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# EFFECTIVENESS OF MUSCLE ENERGY TECHNIQUES (METS) COMPARED TO PASSIVE STRETCHING IN IMPROVING HAMSTRING FLEXIBILITY IN PATIENTS OF NONSPECIFIC CHRONIC LOW BACK PAIN

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**Abstract:**

***Background***: *Hamstring tightness or decreased flexibility is a predisposing cause for the hamstring strain, lumbar spine disorders, and low back pain..*

***Objective***: *To determine whether muscle energy technique or static-passive stretch is the better treatment for increasing hamstring flexibility in patients suffering from nonspecific chronic low back pain.*

***Materials and methods***: *It were a quasi-experimental study which completed in 4 months from November 2016 to February 2017. A total of 60 subjects of chronic nonspecific low back pain who fulfilled inclusion criteria were selected from different hospital settings of Lahore through convenient sampling and allocated into Group A and Group B. After pre-testing through active knee extension test, subjects in Group A were given muscle energy technique along with conventional physiotherapy and subjects in Group B were given static passive stretching along with conventional physiotherapy treatment. Post-test measurements were taken after 4 weeks. The treatment of five sessions a week, for a total of four weeks, was given to both groups. Improvement in hamstring flexibility was measured through active knee extension test.*

***Results:*** *SPSS version 20 was used for analysis. Within groups analysis showed that mean popliteal angle of Group A in pretest measurements was 146.03±12.92 and in posttest measurements was 158.70±9.87 ($p<0.001$*) and mean popliteal angle of measurements in Group B for pretest readings was 147.30±10.75 and in posttest reading, was 155.67±11.55($p<0.001$*) showing significant improvement with both interventions.*

*Mean of difference of pretest-posttest popliteal angle measurement in Group A was 12.67±6.53 and in Group B was 8.37±3.85 ($P=0.003$) showing that there was statistically significant difference between improvement of both groups and interventions of Group A (METs) are better in improving hamstring flexibility as compared to interventions in group B (static passive stretch)*

***Conclusion***: *Muscle energy techniques and static passive stretching, both were effective in improving the hamstring flexibility but muscle energy techniques were found to have better effect as compared to static passive stretching in improving hamstring flexibility in patients with non-specific low back pain*

***Keywords:*** *Muscle energy techniques, passive static stretching, popliteal angle, hamstring flexibility, low back pain, active knee extension test*

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## INTRODUCTION:

The low back pain is the pain in the lower back area. (Lumbago). [1] The role of flexibility of muscles determines the ability of an individual to perform safe and optimal physical activity. [2] Hamstrings are one the muscles groups in our body, which have a higher tendency of shortening. Tight hamstrings may cause increased biomechanical stresses on lumbopelvic area as well on patellofemoral compressive forces. That could be the reason of increased incidence of hamstring tightness in patients with low back pain. [3] Osteopaths developed a manual technique named as Muscle energy technique (MET) which is used by many professions which are relevant to manual therapy. Bountiful objectives of this technique which are claimed to be efficacious are such as lengthening of contracted or shortened muscle, strengthening of weakened muscles, increasing the joint range of motion (ROM) and to aid the blood or fluid drainage acting as a lymphatic or venous pump. [4] There is limited research data that is supporting and authenticating the use of Muscle energy techniques and lacking the evidence justifying the theories illustrating the effects of MET's, although these are extensively used by osteopaths and other manual therapists as well. Elongation of muscle to its endurance and continuing the situation for a period of time is known as static stretching. [5] There is little or no research data exploring the time required for a sustained stretch. According to Behm et al [6] thirty seconds once per day is maximum time required for a stretch to hold. Slow stretching techniques manifested having beneficial effects such as firstly it will not evoke a powerful reflex contraction, secondly it restricts the tissue absorbing huge amounts of energy per unit time, thirdly this technique pacifies muscle cramps. According to Fasen JM et al [7] , static stretching supposed to be the protected and most successive method of stretching along with the minimal risk of injury. Elongation of muscle to its endurance and continuing the situation for a period of time is known as static stretching [5]Static stretch is a technique in which the muscle is slowly elongated in a position of tolerance and then held. This method requires less energy to execute and lessen the soreness. There is little or no research data exploring the time required for a sustained stretch. According to Behm et al [6] thirty seconds once per day is maximum time required for a stretch to hold. Slow stretching techniques manifested having beneficial effects such as firstly it will not evoke a powerful reflex contraction, secondly it restricts the tissue absorbing huge amounts of energy per unit time, thirdly this technique pacifies muscle cramps. Noelle M. Selkow conducted a pilot study gauge the effects of MET on pain. The effect was short term. It was performed in people who experienced non-specific lumbo pelvic pain. This study was a randomly control trial. This study involved the application of the tests on randomly chosen twenty participants with self-explained lumbopelvic pain. They categorization was into two groups (MET or control). The results witnessed that the subjects enrooted to MET registered a reduction in visual analogue scale (VAS) most severe pain in the past day. Therefore, concluding that MET observed to be more effective to decrease lumbopelvic pain over a day. [8] The whole strategy was enrooted under the supervision of physical therapists by the pain management program. Muscle extensibility and tolerance to muscle stretch were the two primary outcomes which were observed by hip flexion angles measured passively with standardized and non-standardized torques. Initially, measurements were taken before day 1 of stretching, and lastly, measurements were recorded one or two days after the last day of stretching. An assessor recorded the testing for this purpose was blinded. Results of the study revealed that in subjects with chronic MS pain, 3 weeks of stretch altered the tolerance discomfort but not the muscle flexibility. [9] The study Shahid et el concluded that chronic pain can be managed with use of Spinal stabilization exercises are effective for management of chronic Low back pain. There was significant improvement in functional index and reduction in pain with use of the spinal stabilization combination with Latissimus dorsi stretch. [10]

Regarding its risk factors different body mechanics like non-structural scoliosi,Leg length discrepancy and postural imbalances can effect it . [11]
The objective of this study is to determine whether muscle energy technique or static-passive stretch is the better treatment option for increasing hamstring flexibility in patients with nonspecific chronic low back pain

## MATERIALS AND METHODS:

It was a Qusai experimental study. 60 patients of non-specific chronic back pain with hamstring tightness were equally divided in two groups. Non-probability convenience sampling technique was used. The study completed in 4 months from November 2016 to February 2017. It was conducted in Rasheed Hospital, Defense, Lahore,Ch. Muhammad Akram hospital, Raiwind Road, Lahore and Mid City Hospital, Jail Road, Lahore. A total of 60 subjects of chronic nonspecific low back pain who fulfilled inclusion criteria were allocated into Group A and Group B. All the patients in both the groups were pre-tested for hamstring flexibility. A non-probability convenient sampling technique was used and subjects were allocated to Group A and Group B. After pre-testing through active knee extension test, subjects in Group A were given muscle energy technique and conventional physiotherapy and Group B were given static passive stretching along with conventional treatment. Post-test measurements were taken after 4 weeks. The treatment of five sessions a week, for a total of four weeks, was given to both groups. Improvement in hamstring flexibility was measured through active knee extension test. Patients with non-specific chronic LBP with hamstrings tightness in Age between 20 to 60 years, having CLBP (more than 3 months) of mild-moderate intensity were included. While Constant or persistent severe pain, inflammatory conditions (rheumatoid arthritis, ankylosing spondylitis), Spinal infections(neuralgia, discitis, osteomyelitis, epidural abscess), Recent hamstrings injury and strains and Knee deformities and injuries were excluded .Group A(MET group)The subjects in the group were given muscle energy technique for hamstrings along with conventional physiotherapy treatment of low back pain. With patient in supine lying and knee fully extended, the therapist flexed the hip to the point where the subjects reported discomfort. Moderate level isometric contraction of the hamstring muscle was then elicited (approximately 75% of maximal) for a period of five second. After a period of three seconds of relaxation, the technique was repeated three times. [12] Group B (Passive stretch) was given passive static stretch of hamstring along with conventional physiotherapy. Patient in supine lying with knee fully extended. Therapist supported the patient's lower leg with arm or shoulder and other leg was stabilized with the belt strapped along anterior side of thigh. With the knee at 0 degree extension, and the hip in neutral Rotation, the patient's hip was be flexed by therapist until patient felt gentle stretch at the posterior aspect of thigh. Six repetitions with 10 second of stretch duration were given in each session [13,14] Assessment of hamstring tightness was done by the Active knee extension test. The inter-rater reliability of AKA test is 0.87 [15[ The range of motion at hip and knee was measured by using landmarks of lateral condyle of the femur, greater trochanter, and the lateral malleolus. The goniometer was placed over the lateral condyle of the femur with the proximal arm placed along the femur toward greater trochanter which was used as reference point. The distal arm of goniometer was aligned along lower leg toward lateral malleolus. Three measurements were performed on each extremity and an average of the three will be used as the final reading for knee range of motion .[ 16] The study started after approval from "Ethical Committee of Riphah College of Rehabilitation Sciences, Lahore" and data was collected after permission from hospital settings. A written informed consent was taken from all the patients. The personal information of participants was kept confidential. Participants were given right to withdraw from study anytime without giving reason

**RESULTS:**

**Table-1 Socio-demographic Profile**

| Socio-demographic Profile of participants | | | | |
|---|---|---|---|---|
| | | **Group A (Muscle Energy Technique) n=30** | **Group B (Static Passive Stretching) n=30** | **p-Value** |
| **Age (Years)** | | 46.10±14.03 | 50.06±15.64 | 0.31 |
| **Weight (Kg)** | | 68.93±10.35 | 66.77±6.67 | 0.342 |
| **Gender** | **Male** | 13 | 19 | 0.194 |
| | **Female** | 17 | 11 | |
| values are Mean ± SD of popliteal angle in degrees | | | | |

Socio-demographic characteristics of observations are summarized in **Table-1**. Total 60 subjects were included in the study who were divided equally into two different groups i.e. Group A and Group B. Out of 30 patients in group A 13 (43%) were male and 17 (57%) were females whereas in group B 19 (63%) subjects were male and 11 (27%) were females. Mean age subjects in group A was 46.10±14.03 and in group B was 50.06±15.64 (P=0.310).Subjects in both groups were also comparable in terms of weight as mean weight of subjects in groups A was 68.93±10.35 and mean weight of subjects in group B was 66.77±6.67 (P= 0.342).

**Table-2 Within Group comparison**

| Within Group comparison | | | |
|---|---|---|---|
| **Groups** | **Pretest^** | **Posttest^** | **P-Value** |
| **Group A(METs)** | 146.03±12.92 | 158.70±9.87 | <0.001* |
| **Group B(Static stretch)** | 147.30±10.75 | 155.67±11.55 | <0.001* |
| ^ values are Mean±SD of popliteal angle in degrees | | | |
| [p] *P*-valve is calculated through Wilcoxon signed rank test (Non-Probability) | | | |
| * *p*- valve significant at ≤0.05 | | | |

Comparison of pretest and posttest observations within groups is summarized in table 2.Mean popliteal angle of group A in pretest measurements was 146.03±12.92 and in posttest measurements was 158.70±9.87 (<0.001*) showing significant improvement with the intervention of group A (METs). Mean popliteal angle of measurements in group B for pretest, readings was 147.30±10.75 and in posttest reading was 155.67±11.55 (0.001*) showing significant improvement with the interventions of group B (static passive stretching)

**Table-3 Between Group Comparisons**

| Table-3 Between Group Comparison | | | |
|---|---|---|---|
| **Improvement in ROM** | **Group A** | **GroupB** | **P-Value [p]** |
| **Mean difference of (pretest-posttest reading)** | 12.67±6.53 | 8.37±3.85 | 0.003* |
| [p] *P*-valve is calculated through Man Whitney U test (Non probability) | | | |
| * *p*- valve significant at ≤0.05 | | | |

Comparison of improvement between groups is summarized in table 3. Mean of difference of pretest-posttest popliteal angle measurement in Group A was 12.67±6.53 and in Group B was 8.37±3.85 (P=0.003) showing that there was statistically significant difference in improvement of both groups and interventions of Group A (METs) are better in improving hamstring flexibility as compared to interventions in group B (static passive stretch)

## DISCUSSION:

The objective of this study was to compare two different stretching techniques to determine which of these is more effective in improving hamstring flexibility. The 2 types of treatment studied were muscle energy techniques and passive static stretching. The results of this study demonstrate that muscle energy techniques are more effective than the passive static stretch. The mechanism of increasing muscle flexibility involves both neurophysiological (stretch tolerance) and mechanical factors (viscoelastic and plastic changes) [7] . The 3 weeks of regular stretching are required to change physiological properties of muscles and cause permanent lengthening [14] In this study, a total of 4 weeks stretching were given to both groups to meet this physiological phenomenon. Several studies with the objective of determining the best treatment to increase hamstring flexibility have been conducted. The results of METs application in this study are in agreement with the previous studies Most of the researches that involve the METs focus on the application of single treatment but in this study, posttest reading was taken after for weeks to get more reliable results. Moreover, the effectiveness of muscle energy techniques may be due to the inhibitory effect of Golgi tendon reflex, which is believed to be activated in isometric contraction of the muscle[.17-18 ] There has been very limited research on the comparison of static stretch and METs, although previous researchers have found the effectiveness of both on an individual basis. The episodes of passive stretch were also found to cause discomfort in patients, this could be the cause of less improvement in muscle extensibility with passive stretching than MET in this study [19] The results of this study may be useful for health professionals in their clinical practices in determining the best treatment modality for tight hamstrings

## CONCLUSION:

Muscle energy techniques and static passive stretching, both were effective in improving the hamstring flexibility but muscle energy techniques were found to have better effect as compared to static passive stretching in improving hamstring flexibility in patients of non-specific low back pain.

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