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Immediate effect of active release technique (ART) and muscle energy technique (MET) on hamstrings muscle tightness in adult population - A comparative study

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Abstract
Objectives: To compare the immediate effects of Active Release technique and Muscle energy technique in Adult population having hamstrings muscle tightness
Study design: Comparative study
Methods: Ethical clearance was taken from college and consent was taken from 40 male and female subjects having hamstrings tightness .They were divided into 2 equal groups. Pre and post measure of active knee extension test was taken. Group A underwent active release technique and group B underwent muscle energy technique.
Result: There was significant improvement in hamstrings flexibility (p=0.001) in both techniques. Statistical comparison of both techniques showed that both are equally effective.
Conclusion: This study concludes that both active release technique and muscle energy technique are equally effective immediately on hamstrings tightness.

Keywords: ART, MET, Flexibility, hamstrings tightness

Introduction

1. Flexibility is the ability of the muscle to lengthen and allow one joint (or more than one joint) to move through range of motion [1]. Loss of flexibility is defined as a decrease the ability of muscle to deform.
2. Muscular flexibility is an important aspect of normal human function. Limited flexibility significantly affects human function [2].
3. The ability of an individual to move smoothly depends on his flexibility, an attribute that enhances both Safety and optimal physical activities.
4. Muscle tissue length is thought to play an important role in efficiency and effectiveness of human movement [1].
5. Limited flexibility has been shown to predispose a individual to several musculoskeletal overuse injuries and significantly affects a individuals level of function [2].
6. Hamstrings is one of the common muscle that undergoes tightness [1]. Tight hamstrings muscle also can increase the patellofemoral compressive force because of the increased passive resistance during the swing phase of ambulation and running [9]
7. Hamstring tightness are associated with a posterior rotation of the pelvis in standing due to attachment of hamstring muscle is on ischial tuberosity. Tightness in hamstring muscle causes posterior pelvic tilt which lead to decrease in lumbar lordosis. Decrease in lumbar lordosis result in low back pain [3].
8. Active Release technique was developed by Dr. P. Michael Leahy to work on variety of muscle, tendon, ligament, fascia and nerve. Active release technique therapy for the hamstrings is useful to alleviate pain and tightness. Active release technique helps the hamstrings to return to its normal condition. ART is performed by application of digital pressure by therapist while actively shortening the muscle and then relaxing (by recipient) then removal of digital pressure.

It restore function by breaking the cross fibre adhesion which restricts the smooth movement of tissues by adhering to adjacent tissue [2].

9. Muscle energy technique is manual technique developed by osteopaths and is now used in many different manual therapy professions. Post isometric relaxation and reciprocal inhibition are the two forms of muscle energy technique. Post isometric relaxation helps in lengthening of tight hamstrings by its contraction and relaxation method .Muscle energy technique was proved as an effective technique in rehabilitation for elongating shortened muscle tissue. In PIR (post isometric relaxation) a strong muscle contraction against equal counterforce triggers the Golgi tendon organ .The afferent nerve impulses from Golgi tendon enters the dorsal root of spinal cord and meets with an inhibitory motor neuron .This stops the discharge of the efferent motor neurons impulse and therefore prevents further contraction, this results in the relaxation [9].

2. Need of Study

1. Hamstrings tightness is most common clinical sign seen in normal individual. This can lead to many biomechanical problems in future. Studies shows prevalence 4 % in males and 96% in females [3].
2. The long term effectiveness of active release technique and muscle energy technique on hamstrings muscle tightness has been studied individually but the comparison of immediate effects between both of them is not yet done.
3. So, this study focuses on checking the immediate effect of both the techniques on hamstrings tightness in young adults.

3. AIM

1. To compare the immediate effect of Active Release Technique (ART) and Muscle Energy Technique (MET) on hamstrings tightness in adult population.

4. Objectives

1. To study the immediate effect of ART in improving hamstrings flexibility.
2. To study the immediate effect of MET in improving hamstrings flexibility.
3. To compare immediate effects of ART and MET in improving hamstrings flexibility.

5. Hypothesis

1. **Null Hypothesis (H0):** There will be no significant difference between immediate effects of Active Release technique and Muscle energy technique on hamstring tightness in adult population.
2. **Alternative Hypothesis (H1):** Immediate effect of ART will be more effective than immediate effect of MET on hamstrings tightness in adult population
3. **Alternativehypothesis (H2):** Immediate effect of MET will be more effective than immediate effect of ART on hamstrings tightness in adult population.

6. Materials

1. Informed consent
2. Pen
3. Paper
4. Plinth
5. Universal Goniomete
6. Gel

7. Methodology

1. Sample Size: 40
2. Study Design: Comparative study
3. Sampling Method: convenient sampling.
4. Study Population: Subjects having hamstrings tightness aged between 18-25 years
5. Study Setting: in and around colleges of Pune
6. Duration of Study : minimum 6 months

8. Criteria

Inclusion criteria:

1. 20 -50 degrees active knee extension loss with hip in 90 degrees flexion (active knee extension test) [7].
2. Age group between 18 -25 years [3]
3. Both genders were included.

9. Exclusion criteria:

1. Subjects within last 20 degrees of active knee extension test.
2. Subjects having recent fractures of lower limb
3. Subjects having acute or chronic hamstring strain.

10. Outcome Measure

Active Knee Extension Test.

1. Subject in supine lying position .An adjustable cross bar will be fixed an inch proximal to the hip.
   Subject's pelvis and nontest leg will be stabilized using a stabilizing belt.
2. The hip and knee of the extremity in 90° flexion with the anterior aspect of thigh in contact with the horizontal cross bar frame at all times to maintain hip in 90° flexion. The subject will then asked to extend the knee to their maximum available range of motion. The available range of motion will be measured and will be deducted from 180 degrees to get the total extension limitation [9].

11. Procedure

1. Synopsis proposal including procedure and methodology was approved by the ethical committee of PES modern college of physiotherapy at institution level. The safety of the participant was ensured by the researcher and strict confidentiality was maintained regarding patient information, there condition and the treatment.
2. Study was conducted in and around Pune .Subjects was selected according to the inclusion and exclusion

criteria based on and divided into two equal groups by Random allocation –chit method.
3. The subjects were explained about the study in detail. Consent was taken from the subjects who were eligible according to the inclusion criteria and wished to participate in the study. Pre intervention and post intervention measurements were taken.
4. Subjects were assured that the collected data would not be misused in any form.
5. Group A ,20 subjects received active release technique Group B, 20 subjects received muscle energy technique

Treatment Interventions Group A

1. **Active Release Technique**
2. ART is a non invasive, soft tissue treatment that both locates and breaks scar tissue and adhesions which causes pain, stiffness weakness and other physical dysfunction [2].
3. In case of ART, the involved tissue is taken from a shortened position to a fully lengthened position while applying tension longitudinally along soft tissue fibers.

4. **Procedure of ART**


5. Subjects in prone lying on plinth and gentle tension applied to the hamstrings muscle along entire length while actively shortening and lengthening.
Longitudinal tension over origin, belly and insertions of hamstrings muscle.This cycle repeated for 5 more times. (13)

Group B

3. Post isometric relaxation

1. Muscle energy technique is manual technique developed by osteopaths. Post isometric relaxation and reciprocal inhibition are the two forms of MET.
2. Post isometric relaxation: Subject in supine lying with contralateral hip and knee semi flexed position.
Therapist standing on intervention side of the subject, facing head end side of plinth. The leg to be treated was fully flexed at hip and knee, and then extended until restriction. The calf of the treated leg was placed on shoulder of therapist. The subject was instructed to gently bend knee against the resistance (here resistance given by shoulder). Ask the subject to slowly build up an isometric contraction, hold it for 7 to 10 seconds and then release. Second time straightened knee towards new barrier.(9)
3. Subjects were asked to apply 20% strength. Repeat two more times. (11)

Fig 1: Post isometric contraction

13. Data Analysis

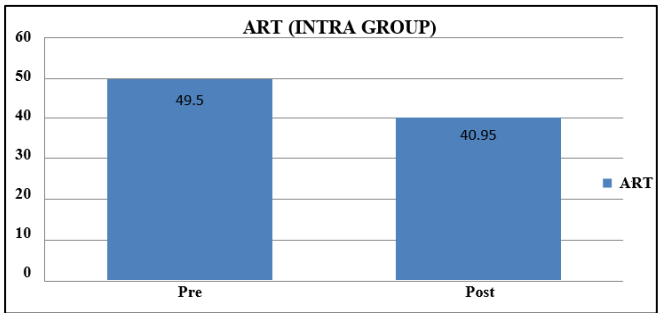
1. Hamstrings muscle flexibility was analyzed using Universal Goniometer (to major tightness in degrees).
2. The data was entered in excel sheet and subjected to statistical analysis.
3. Data entered was analyzed with the help of Graph pad instat.

14. Statistical Analysis

1. The level of significance for pre and post values of group A and B was calculated by using paired t test respectively.
2. Group A and group B inter group data analyzed by using unpaired t test.

Intra Group Analysis
Group A (Active Release Technique)

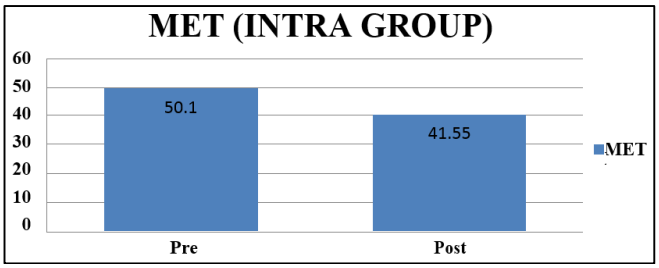
Hamstrings Tightness	Pre	Post
Mean	49.5	40.95
SD	6.992	6.261
P Value	0.0001	
T Value	15.282	



Graph 1: GROUP A (pre and post) comparison

Intra group
Group B (Muscle Energy Technique)

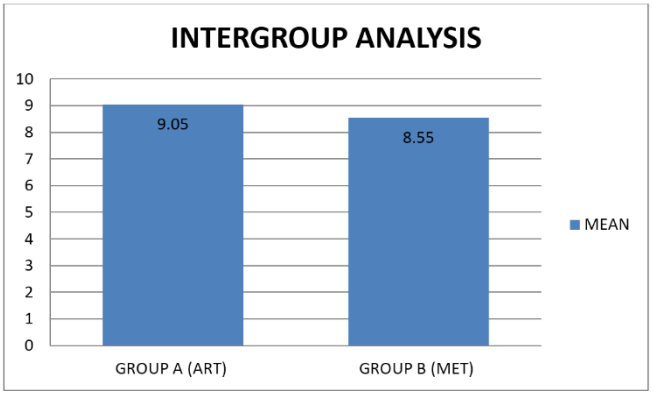
Hamstrings tightness	Pre	Post
Mean	50.1	41.55
SD	6.965	5.889
P value	0.0001	
T value	7.179	



Graph 2: GROUP B (pre and post) comparison

Intergroup Analysis

Hamstrings tightness	Group A	Group B
Mean	9.05	8.55
SD	4.371	2.502
P value	0.6596	
T value	0.444	



Graph 3: Group a and b comparison

15. Results

40 subjects participated in the study. Both males and females of age group 18-25 were included in the study.

Active knee extension test were performed before and after the intervention. Graph 1 shows the comparison between pre and post values of active knee extension test for group A. In which p value is 0.0001 which is significant. Graph 2 shows the comparison between pre and post values of active knee extension test for group b. In which p value is 0.0001 which is significant. Graph 3 shows comparison between the group A and B .The value for group A is 9.05 ± 4.371 while for group B is 8.55 ± 2.502 but p value is 0.6596 which is considered not significant. According to statistical analysis of the data, both the group are equally effective.

16. Discussion

1. The study was performed among 40 individuals in the age of 18 to 25. They were divided into two groups of 20 by chit method. Hamstrings tightness was assessed before and after treatment. Both the Groups showed significant improvement on hamstrings muscle.
2. This can be correlated with study conducted by Jesudas Mazumdar and Jitendra shriwas which showed significant improvement in the hamstrings with muscle energy technique (7).
3. Vijay Kage, rakhi Ratnam Showed in their study that active release technique for hamstrings is designed to alleviate pain and tightness and help the hamstring to return to its normal condition. (2)
4. Ballantyne f, fryer. Mc Laughlin in their study shows effectiveness of muscle energy technique on hamstrings flexibility.(8)
5. In post isometric contraction, a strong muscle contraction against equal counterforce triggers the Golgi tendon organ .The afferent nerve impulse from Golgi tendon enters dorsal root of spinal cord and inhibitory motor neuron .This causes relaxation of the muscle. An increase in flexibility after muscle energy technique occurred due to increase tolerance to stretching.(9)
6. ART is assumed to restore normal function by breaking the cross-fibre adhesion which restricts the smooth movement of tissues by adhering to adjacent tissues.
7. In this study significant improvement in hamstrings flexibility was seen by both ART and MET.Data entered was analyzed with the help of Graph pad instat. There is statistical significance (p=0.0001) between pre and post values of Active knee extension test in group B (POST ISOMETRIC CONTRACTION). Statistically ART also showed significance in hamstrings flexibility (p=0.0001). ART and MET showed significant improvement in pre and post values of both groups individually.
8. When ART and MET was compared statistically (p value = 0.6596) it was found that there was no statistical significance.
9. Hence, null hypothesis was proved .There was no significant difference in immediate effects of Active Release technique and Muscle energy technique on hamstring tightness hence both are equally effective.
10. However both the groups individually showing significant improvement in hamstrings flexibility which concludes that both techniques are immediately effective.

17. Conclusion

1. This study concludes that active release technique and muscle energy technique are individually effective in reducing hamstrings tightness.
2. However, when we statistically compare both the technique. There was no significant difference in immediate effects of Active Release technique and Muscle energy technique on hamstring tightness hence both are equally effective.

18. Limitations

1. Study was performed under small sample size.
2. Latent trigger points has not been considered.

19. Future Scope

1. The study can be conducted separately in males and females.

2. Study can be conducted in a different profession.

20. Acknowledgement

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