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Research Article

COMPARATIVE STUDY ON THE EFFECTIVENESS OF MUSCLE ENERGY TECHNIQUE VERSUS STATIC PASSIVE STRETCHING ON HAMSTRING TIGHTNESS IN HEALTHY YOUNG INDIVIDUALS

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A R T I C L E I N F O

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A B S T R A C T

Objective: To compare effectiveness of Muscle Energy Technique (MET) & Static Stretching on hamstring tightness in healthy young individuals.
Method: 40 individuals with hamstring tightness between age of 18 to 25 were included and randomly allocated into two groups 20 of each. Group A was given MET & group B was given Static Stretching for 5 consecutive days. Active knee extension test (AKET) as outcome measure was performed before and after the 5 days.
Result: The result of within groups shows significant difference between pre and post score of AKET & between groups also shows significant difference for the post test score of group A&B.
Conclusion: The MET showed statistically significant improvement than static stretching in reducing hamstring tightness in healthy young individuals.

INTRODUCTION

Muscle tightness is caused by a decrease in the ability of the muscle to deform, resulting in a decrease in the range of motion at the joint on which it acts. The term has also been used to denote a slight to moderate decrease in muscle length; usually the movement in the direction of the elongating muscle is limited. Muscle tightness usually results from inadequate or improper rehabilitation following sustained muscle injury or low levels of physical activity in individuals. (1)

The hamstrings are example of muscle groups that have a tendency to shorten.(2) Physiologically full stretch occurs in this muscle only if the knee is fully extended and hip fully flexed(3) . Complete contraction occurs when the knee is fully flexed and hip is fully extended(4). Complete contraction and stretching rarely occurs in normal daily activity and hamstrings are therefore rarely put through their full physiological amplitude. Therefore chance of it going into tightness are more in individuals not participating in any daily stretching routine. Hamstrings muscle tightness is a common condition even among young healthy individuals and recreational athletes.(5)
In young age, hamstrings tightness is one of the common factors causing low back ache(6), herniated lumbar disc(7), decreased lumbar lordosis(8),decreased range of lumbar spine flexion and increased range ofthoracic spine flexion(9), increased thoracic hypnosis angle in adolescents with Scheuermann disease (10) and a higher risk ofmuscle injury(11), lumbar spine dysfunction (12).

Techniques previously investigated for hamstring flexibility include static, ballistic and active assisted stretching exercise, ice, heat(13) , soft tissue massage, ultra sound, SWD , myofacial release and proprioceptive neuromuscular facilitation (PNF)(14), kinesio taping(15), MET(16) Each of these interventions has demonstrated clinical and experimental success; no agreement has been reached on a standard protocol for treatment. Choice for a hamstring lengthening technique is typically based on provider specialty or preference.(17)

PassiveStatic Stretching is a commonly used method of stretchingin which soft tissues are elongated just past the point oftissue resistance and then held in the lengthened positionwith a sustained stretch force over a period of time. Otherterms used interchangeably are sustained, maintained, or prolonged stretching.(18)

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. Muscle Energy Technique (MET) is a manual therapy that uses the gentle muscle contraction of individual to relax & lengthen muscle & normalize joint. MET is a form of therapy that utilizes the patient's muscle contraction and body positioning to normalize joint motion.(19)
Many studies have been conducted on the efficacy of passive stretching technique (static) and MET independently but

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hardly very little study has given any comparison between efficacies of both the techniques.

Hence the study is proposed to compare the effectiveness of passive stretching technique (static) versus MET for duration of 5 days to reduce the hamstring tightness on asymptomatic individual.

MATERIALS AND METHODOLOGY

Study Design: A Pre Post Experimental Study

Sample design: Convenience Sampling followed by odd even assignment

Sample size: Total 40

- Group A: n=20 subjects received Muscle Energy Technique
- Group B: n=20 subjects received Static Passive Stretching technique

Inclusion criteria

- Individual with Hamstring tightness (Lack of Active knee extension >15 degree on AKET)
- Age- 18-25
- Sex- male & female
- Subjects willing to participate

Exclusion criteria

- Fracture, trauma, soft tissue injury,
- age>25,
- Acute/chronic low back pain ,
- acute/chronic Hamstring injury

Outcome measures:

Active Knee Extension Test (AKET)

The AKET consists in an active extension movement at the knee joint (with the hip flexed at 90°), in which the subject is instructed to stop when he feels strong resistance to the movement.[20]

Procedure

All the subjects were diagnosed clinically to have tight hamstrings using AKET. The procedure was clearly explained to all the patients and their consent was obtained. Data was collected by assessing each patient's performance on AKET before beginning the treatment and at the end of 5 days of treatment.

Group A: MET for shortness of lower hamstrings[19]

- The non-treated leg needs to be either flexed or straight on the table.
- The treated leg should be flexed at both the hip and knee, and then straightened by the practitioner until the restriction barrier is identified (one hand should palpate the tissues behind the knee for sensations of bind as thelower leg is straightened).
- The isometric contraction against resistance is introduced at this 'bind' barrier.
- The instruction might be something such as 'try to gently bend your knee, against my resistance, starting slowly and using only a quarter of your strength'.
- It is particularly important with the hamstrings to take care regarding cramp, and so it is suggested that no more than 25% of patients' strength should ever be used during isometric contractions in this region.
- Following the 7-10 seconds of contraction followed by complete relaxation, the leg should, on an exhalation, be straightened at the knee towards its new barrier. This slight stretch should be held for up to 30 seconds.
- Repeat the process for 3 repetitions

Figure 2 MET for shortness of lower hamstrings

Group B:Static passive stretching of hamstrings

Flexion of the Hip with Knee Extension[21]

Hand Placement and Procedure

With the patient's knee fully extended, support thepatient's lower leg with your arm or shoulder.Stabilize the opposite extremity along the anterior aspectof the thigh with your other hand or a belt or with theassistance of another person.With the knee at 0 degree extension, and the hip in neutralrotation, flex the hip as far as possible.

Figure 3 Static passive stretching of hamstrings

DATA ANALYSIS & RESULTS

For the statistical analysis, data were obtained before the treatment and after the end of treatment from both the groups. Active Knee Extension Test was scored before and after the intervention.

Mean and standard deviation of pre and post test values of Active Knee Extension Test of Group A (Muscle Energy Technique) and Group B (Static Passive Stretching) were calculated.

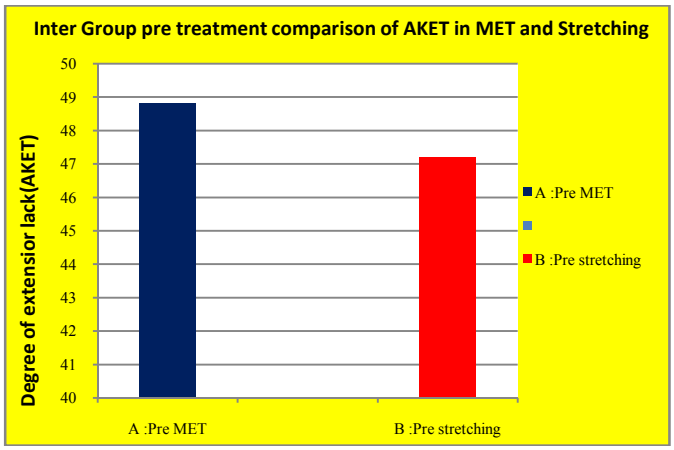
Paired t test was used for the intra group comparison of pre and post test values of outcome measures within the groups Unpaired t test was used for the inter group comparison of pre-pre and post-post test values of outcome measures between the groups. The significance level adopted for the statistical tests was 5%. All statistical tests were performed using SPSS Version 16 software.

Table 1 Demographic Details

Demographic Data		Group A(N=15)	Group B(N=15)
Age	Mean	21.20	21.87
	SD	2.01	2.16
Sex	Females	11(73%)	9(60%)
	Males	4(27%)	6(40%)

Table 2 Inter Group Pre Treatment Comparison of AKET in MET and Stretching

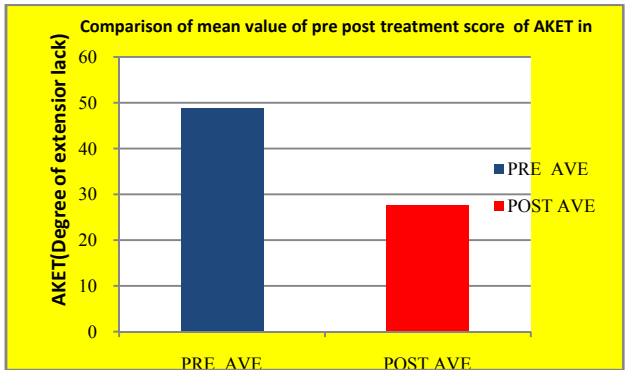
Group	Mean	Sd	t	Df.	p value
A :Pre MET	48.8	4.35	o.673	28	0.253
B :Pre stretching	47.2	3.94			



Graph 2 Inter Group pre treatment comparison of AKET in MET and Stretching

Table 3 Intra group comparison of pre and post treatment score of AKET in Group A (MET)

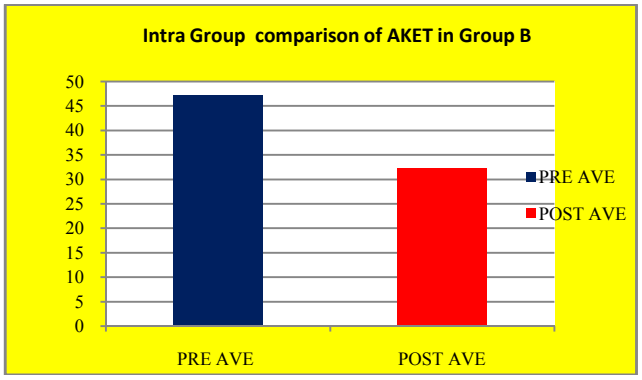
Group A	Pre mean	Post mean	Mean Diff±SD	t	p value
AKET	48.8	27.6	21.25.50	14.51	0.0001



Graph 3 Comparison of mean value of pre post treatment score of AKET in MET

Table 4 Intra group comparison of pre and post treatmnent of AKET in group B

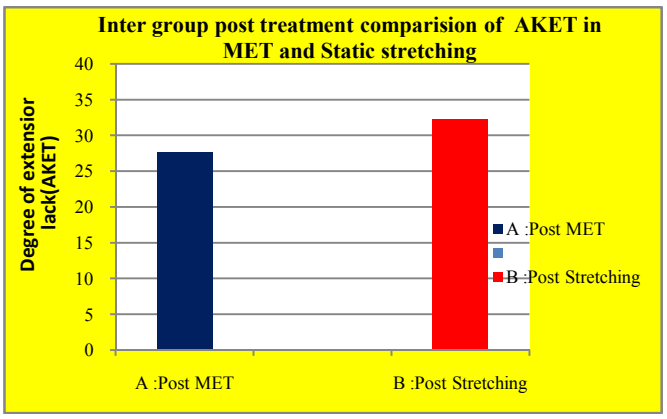
Group B	Pre mean	Post mean	Mean Diff+SD	t	p value
AKET	47.2	32.26	14.94±2.21	14.30	0.0001



Graph 4 Intra Group Comparison of mean value of pre post treatment score of AKET in Group B (stretching)

Table 5 Inter Group post Treatment Comparison of AKET in MET and Stretching

Group	Mean	Sd	t	Df.	p value
A :Post MET	27.6	4.54	3.47	28	0.0008
B :Post Stretching	32.26	2.27			



Graph 5 Inter Group post Treatment comparison of AKET in MET and Stretching

DISCUSSION

Results of this study suggest that there is a significant improvement in the Active Knee Extension Test scores following intervention were observed in all the subjects of both the groups. Pre-Post mean difference of AKET score in group A (MD=21.2) was more than the Pre-Post mean difference of AKET score in group B (MD=19.8). Paired t test shows p value<0.05 in both the groups for all outcome measures suggesting that both the treatment protocols are significant in improving the Hamstring Tightness. Unpaired t test shows p value<0.05 for post-post mean value comparison of both outcome measure between the group suggesting a statistically significant difference was found between the treatment protocol. Pre-Post Mean differences of all outcome measures in both the groups suggesting more improvement gained in hamstring tightness. The results of the present study show that MET is more effective than Static Passive Stretching in reducing hamstring tightness and improving hamstring flexibility.

There are numerous studies proving the effectiveness of MET in hamstring tightness. Mohdwaseem *et al* conducted study on "efficacy of muscle energy technique on hamstring flexibility" in normal Indian collegiate males for 5 consecutive days. There was a significant difference between the subjects treated with Muscle energy technique and control group subjects, in terms Of improvement in Active knee extension range of

motion/Popliteal angle. Conclusion indicates that MET is significantly improving the hamstring flexibility (range of motion) in collegiate males[22].

An increase in flexibility afterMET occurred due to biomechanical or neuro-physiological changes or due to an increase in tolerance to stretching.It can be speculated on the neurological mechanisms that may produce increased range of motion of a joint after MET, however, there is little research to substantiate these theories. Kuchera[23] attributed the effectiveness of MET to the inhibitory golgi tendon reflex. This reflex is believed to be activated during isometric contraction of muscles, which is claimed to produce a stretch on the golgi tendon organs and a reflex relaxation of the muscle.[24]Increased tolerance to stretch, which has been demonstrated following passive static stretching of the hamstring muscles, may also play a role in the apparent increased flexibility of muscles following MET.

Handel *et al*.[25] suggest that an increased stretch tolerance is a possible mechanism behind the increased ROM seen in their study after the contract-relax exercise program. According to Zuzana, the changeswithin the connective tissues display mechanicalproperties relating to both fluid (viscous) and elasticcomponents. "Creep" represents the temporaryelongation of connective tissue during stretch asa result of its viscoelastic properties.[26] Permanent"plastic" changes occur as a result of micro‐tearingand remodeling of connective tissue fibers. MET mayproduce increased muscle length by a combination ofcreep and plastic changes in the connective tissues.

The results of this study may be applied to a population with clinical diagnosis of hamstring tightness in normal healthy young individuals. This study did not include a follow-up period, and, therefore, no conclusions can be drawn about the long term benefits of the intervention.

Future study can be done with longer protocol with followup assessment and broader sample size. The major limitations of this study are dominant side was not differentiated and physical activity of the subjects were not considered. More investigation could be done using correlation with EMG activities of the muscle.

CONCLUSION

This study concludes that Muscle Energy Technique (MET) is highly significant in improving Hamstring flexibility than the Static Passive Stretching in normal healthy young individuals. The other benefits are these techniques are very simple and can be easily used on subjects who are experiencing lack of muscle flexibility.

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