Immediate effect of MET vs Static Stretching on Tendo–Achilles Tightness

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Abstract
Static stretching commonly used conventional technique to lengthen a shortened muscle/group of muscles. Literature showed that MET improves flexibility and range of joint hence the need to find out immediate efficacy of MET over static stretching techniques. 70 subjects were screened for Tendo-achilles tightness on the Weight-bearing Lunge test and Ankle Flexibility Test. They were then randomly allocated into groups of self stretching and MET. Pre and post reading were recorded. Study concluded, MET is statistically significant in Ankle Flexibility Test. The two interventions were equally effective on the Weight-Bearing Lunge Test.

Keywords: Tendo-achilles, MET, Static-Stretching.

Introduction
The Achilles is the largest and strongest tendon in the human body. The gastrocnemius and Soleus muscle unite to become the tendon at the lower end of calf.
Flexibility is absolute range of movement in a joint(s) and length in muscles that cross the joint16.
Loss of flexibility can be a predisposing factor for pain syndrome or balance disorders. There are many factors that affect flexibility: Internal factors – training oversight, muscle strength, endurance and range of motion and genetics. External factors-weather, age, walking surface, shoes.
Stretching is defined as the act of applying tensile force to lengthen muscles and connective tissues.
There are various techniques of stretching like static, dynamic, ballistic, PNF.
It is reported that about 88% of forefoot & ankle problems arise due to gastrocnemius tightness & contractures.
A greater range of movement in the ankle can often prevent sprains.
It also seen in the people with long sitting jobs & sedentary lifestyle.
Muscle energy techniques are a class of soft tissue osteopathic (originally) manipulation methods that incorporate precisely directed and controlled patient initiated, isometric and / or isotonic contractions, designed to improve musculoskeletal function and reduce pain.
Static stretching is the conventional intervention to lengthen a shortened muscle or group of muscles. Studies have shown MET improves flexibility and joint range, there is need to find out immediate efficacy of MET over static stretching techniques. Static stretching is a very common and conventional technique used to lengthen a shortened muscle or group of muscles. Although studies have shown that MET improves flexibility and range of motion, there is a need to find out immediate efficacy of MET over static stretching techniques.

Methodology
The following is an experimental study carried out by random sampling. The study was conducted on students aged 18-30\textsuperscript{1,3} of MAEER’s Physiotherapy College and MIMER Medical College, Talegaon. Cases were selected based on Weight Bearing Lunge Test (WBLT)\textsuperscript{12} and Ankle Flexibility Test (AFT)\textsuperscript{13}. Participants with recent fractures of the spine or lower limb or suffering from any neurological conditions were excluded.

Procedure
Participant’s informed consent was taken. The 60 participants were randomly divided and assigned to two groups. Group A (n=30) MET (Post Isometric Relaxation), Group B (n=30) Static Self Stretching. The following interventions were given only for the dominant side.

Group A were given MET for gastrocnemius and soleus. Three sets of MET (PIR) were given for both the muscle group. Each stretch held for 30 seconds following 10 seconds of isometric contraction.

Group B were instructed to perform self stretches for the gastrocnemius and soleus which were repeated thrice and each held for 30 seconds.

OUTCOME MEASURES
Immediately after the interventions WBLT and AFT were re-assessed.

STATISTICAL ANALYSIS AND RESULT
All the statistical analysis was done using Instat software.

Pre and post values of WBLT and AFT were analyzed within the groups using paired t test. Inter-group values using K-S test.

Table 1: WBLT

|          | Pre (Mean) | Post (Mean) | SD   | p value |
|----------|------------|-------------|------|---------|
| Group A  | 9.733      | 11.443      | 1.506| 0.0225  |
| Group B  | 9.28       | 10.6        | 1.293| 0.0232  |

Table 2: Ankle Flexibility Test

|          | Pre (Mean) | Post (Mean) | SD    | p value |
|----------|------------|-------------|-------|---------|
| Group A  | 57.25      | 63.994      | 4.953 | 0.0615  |
| Group B  | 62.793     | 67.267      | 2.566 | 0.10    |

Graph 1: WBLT Unpaired

Graph 2: AFT Unpaired

Table 3: Unpaired t test

|               | Mean | SD   | p value |
|---------------|------|------|---------|
| WBLT (MET)    | 1.697| 1.531| 0.0288  |
| WBLT (Static )| 1.420| 1.365| 0.0086  |
Result
The study revealed that both the interventions are equally effective in reducing Tendon-Achilles tightness. However, it revealed a marked increase in the results of the AFT in subjects who were given MET.

Discussion
The current study was undertaken to assess the immediate effect of M.E.T. vs Static Stretching for Tendo-Achilles tightness. For the purpose of this study 70 participants were screened. Out of 60 patients with tightness were taken & divided into 2 groups by random chit method. 30 patients were given M.E.T. and the other 30 were given Static self stretching. Pre and post WBLT & AFT values were assessed. The study revealed that both treatment groups attained successful outcomes on AFT (p is 0.0079) whereas, no statistically significant result were obtained on the WBLT (p is 0.4630). Thus according to AFT, MET is more effective in increasing Ankle ROM than static stretching whereas the WBLT states both MET and static stretching are equally effective in reducing tendo-achilles tightness. Efficacy of MET (PIR) is attributed to the physiological response of the antagonist of a muscle which has been isometrically contracted – reciprocal inhibition (RI) when a muscle is isometrically contracted, its antagonist will be inhibited and will demonstrate reduced tone immediately. Apart from the well-understood processes of reciprocal inhibition the precise reason for effectiveness of MET remains unclear, despite the commonly held view that an isometrically held contraction seems to set a muscle to a new length by inhibiting the influence of the golgi tendon organ.

Effectiveness of both techniques on the gastrocnemius as compared to soleus could be attributed to the difference in the muscle itself, for soleus, a so called “red muscle “, its characterized by relative slower contractions, less fatigability, a slower contractions than the “white“ gastrocnemius. It is seen that spindles in fast – contracting muscles show greater per unit stretch than in slow ones in the muscle itself, for soleus, a so called “red muscle “, its characterized by relative slower contractions, less fatigability, a slower contractions than the “ “ white “ gastrocnemius. It is seen that spindles in fast – contracting muscles show greater per unit stretch than in slow ones.

Conclusion and Clinical Significance
The immediate effect of MET is clinically significant when compared to static stretching. Equal number of repetitions of both methods were given, and still MET had a greater effect. So we can imply that fewer repetitions of MET could have greater or equal effect as static stretching.

Scope and Limitations
SCOPE
This study could be done on specific groups who are predisposed to plantar fasciitis, forefoot pain, and Achilles tendinitis and ankle problems, based on their profession, comorbidities or sport.

Limitations
Ankle range of motion could be included as an outcome measure as MET showed a positive effect on gastrocnemius tightness.

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References
1. The Gastrocnemius: The new paradigm for the human foot and ankle. James Aims, MD
2. The Effect of Muscle energy technique on gross trunk range of motion Karen L Lenehan, Gary Fryer, Patric McLaughlin. Journal of osteopathic medicine 6(1), 13-18, 2003.
3. The immediate effect of muscle energy technique on posterior shoulder tightness: a randomized controlled trial. Stephanie D Moore, Kevin GLaudner, Todd A MCloda, Micheal A Shaffer. Journal of orthopaedic& sports physical therapy 41(6), 400-407, 2011.
4. DiGiovanni CW, Kuo R, Tejwani N, et al. Isolated gastrocnemius tightness. J Bone Joint Surg Am 2002;6:962–70.
5. The Role of Isolated Gastrocnemius and Combined Achilles Contractures in the Flatfoot DiGiovanni, MD Christopher W.
6. Aronow MS, Diaz-Doran V, Sullivan RJ, et al. The effect of triceps surae contracture force on plantar foot pressure distribution. Foot Ankle Int 2006;1:43–52.
7. Garrett T, Neibert PJ. The effectiveness of a gastrocnemius/soleus stretching program as a therapeutic treatment of plantar fasciitis. SportRehabil 2013;22(4):308–12.
8. Nutt J. Diseases and deformities of the foot. E.B.Treat & Co; 1913. Google Digital Copy.
9. Riddle DL, Pulisic M, Pidcoe P, et al. Risk factors for plantar fasciitis: a matched case-control study. J Bone Joint Surg Am 2003;5:872–7.
10. Young R, Nix S, Wholohan A, et al. Interventions for increasing ankle joint dorsiflexion systematic review and meta-analysis. J Foot Ankle Res 2013;6:1–10.
11. Macklin K, Healy A, Chockalingam N. The effect of calf muscle stretching exercises on ankle joint dorsiflexion and dynamic foot pressures, force and related temporal parameters. Foot (Edinb) 2012;22:10–7.
12. Intra-rater and inter-rater reliability of a weight-bearing lunge measure for ankle dorsiflexion. Kim Bennel, Richard Talbot, Australian Physiotherapy.
13. JOHNSON, B.L. and NELSON, J.K. (1986) Practical Measurements for Evaluation in PE . 4th ed. Minneapolis: Brueges Publishing.
14. BANDY ,W.D. and IRION , J.M. (1994) The effect of time on static stretch on the flexibility of the hamstring muscles. Physical therapy, 74(9), p 845-850.
15. Muscle Energy Technique by Leon Chaitow. (Third Edition).
16. McClure, M; Exercise and training for soinalpatients, Part B, Flexibility training, In Basmajian, JV, Nyberg, R (eds);RatinalMnual Therapies, Baltimore; Williams & Wilkins, 193, p 359.
17. The influence of contraction duration in muscle energy technique applied to the atlanto-axial joint. ND Fryer , BSc, MHSc,(Osteo), WojteckRuszkowski, School of Health Sciences, Victoria University, Melbourne, Austraila.
18. J.E. Gregory, Relations between identified tendon organs and motor units in the medial gastrocnemius muscles of the cat. Experimental Brain Research, 81, 3(602).
19. Yukiko Makihara L. Segal , Jonathan R. Wolpaw and Akio K Thompson , H-reflex modulation in the human medial and lateral gastrocnemii during standing and walking , Muscle & Nerve, 45, 1, (116-125), (2011).