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Immediate Effects of Muscle Energy Technique Versus Myofascial Release Technique on Calf Muscles Flexibility in Female Students

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ABSTRACT

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Background: Calf muscle tightness is a prevalent issue among female students, affecting posture, gait, and ankle mobility. This study compared the immediate effects of Muscle Energy Technique (MET) and Myofascial Release (MFR) on calf muscle flexibility. Objective: To determine which technique is more effective in improving calf muscle flexibility in female students. Methods: This pre- and post-experimental study was conducted on 60 female students (age 18–24 years) with reduced calf flexibility. Participants were randomly allocated to Group A (MET; n=30) or Group B (MFR; n=30). Interventions were administered in single sessions, with assessments using goniometry for ankle range of motion (ROM) and manual muscle testing for gastrocnemius tightness. Results: Both groups demonstrated significant within-group improvements ($p < 0.001$). MET group showed mean ankle dorsiflexion improvement of 16.17° , while MFR group improved by 44.83° . Gastrocnemius tightness improved by 0.85 units in MET and 1.02 units in MFR. Between-group analysis revealed no significant differences in final outcomes ($p > 0.05$), indicating comparable effectiveness. Conclusion: Both MET and MFR are effective immediate interventions for improving calf muscle flexibility in female students. The techniques can be used interchangeably based on clinical context and patient preference.

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Introduction

The group of the muscles of the calf, which includes soleus and gastrocnemius, they are the fundamental muscles for the function of the lower extremity. Their role is crucial during walking, running, or jumping and when one has to maintain their

postural balance. The plantar flexion at ankle as well as the flexion of the knee is directly contributed by the gastrocnemius muscle, being the more superficial one among the two. (1) The tightness of the calf muscle (also called reduction in flexibility or shortened gastrocnemius) is highly prevalent among the young adults, specially in the university students, as they sit for prolong period of times, has a sedentary lifestyle and their posture is also poor. If the flexibility of the calf is limited, eventually it lead to altered mechanics of the gait, reduction of the dorsiflexion of the ankle ROM and there are increased chances that one can be at risk of developing musculoskeletal dysfunction and injury (2,3)

Female students are more prone to develop this condition because of the factors of wearing high heels and academic schedules promoting sedentary lifestyle. According to recent research, patellofemoral pain, lower back pain, and poor balance are all correlated with decreased ankle dorsiflexion mobility, a key sign of calf tightness. (4,5).

A variety of physiotherapy techniques are being developed to boost flexibility and relieve tense muscles. Based on osteopathic principles, muscular Energy Technique (MET) uses the patient's own regulated isometric muscular contractions accompanied by passive stretching to encourage relaxation through reciprocal inhibition and post-isometric relaxation (PIR) (6). To promote increased muscle length and joint mobility, MET activates neuromuscular systems such as Golgi tendon organ responses and muscle spindle responses. (7). Myofascial Release Technique (MFR) is the application of prolonged direct pressure to fascial limitations and myofascial trigger points with the goal of releasing fascial adhesions and increasing tissue mobility without the need for patient muscle activation. (8). In a 2024 study by Sorathiya et al., MET and IASTM were compared for hamstring tightness and both treatments were helpful, with MET having somewhat better results. Thus, manual therapy modalities promote flexibility increases via various pathways. (9). The comparative effectiveness of MET and MFR on calf muscle flexibility in young female populations remains understudied, justifying the present investigation.

Literature Review

Muscle Energy Technique Effectiveness. Clarke and Allen (2021) investigated MET post-isometric relaxation on latent trigger points of the gastrocnemius, findings reported great reduction in trigger points and the dorsiflexion at ankle was also improved 8.33° to 9.83° (10). Ahmad et al. (2023) compared MET and static stretching on hamstring flexibility in young adults, they reported that MET produced mean improvements of 41.47° in Active Knee Extension Test compared to 27.74° in the static stretching group, which supported that MET's efficacy through autogenic inhibition mechanisms (11). Sorathiya et al. (2024) conducted a comparative study of MET and Instrument-Assisted Soft Tissue Mobilization (IASTM) for hamstring tightness in the population of students, reported that both the techniques effective with MET showing slightly superior pain reduction and flexibility gains ($p < 0.05$) (9). A comprehensive 2024 study by Singh et.al. comparing Active Release Technique and Positional Release Therapy in female students with tightened calf muscles, and reported that both techniques were effective in pain reduction and dorsiflexion and plantarflexion improvement, with Positional Release Therapy demonstrating superior results in pain reduction (1.15 ± 0.69 vs 3.31 ± 0.75 on NPRS) (12). Deshmukh et al. (2024) compared static and dynamic myofascial decompression on gastro-soleus trigger point pain, they reported that that both approaches significantly caused pain reduction and improvement in muscle power, with dynamic myofascial decompression showing effects that lasted after 5 days (13). In a 2025 systematic review they examined massage gun vs MFR for the latent trigger points in the muscle of the calf, in which they reported improvement in severity and intensity of pain as well as ROM of ankle in a 12 week protocol (14). These results highlight the usefulness of soft tissue mobilization treatments in particular in female populations with calf muscle weakness. According to the already available data, both MET and MFR seem to be successful in improving the flexibility of the calf muscles, through various processes (neuromuscular reflexes and fascial release, respectively). Therefore, it would be interesting to perform a comparison of these two techniques to facilitate a clinical decision.

Methods

Study Design and Participants

This was a pre- and post-experimental study conducted at Isra Institute of Rehabilitation Sciences. Sixty healthy female students aged between 18-24 years with impaired calf muscular flexibility were recruited by purposive non-probability sampling. Inclusion criteria were: Female gender, age 18–24 years, calf muscle tension proven (ankle dorsiflexion $< 15^{\circ}$) and willingness to participate. Exclusion criteria included: previous ankle joint damage, low back pain, neurological problems, skin traumatic injury to lower extremities in the past 6 months, and ongoing physiotherapy for calf muscle dysfunction.

Outcome Measures

Calf muscle flexibility was assessed using: (1) Ankle Range of Motion (ROM) measured with a universal goniometer, with participants in prone position and hip extended; (2) Gastrocnemius muscle tightness assessed using manual muscle testing on a scale of 1–5. Both measures were taken immediately before and after intervention.

Intervention Protocols

Group A (n=30) received Muscle Energy Technique: participants lay prone with ankle in dorsiflexion. The therapist applied 20–30% resistance while participants gently pushed the foot downward (plantarflexion) against resistance for 7–10 seconds, followed by relaxation and passive stretch held for 30 seconds. The sequence was repeated 3–5 times per session, with total session duration of 10–15 minutes. Group B (n=30) received Myofascial Release: participants lay prone with a pillow under the ankles. The therapist applied gentle sustained pressure to the gastrocnemius muscle for 90–120 seconds, followed by release. Treatment included 4–6 sessions over 2–3 weeks. Both interventions targeted the gastrocnemius muscle specifically.

Data Analysis

Data were analyzed using SPSS version 23. Descriptive statistics calculated demographic characteristics. Paired t-tests assessed within-group changes. Independent t-tests compared between-group differences. Statistical significance was set at $p < 0.05$.

Results

Participant Characteristics. The study included 60 female participants with mean age 21.95 ± 2.08 years (Table 1). Age distribution was: 18–20 years (35%, n=21), 21–23 years (45%, n=27), and 24–26 years (20%, n=12). BMI distribution was: underweight (20%, n=12), normal (55%, n=33), and overweight (25%, n=15). Involved leg distribution was: left leg (56.7%, n=34) and right leg (43.3%, n=26). Demographic characteristics were comparable between MET and MFR groups.

Table 1. Demographic Characteristics of Participants

Characteristic	MET Group (n=30)	MFR Group (n=30)
Age (years), mean $\pm$ SD	21.9 $\pm$ 2.1	22.0 $\pm$ 2.1
BMI, mean $\pm$ SD	22.3 $\pm$ 2.2	22.4 $\pm$ 1.9
Left Leg Involved (%)	56.7%	56.7%
Right Leg Involved (%)	43.3%	43.3%

MET = Muscle Energy Technique; MFR = Myofascial Release Technique; BMI = Body Mass Index

Within-Group Changes. Both interventions produced significant within-group improvements (Table 2). In the MET group, ankle ROM improved from $101.83^\circ \pm 10.54$ pre-intervention to $85.67^\circ \pm 5.68$ post-intervention (mean change: 16.17° , $p < 0.001$). Gastrocnemius tightness improved from 4.23 ± 0.60 to 5.08 ± 0.19 (mean change: 0.85 units, $p < 0.001$). In the MFR group, ankle ROM decreased from $129.00^\circ \pm 185.81$ pre-intervention to $84.17^\circ \pm 9.48$ post-intervention (mean change: 44.83° , $p < 0.001$). Gastrocnemius tightness improved from 4.03 ± 0.57 to 5.05 ± 0.33 (mean change: 1.02 units, $p < 0.001$). Both groups demonstrated statistically significant improvements across all measures ($p < 0.001$).

Table 2. Pre- and Post-Treatment Measurements by Group

Measure	Group	Pre (M $\pm$ SD)	Post (M $\pm$ SD)	Change	p-value
Ankle ROM ($^\circ$)	MET	101.83 $\pm$ 10.54	85.67 $\pm$ 5.68	16.17 $^\circ$	<0.001
	MFR	129.00 $\pm$ 185.81	84.17 $\pm$ 9.48	44.83 $^\circ$	<0.001
Gastrocnemius Tightness (1-5 scale)	MET	4.23 $\pm$ 0.60	5.08 $\pm$ 0.19	0.85	<0.001
	MFR	4.03 $\pm$ 0.57	5.05 $\pm$ 0.33	1.02	<0.001

Between-Group Comparisons. Independent t-tests revealed no significant between-group differences in post-treatment measures (Table 3). For ankle ROM, $p = 0.460$; for gastrocnemius tightness, $p = 0.634$. These findings indicate comparable effectiveness of both interventions in improving calf muscle flexibility.

Table 3. Between-Group Comparison of Post-Treatment Outcomes

Outcome	MET (M±SD)	MFR (M±SD)	t-value	p-value
Post Ankle ROM (°)	85.67±5.68	84.17±9.48	0.744	0.460
Post Gastrocnemius Tightness	5.08±0.19	5.05±0.33	0.479	0.634

Discussion

The results of the study showed that both MET and MFR significantly and rapidly improved the flexibility of calf muscle in female students without any significant difference between the two strategies (18). The magnitude of within-group changes was consistent with recent data indicating benefits of manual therapy techniques for muscular tension. In the MET group, post-isometric relaxation improved the ankle ROM by 16.17°. Increase in ankle ROM of dorsiflexion of 8.33-9.83° was also reported by Clarke and Allen (2021). The MFR group increased 44.83° in ROM. This shows that the mechanisms of fascial release are useful for muscle restrictions when appropriate posture is used. The similar results after therapy ($p>0.05$) are similar to the findings of Patel et al. (2023) who reported no significant differences among MET and MFR groups for hamstring flexibility in footballers. Both treatments treat muscular tightness but via different neurophysiological mechanisms. MET stimulates inhibitory mechanisms via Golgi tendon organs and reciprocal inhibition, and MFR relieves myofascial trigger points and fascial restrictions via sustained pressure. Clinically, the lack of substantial differences between groups shows that the choice of approach may be driven by patient preference, the availability of resources and the clinical presentation, rather than by greater efficacy. In particular, the results indicate efficacy of both approaches in university settings where female students often present with calf tightness due to sedentary academic schedules and footwear choices (high heels). These findings are consistent with the 2024 comparative efficacy research that showed the advantages of both MET and IASTM and support the idea that different manual therapy techniques can lead to comparable gains in flexibility. One caveat is that MFR group had greater mean ROM change (44.83° vs 16.17°), however this was not statistically significant and might be due to variability in baseline measurements shown in MFR group ($SD=185.81$ pre-treatment). Both approaches are evidence based instant therapies that are clinically appropriate for improving acute flexibility in young female populations.

Conclusion

Both Muscle Energy Technique and Myofascial Release Technique are beneficial in improving the flexibility of the calf muscle in the immediate term in female pupils. Both groups showed considerable improvement in ankle range of motion and gastrocnemius muscle tension but there was no statistically significant difference between the groups in the end results. The findings of this study favor the clinical use of both approaches as effective acute treatments for calf muscle stiffness. Future research exploring long-term effects, optimal treatment frequencies, and combination techniques would further improve evidence-based practice in the management of calf flexibility.

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