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Immediate Effects of Muscle Energy Technique versus Myofascial Release Techniques on Hamstring Flexibility in Footballers: A Comparative Study

Dr. Anand Patel[1], Dr. Niyati Patel[2], Dr. Mona Patel[3]

[1, 2]Assistant Professor, Vidhyadeep Institute of Physiotherapy, Vidhyadeep University, Anita, Surat, Gujarat, India

[3]Assistant Professor, School of Physiotherapy, P PSavani University, Kosamba, Surat, Gujarat, India

Abstract: ***Background: Most often, attention is focused on management of pain and injuries and decreased muscle strength in football players while little attention is given to flexibility. The objective of this study was Immediate Effects of Muscle Energy Technique (MET) Versus Myofascial Release Techniques (MFR) on Hamstring Flexibility in Footballers aged 18 - 25 years. MET is used to lengthen a tight muscle, strengthen weak muscles, reduce localised oedema or mobilize an articulation with adhesion or restriction MET consists of different techniques, one of which is Post Isometric Relaxation Technique (PIR). Cross hand release methods are by a far the main, major and normally utilized strategies in the MFR approach and structure the premise of each other MFR procedure. Method: In the present experimental study, there are 102 patients with hamstring tightness footballers. Inclusion criteria were male with age of 18 years to 25 years with hamstring tightness. Minimum 20 degrees of flexion at knee while performing active knee extension (AKE) test unilaterally, Hamstrings are tight and active straight leg raising (ASLR) range was between 30 - 70 ranges. Patient were randomly divided into two groups: MET Group A (n=51) and MFR Group B (n=51). Both groups also received conventional therapy. Patient was evaluated immediately after the treatment by AKE test and ASLR test. Result: All the test and calculation were performed using SPSS software version 21. The group were heterogeneous at baseline in their demographic details and outcome scores with p - value < 0.05. Outcome measurements were completed on 102 participants. Pre and post intervention within group was done using WILCOXON SIGNED RANK TEST which shows significant difference in both groups in all the outcome scores (ASLR and AKE with p < 0.05). Comparison between two groups was done by MANN WHITNEY TEST which shows no significant difference in ASLR and AKE outcome score (ASLR and AKE with p < 0.05). Conclusion: The study Concludes that both the techniques used in the present study i. e., Muscle Energy Technique (MET) and Myofascial Release Techniques (MFR) Both the techniques are effective for the improving flexibility of hamstring Muscle in footballers.***

Keywords: Hamstring Flexibility, Muscle Energy Technique, Myofascial Release Active Knee Extension Test, Active straight leg raising test

1. Introduction

The Hamstring is a multi - joint muscle complex that exerts a strong contracting force repeatedly in a lot of exercises and daily activities. It consists of three main muscles: Biceps Femoris (Short head and Long Head), Semitendinosus and Semimembranosus.[1] The Hamstring contributes significantly in hip extension and knee flexion. Furthermore, it plays a cardinal role in the gait cycle. The Hamstring gets activated in the final 25% of the gait cycle just as the extension of hip begins and continues to do so for 50% of the swing phase to bring about hip extension and resist knee extension. In addition to this, the Hamstring alongside the Anterior Cruciate Ligament (ACL) wields the role of dynamic stabilization of the knee joint. During the heel strike phase of the gait cycle, the Hamstring elongates over both, hip and knee joints and manages to decelerate the anterior translation of the tibia while knee extension occurs and the weight of the body is shifted forward.[2, 3]

Flexibility is considered an essential element of normal biomechanical function.[4] Limited flexibility has been shown to predispose a person to several musculoskeletal overuse injuries and significantly affect a person's level of function and causes neuro - musculoskeletal symptoms. These musculoskeletal symptoms will lead to decrease in strength, stability, endurance and much more.[5] Several studies have also shown the prevalence of hamstring tightness in athletes, specially footballers.[6, 7]

The Myofascial Release Techniques (MFR) is a "curative" tool for treatment of the tightness. It is a manual therapy technique that uses applied pressure and stretching to muscles and fascia with the intent to improve movement of the muscles and the surrounding fascia.[8, 9]

Amongst various approaches which work on the fascial tissue structures, Myofascial Release (MFR) technique was considered to have potential in pain reduction, improving flexibility, reducing disability thus enhancing function in the activities of daily living.[10, 11, 12, 13]

Muscle energy (MET) is a manual technique in which the person's muscle energy is used in gentle isometric contractions to relax the muscle using autogenic or reciprocal inhibition. Many studies have identified the effect of the MET, which is to inhibit the Golgi tendon reflex and the reflex from being activated during the isometric contraction of muscles and to produce a stretch in the Golgi tendon organs and reflex relaxation of the muscle.[14]It is claimed to be effective for a variety of purposes including lengthening a shortened muscle, as a lymphatic or venous

pump to aid the drainage of fluid or blood and increasing the range of motion.1[5]

Stretching techniques are the treatments used to improve muscular extensibility to improve ROM, and can help prevent damage in daily life or sports, reduce muscle pain, and improve muscle capability, and athletic performance.[16 - 22]

Two most common tests which are used to measures hamstring flexibility are active - knee - extension test (AKE) and the straight - leg - raise test (SLR).2[3] Active knee extension (AKE) test attempts to indicate hamstring musculotendinous length by measuring the angle of knee flexion during active knee extension while the hip is held at 90º of flexion and intratester reliability is high for this test.[24]The AKE test is performed with the patient lying supine with both lower extremities extended. The tester flexes the ipsilateral hip to 90 and maintains this angle while the ipsilateral knee is actively extended. The contralateral lower extremity is stabilized on the examination table. Clinically, the endpoint is reached when either the tester feels slight resistance or the subject reports a strong but tolerable stretching sensation in the hamstring musculature. Using a universal goniometer, the tester can measure the KEA (Knee Extension Angle), which is the degree of knee flexion from terminal knee extension.[25]

The active straight leg raise (ASLR) and passive straight leg raise (PSLR) tests are commonly used in clinical settings to assess hamstring tightness.[26] The straight leg raise (SLR) test is widely reported in the literature as an indicator of hamstring muscle length and as an aid in the diagnosis of sciatica and nerve root irritation.[27, 28, 29]ASLR is performed in a relaxed supine position with legs straight and feet apart. Subjects are instructed to raise one leg, keeping the knee straight, to a point where they first felt a stretch sensation in the posterior thigh area.[30] Both AKE and SLR have excellent interrater reliability.[24]

Universal Goniometry (UG) has long been recommended by both physicians and physical therapist as the most accurate tool for measuring articular range of motion (ROM) thus contributing to make accurate diagnoses and monitoring efficiency of treatment.[31]

There are less studies are found comparing the immediate effect of Muscle Energy Technique Versus Myofascial Release Techniques on Hamstring Flexibility in Footballers The result of this study would implicate a better treatment program for the subject with hamstring tightness in footballers.

Inclusion criteria: Age group between 18 to 25 years, only male subjects, Asymptomatic subjects with hamstring tightness, Minimum 20 degrees of flexion at knee while performing active knee extension test (AKE) unilaterally, Hamstrings are tight and active straight leg raising (ASLR) range was between 30 - 70 ranges.

Exclusion criteria: Hypersensitive skin, diagnosed subjects with neurological deficits, diagnosed subjects with malignancy, diagnosed subjects with skin disease, Subjects diagnosed with systemic illness, Traumatic injury to the knee joint and lumbar spine less than 6 months

Procedure of study

The purpose of this study was explained and a written informed consent and demographic details was obtained from all the subjects. Subjects were preliminary screened based on the inclusion and exclusion criteria. Total 128 Footballers participated and 102 are fitted in inclusion exclusion criteria They were allocated in to two Groups Muscle energy technique (Group A =51) and Myofascial release technique (Group B =51), by chit method. On the first day of the treatment, pre - test and post - test measurements of flexibility of hamstring muscle by AKE and ASLR test by universal goniometer was taken.

Pretest and post - test measurement of hamstring flexibility was done using ASLR and AKE tests. The ASLR was measured as the participant lay supine with the legs extended, while maintaining knee extension and monitoring pelvic rotation, subject was asked to raise one leg, keeping the knee straight, until they first felt a stretch sensation in the posterior thigh area. The ROM measurement was recorded with the goniometer. The measurement was taken pre intervention and post intervention. (42) To perform active knee extension (AKE) test as popliteal angle. Popliteal angle measurements were recorded by goniometer. The hip and knee joints were kept at 90 - 90 position. Then the subject was asked to actively extend the knee and the angle was noted down between thigh and leg. The attained angle was subtracted from 90 degrees and the angle was noted down. The measurement was taken pre intervention and post intervention. (43)

Muscle energy technique

The supine patient fully flexes the hip on the affected side. The flexed knee is extended by the practitioner to the point of resistance (identifying the barrier). The calf of the treated leg is placed on the shoulder of the therapist, who stands facing the head of the table on the side of the treated leg. If the right leg of the patient is being treated, the calf will rest on the practitioner's right shoulder, and the practitioner's right hand stabilizes the patient's extended unaffected leg against the table. The practitioner's left hand holds the treated leg thigh to both maintain stability and to palpate for bind when the barrier is being assessed. The patient is asked to attempt to straighten the lower leg (i. e., extend the knee) utilizing the antagonists to the hamstrings, employing 20% of the strength in the quadriceps. This is resisted by the practitioner for 7–10 s. Appropriate breathing instructions should be given. The leg is then extended at the knee to its new hamstring limit if the problem is acute (or stretched slightly if chronic) after relaxation and the procedure is then repeated.[34]

Myofascial release technique

Patient position: Prone position, Light stroking (2 - 3 min) [10]. Hands - Contact is made with fist. Light pressure is applied with the fist over the hamstrings proximal to distal direction (2 - 3 mins). Myofascial release technique (MFR). MFR is given with the ulnar border from proximal to distal direction with a light gentle pressure over the hamstring muscle until the slack in the skin is loosened. Every stroke is

to be held for 30 seconds, 5 repetitions per session. The hand position was crossed in order to work as energy efficiently as possible. All the subjects will be instructed to not perform any flexibility or stretching exercises of lower limb during the treatment period.[35]

Conventional exercises (Hamstring muscle stretching)
The subject will be asked to lie supine and relax completely. With the patient's knee fully extended, support the patient's lower leg with arm or shoulder. Stabilize the opposite extremity along the anterior aspect of the thigh with other hand or a belt or with assistance of another person. With the knee at 0 - degree extension, and the hip in neutral rotation, flex the hip as far as possible.[36]

Statistical Analysis
All the test and calculation were performed using SPSS software version 21. Shapiro - Wilk test was applied to check the normality of the data. All the quantitative data of this study follows the not normal ($p \leq 0.05$). WILCOXON SIGNED RANK TEST was used to analyse the differences between pre and post treatment within each group and MANN WHITNEY TEST for between group comparisons.

2. Results

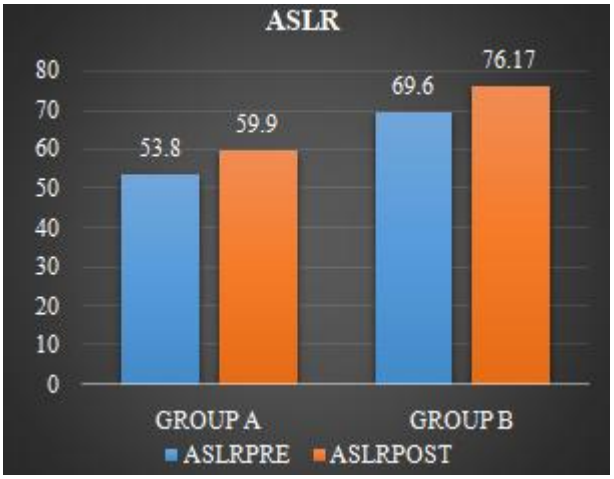
Total 128 patients were assessed for eligibility.102 patients were enrolled in the study and randomized to one of the treatment groups (51 Muscle Energy Technique GROUP And 51 In Myofascial Release Techniques Group). The group were heterogeneous at baseline in their demographic details and outcome scores with p - value < 0.05. Outcome measurements were completed on 102 participants. Pre and post intervention within group was done using WILCOXON SIGNED RANK TEST which shows significant difference in both group in all the outcome scores (ASLR and AKE with $p < 0.05$). Comparison between two groups were done by MANN WHITNEY TEST which shows no significant difference in ASLR and AKE outcome score (ASLR and AKE with $p > 0.05$). According to statistical analysis of the data, Group A (Muscle Energy Technique) and Group B (Myofascial Release Techniques) not significant.

Table 5.1: Patient's Baseline characteristics

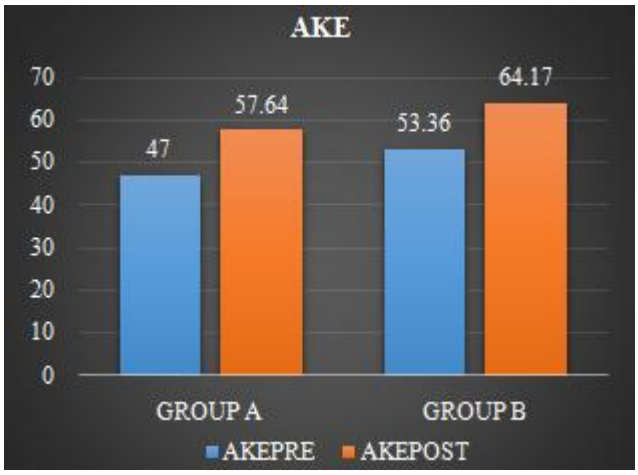
Variable	Group A	Group B	P Value
	Mean ± SD	Mean ± SD	
Age	21.66 ± 1.55	21.76 ± 2.43	.000
BMI	19.02 ± 3.13	20.38 ± 2.02	.000
PREASLR	53.8 ± 12.67	69.60 ± 16.70	.000
PREAKE	47 ± 9.14	57.64 ± 12.53	.000

Table 5.2: Within group Comparison of Pre - and Post ASLR and AKE in Group A and Group B

Outcome	Group	Mean ± SD		P Value
		Pre	Post	
ASLR	Group A	53.8±2.67	59.9±12.87	.000
	Group B	69.60±16.70	76.17±16.06	.000
AKE	Group A	47±9.14	53.36±8.54	.000
	Group B	57.64±12.53	64.17±11.85	.000



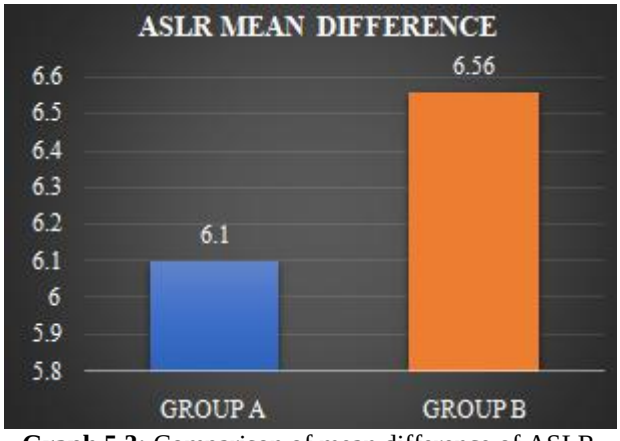
Graph 5.1: Within Group comparison of mean of Pre and Post ASLR in Group A and Group B



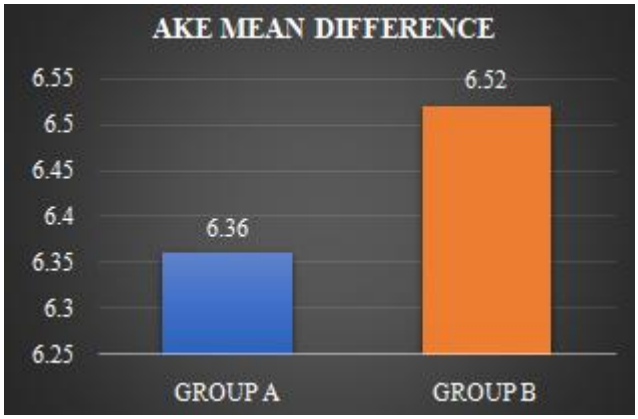
Graph 5.2: Within Group comparison of mean of Pre and Post AKE in Group A and Group B

Table 5.3: Between Group Comparison of Mean difference of ASLR and AKE Group A and Group B

Outcome	Group	Mean Diff± SD	P Value
ASLR	Group A	6.1±6.33	.000
	Group B	6.56±3.07	
AKE	Group A	6.36±4.18	.008
	Group B	6.52±2.65	



Graph 5.3: Comparison of mean difference of ASLR between Group A and Group B



Graph 5.4: Comparison of mean difference of AKE between Group A and Group B

3. Discussion

The purpose of the current study was to investigate the Immediate Effects of Muscle Energy Technique (MET) Versus Myofascial Release Techniques (MFR) on Hamstring Flexibility in Footballers. Result of present study indicates thatboth techniques are effective in improving hamstring flexibility.

METcoupled with Conventional exerciseswas performed. Some difference between Hamstringtightness, pre and post intervention was noted. This suggests that the immediate effect of MET was somewhat significant on Hamstring tightness. MET primarily targets soft tissues, also making some contribution to joint mobilization. It has been termed as active muscular relaxation technique. (Waseem, 2019) [37] The term mainly comes up because while the stretch given might be passive, there is active participation of the subject with the isometric contraction in the process of relaxation. Adkitte, R; et al. (2016) said that the contraction is done in a precisely controlled direction and with varying intensities giving benefits such as decreasing tightness, increasing strength and improving mobility. The study was done on national level football players for Hamstring tightness, MET proved to be very helpful.[38]

Muscle energy techniques are soft tissue therapy primarily working on active muscle relaxation. It directly facilitates and controls voluntary isometric contraction of the target muscles.[39]METs alter the connective tissues in both components [creep and plastic changes], which causes increased flexibility in the muscles. Changes in the biomechanical or neurophysiological aspects of the muscle would cause an increase in the length of the muscle.[40] Studies have shown that the immediate range of motion changes is possible due to increased tolerance to stretch, as there was no evidence of viscoelastic change.[41] Studies highlighted that METs produce an immediate effect but did not discuss their effectiveness for a longer duration.

MFR coupled with Conventional exercises was performed to improve hamstring flexibility. According to Salvi Shah and J. Miller, the pressure associated with MFR causes the golgi tendon organ to sense a change of tension in the muscles and responds to this high or prolonged tension by reflexively inducing relaxation of muscle spindles.[42]

The study is supported by Schleip R et al., that the fibroblasts are supposedly stimulated through an electric charge when pressure is applied to the tissue, which is generally termed as Piezoelectricity.[43] Piezoelectricity is the electric charge that accumulates in certain solid materials (such as crystals, certain ceramics, and biological matter such as DNA) in response to applied mechanical stress.[44, 45] The myoglobin is a fluid protein present in the muscle which is thick, or viscous in nature and under static conditions will flow over time when shaken, agitated, sheared or otherwise stressed.4[6] Thixotropic effect is another recurring effect that supposedly explains the process in which the connective tissue responds in a fluid - like manner.[47]

Thixotropic is a time - dependent shear thinning property which helps in increasing the range of motion after MFR.[48, 47] Another effect seen after MFR is because of responses in the autonomic nervous system where it reduces the levels of cortisol concentration which will helps in reduction of physical stress. The stimulation of the fascia and in turn the mechanoreceptors could also be responsible for triggering the autonomic nervous system to contract the fascia through smooth muscle cells.4[9] These contractions explain the relaxation effects of MFR and increases the blood flow and changes in the viscosity as a result it will reduce delayed onset of muscle soreness and increase the range of motion.[43]

Passive stretching has also produced improvement within the groups. Stretching has made the ability to improve muscle length. Reviews show significant changes in the activation of the Golgi tendon organ during stretching. Passive stretching creates tension on the muscle - tendon, which activates the Golgi tendon organ and produces autogenic inhibition of the muscles being stretched.[50]

4. Conclusion

The study Concludes that both the techniques used in the present study i. e., Muscle Energy Technique (MET) and Myofascial Release Techniques (MFR) Both the techniques are effective for the improving flexibility of hamstring Muscle in footballers.

5. Limitations

Sample size was small. Only Male were included. Duration of the study was short (immediate). Long term follow up of the patients was not done after completion of the intervention duration hence long term benefits of intervention are unknown. Therapist and assessor was not blinded to the study groups.

6. Future Recommendation

Future study should focus on other forms of exercise which improves Hamstring flexibility. Future study should focus on other forms of Outcome. Future study should focus on large sample size. Longer duration and long term follow - up should be made to find out the effect of the treatment. Similar type of study can be advised for the other muscle tightness.

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