$), confirming the effectiveness of the MET in reducing hamstring tightness.

Comparable improvements were observed in the CT group. AKE values decreased from a pre-treatment median of 29° (IQR 26–30) to 20° (IQR 20–20) after treatment. The BSSR scores also showed substantial enhancement, decreasing from 16 cm (IQR 14–16) to 0 cm (IQR 0–1). These findings were also statistically significant ($p = 0.001$), demonstrating that conventional physiotherapy, comprising static stretching and cryotherapy, contributed to improved muscle flexibility.

Overall, Table 1 indicates that both interventions produced meaningful and statistically significant gains in hamstring flexibility, as reflected in the improvements in both the AKE and BSSR measures.

Table 1. Within-group comparison of flexibility outcomes (AKE and BSSR) before and after treatment in MET and conventional physiotherapy groups.

Group	Outcome	Pre-Median (IQR)	Post-Median (IQR)	p-value
MET	AKE (°)	28 (25–30)	20 (19–20)	0.001
MET	BSSR (cm)	15 (10–16)	0 (0–0)	0.001
Conventional	AKE (°)	29 (26–30)	20 (20–20)	0.001
Conventional	BSSR (cm)	16 (14–16)	0 (0–1)	0.001

Both interventions produced statistically significant improvements in flexibility, as measured by AKE and BSSR ($p = 0.001$).

Comparative Findings

Although both groups improved, MET participants achieved a greater reduction in AKE and BSSR scores, indicating a better improvement in flexibility within the same intervention duration.

DISCUSSION

The present study compared the *MET* with conventional physiotherapy (static stretching and cryotherapy) for treating hamstring tightness in sportspersons. The findings revealed that both interventions significantly improved flexibility, but the MET demonstrated slightly superior results within a shorter duration.

Mechanistic Interpretation

The improved flexibility following MET can be attributed to neuromuscular reflex mechanisms, such as PIR and RI, which reduce muscle tone and enhance sarcomere length [5, 6]. During MET, isometric contraction activates Golgi tendon organs, inhibiting alpha motor neuron activity and allowing the muscle to elongate further. This contrasts with static stretching, which primarily relies on passive lengthening of the soft tissue and may not engage in active neuromuscular pathways [9].

Comparison with Previous Studies

The findings are consistent with earlier research reporting MET's efficacy in improving hamstring flexibility in healthy and athletic populations [10–15, 16–18].

Raza et al. (2023) found MET and static stretching to be equally effective in reducing knee pain and enhancing flexibility [10].

Bhutta et al. (2023) demonstrated superior improvement in young athletes who underwent PIR [11].

Patel et al. (2023) and *Purushothaman (2022)* observed significant gains in flexibility using MET compared to myofascial release and passive stretching [12, 13].

Similarly, *Rojhani-Shirazi (2021)* and *Kalanekar and Koley (2020)* reported greater functional outcomes with MET than with static stretching among athletes and students [14, 15].

Clinical Significance

The rapid improvement observed within 15 days in this study suggests that MET can expedite recovery compared to conventional stretching protocols, which often require four weeks or more for comparable gains (16,19). For athletes who require prompt return to training, the MET offers a time-efficient rehabilitation option [16, 19].

Limitations

- The sample size was small (n = 30) and was limited to a single institution.
- The study included sportspersons from mixed disciplines, which may have introduced variability.
- Manual measurement tools (goniometer, measuring tape) may have induced minor errors.

Strengths

- Randomized controlled design ensured unbiased allocation.
- Use of validated outcome measures (AKE, BSSR).
- Practical clinical relevance for sports physiotherapy.

Future Recommendations

- Future studies should include:
- Larger, multicentric cohorts;
- Long-term follow-up to assess retention of flexibility gains;
- Comparison of MET with newer neuromyofascial or AI-guided physiotherapy techniques [17, 18].

CONCLUSION

The comparative analysis indicates that both the MET and conventional physiotherapy are effective in improving hamstring flexibility in sportspersons. However, MET demonstrates a greater and faster enhancement in range of motion, likely due to its active neuromuscular engagement mechanism. Incorporating the MET into rehabilitation protocols can optimize athletic performance and prevent injuries associated with hamstring tightness.

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