RESEARCH ARTICLE

Comparison of hold-relax stretching and muscle energy technique on tight hamstring muscle in young adult females

Abstract

Background: Muscular flexibility is vital for typical human working. Tightness in the hamstring muscles can lead to various injuries and postural disturbance. The prevalence of hamstring muscle tightness is very high in females reflecting many factors related to office workload, domestic workload, and biological differences. This study aims to compare the immediate effects of Hold-Relax (HR) stretching and Muscle Energy Technique (MET) in improving flexibility of hamstrings in healthy young adult females and to compare which technique is better for immediate relaxation and increasing flexibility of tight hamstrings.

Objectives: To determine the effectiveness of hold-relax stretching and muscle energy technique for improving hamstring flexibility.

Material and Methods: This study recruited 26 subjects by using a purposive sampling technique. Participants were randomly divided into two equal groups. Age of group A (22.46 ± 0.88) year and group B (22.00 ± 0.91) year. Subjects in group A were given Hold Relax Stretching (HRS) and Group B underwent the Muscle Energy Technique (MET). Both groups received only one session of stretching. In hold-relax stretching group the muscle was stretched passively by researcher and held this position is held for 7 to 10 seconds. The subject then performed isometric contractions for 3 seconds, following a relaxation period of 10 seconds, then passive stretch was applied until a mild stretch sensation was reported. This stretch was held for 7seconds with three repetitions. The muscle energy technique group performed isometric contractions for 7 to 10 seconds with a relaxation period of 10 seconds with 3 repetitions. Pre and post-test reading was taken using a goniometer in the active knee extension test and straight leg raise for both groups before and after the stretch and was noted in the range of motion table. Comparison of all variables was calculated through SPSS.

Results: Pretreatment straight leg raise was 49.92 ± 6.61 it increased to 68.15 ± 7.79 after hold-relax stretching and Pretreatment straight leg raise was 55.00 ± 3.89 it increases to 79.92 ± 9.56 after muscle energy technique. Active knee extension (AKE) was 130.46 ± 6.49 after HRS it increases to 140.77 ± 6.73. and Active Knee Extension (AKE) was 131.92 ± 8.68 after MET it increases to 151.77 ± 11.7. However, within the group comparison did not show a significant difference in AKE and SLR in the MET group. The difference was statistically significant (p-value <0.001).

Conclusion: Within the group, the muscle energy technique showed more improvement and comparing the two groups, both techniques are effective in improving the hamstring muscle flexibility.

Keywords: Hamstring flexibility, muscle energy technique, straight leg raise, hold-relax stretching, active knee extension

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Introduction

Flexibility is the ability of a muscle to lengthen and allow the related joint to move through its Range Of Motion (ROM). Muscle flexibility is critical for human function. It is considered to be an integral component in the prevention and rehabilitation of injuries, as well as a method of improving a person's performance in daily activities. Tight muscles compress the blood vessels leading to a reduction of maximal performance. and affects the Length-tension

relationship of muscle, as well as the shock-absorbing ability of the limb [1-4].

The hamstrings are the muscles in the back of the thigh that control knee flexion and thigh extension. c. It also causes stabilization of the knee and hip joints. Hamstring tightness is when the hip is flexed and the person is unable to extend the knee completely and also complains of discomfort and pain in the posterior compartment of the thigh. Hamstring tightness is a commonly occurring problem because of multi-joint activity, their tonic postural nature, and the significant amount of stretching forces to which they are continually prone. Hamstring tightness can cause the hips and pelvis to rotate back thus decreasing the normal lordotic curve causing back, knee, or foot pain [5-7].

Poor flexibility of the hamstring is also linked to lower back and lower extremity injuries. It is a contributing factor for reduced range of motion and can also lead to other musculoskeletal diseases in the common population as well as sportsmen. Lack of flexibility is considered an intrinsic risk factor for the development of a muscle injury and has been suggested as a predisposing factor for hamstring strains. Decreased flexibility of hamstring creates a vicious cycle of a decrease in range of motion and an increase in postural problems, a compensatory mechanism for controlling undue lumbar lordosis known as "pelvic cross syndrome". leading to back pain [8-11].

The prevalence of hamstring tightness is very high in young females. Limitation of knee extension due to shortness or tightness of hamstring muscles is fairly common in the female population. Hamstring tightness also increases the likelihood of knee flexion contracture. Knee flexion contracture can impede a person's ability to perform weight-bearing exercises and may help in the development of osteoporosis in females. Hamstring tightness is usually proposed as an underlying risk factor for the development of muscle injury frequently seen in females, characterized by pain, stiffness, cramping, and discomfort leading to the hamstring injury (musculotendinous injuries) [12-14].

Hamstring injury is responsible for 37% of muscle injuries in professional women sports players. A higher incidence of Work-Related Musculoskeletal Disorders (WMSD) in working women has been reported and most of them have been linked to tight muscles, especially, hamstring muscles. The study showed that women are two to five times more likely than men to report musculoskeletal problems and their higher prevalence among women reflects the accumulation of many factors related to office workload, domestic workload, and biological differences [15-17].

Maintaining the flexibility of the hamstring is of remarkable significance for physiotherapists and to obtain this aim there is a need to recognize maximally feasible, compelling, and proficient methods to counter the hamstring tightness and achieve flexibility of the hamstring muscle.

Worldwide, various techniques have been found to increase hamstring such as soft tissue mobilization technique, stretch and spray technique, stretching and its different types (static, ballistic, and dynamic) pnf stretching and muscle energy technique [18-24].

In addition, there were some studies in which the two methods of stretching have been compared to improve hamstring flexibility Some studies have shown advantages in using PNF or muscle energy technique Also, in Pakistani studies remarkable increase has been seen in the hamstring flexibility in both techniques when muscle energy techniques are included in comparison to static stretch and dynamic stretch , no significant difference in the immediate effect of both techniques was seen. In various studies, the hold-relax technique is also compared to different studies like stretching contract-relax [25-34].

A systemic review of the literature to study the effect of hamstring stretching on range of motion concluded that it is difficult to identify the most effective method of increasing hamstring flexibility. However, the increase was much greater for their hold-relax proprioceptive neuromuscular facilitation group as compared with the foam roller.

Till recently, no studies have compared hold-relax stretching and muscle energy technique concerning the improvement of hamstring flexibility. Therefore, the present study aims to compare the effectiveness of hold-relax stretching and muscle energy technique by measuring popliteal angle in Active Knee Extension (AKE) and Straight Leg Raise (SLR) in improving hamstring muscle flexibility in young adult females.

Method

The study population was recruited from students at Shalamar School of Allied Health Sciences based on inclusion and exclusion criteria. Written consent was taken and the study procedure was

explained after the recruitment. After signing the consent by the subject, basic demographics were documented. Patients were allocated to one of the two groups by purposive sampling, and the range of motion was tested using a goniometer in the SLR position and AKE test, and values were written in the pre-test ROM table. E

Range of motion was measured by goniometer in Straight Leg Raise (SLR) and AKE test. Reading was recorded in the pre-treatment ROM table.

PNF-Hold Relax stretching wasa applied to Group A (The hamstring muscle was stretched until the subject reported a mild stretch; this position was held for 7 to 10 seconds. The subject then isometrically contract the hamstring muscle for 3 seconds by attempting to push his leg down towards the table against the resistance of the researcher. Following this, the subject was asked to relax for 5 sec. The researcher then applied passive stretch to the muscle until a mild stretch sensation was reported. This stretch was held for 7 seconds. This sequence was repeated three times with each sequence separated from each other by a 20 second interval.

A Muscle Energy Technique (MET) was applied to group B using the reciprocal inhibition mechanism. The RI-MET group performed a 7 to 10 second (30%-50% isometric contraction of the muscle opposing the muscle to be stretched) followed by a 5 second rest interval, and then a stretch of 10 to 60 seconds. This sequence was repeated three times, with an interval of 20 seconds between each.

Then, in the SLR and AKE tests, ROM was measured with a goniometer and the readings were recorded in the post-treatment ROM reading table.

Results

In this study, a total of 26 females, medical students were recruited for this study from ages 18 to 26 years were randomly divided into two equal groups. One group (A) was treated with Hold Relax Stretching (HRS) and group (B) underwent Muscle Energy Technique (MET) **TABLE 1** shows Demographic variables with Mean ± SD of continuous variable i.e average mean ± standard deviation of group A was 22.46 ± 0.88 and an average mean ± standard deviation of group B was 22.00 ± 0. 91years.Average Height of group A was 1.55 ± 0.06 and group B was 1.57 ± 0.08m. There is no difference between Height of both groups (p-value 0.468). Average Weight of group A was 22.52 ± 1.34 and group B was 22.00 ± 1.51 kg/m2. There is no difference between Weight of both groups (p-value 0.867). Average BMI of group A was 22.52 ± 1.34 and group B was 22.00 ± 1.51 kg/m2. There is no difference between BMI of both groups (p-value 0.455).

■ Between-group

The comparison **TABLE 2** showed that Pretreatment straight leg raise was 49.92 ± 6.61 it increased to 68.15 ± 7.79 after HRS. The difference was statistically significant (p-value <0.001). Similarly, at base line the Active knee extension (AKE) was 130.46 ± 6.49 after HRS it increases to 140.77 ± 6.73. The difference was statistically significant (p-value <0.001). Pretreatment straight leg raise was 55.00 ± 3.89 it increases to 79.92 ± 9.56 after MET. The difference was statistically significant (p-value <0.001). Similarly, at base line the Active knee extension (AKE) was 131.92 ± 8.68 after HRS it increases to 151.77 ± 11.71. The difference was statistically significant (p-value <0.001).

■ Within group comparison

Among hold-relax stretching group, Pretreatment straight leg raise was 49.92 ± 6.61 in HRS and post treatment straight leg raise was 68.15 ± 7.79 in HRS. The difference between pre and post SLR was statistically significant (p-value <0.001). Similarly, among hold-relax stretching group, the Active knee extension (AKE) was

TABLE 1. Demographic variables

	Hold Relax stretching	Muscle energy Technique	p-value
Age (Year)	22.46 ± 0.88	22.00 ± 0.91	0.201
Height (m)	1.55 ± 0.06	1.57 ± 0.08	0.468
Weight (kg)	54.38 ± 4.73	54.69 ± 4.51	0.867
BMI (kg/m2)	22.52 ± 1.34	22.00 ± 1.51	0.455

TABLE 2: Between group comparison

	Hold Relax stretching	Muscle energy Technique	p-value
Pretest Straight Leg Raise (SLR)	49.92 ± 6.61	55.00 ± 3.89	0.025
Posttest SLR	68.15 ± 7.79	79.92 ± 9.56	0.002
Pretest Active Knee Extension (AKE)	130.46 ± 6.49	131.92 ± 8.68	0.631
Posttest AKE	140.77 ± 6.73	151.77 ± 11.71	0.007

TABLE 3. Within group comparison

Paired Samples Test			
		Treatment	Sig. (2-tailed)
Hold Relax	Pair 1	Straight Leg Raise Pre Treatment - Straight Leg Raise Post Treatment	.000
	Pair 2	Active Knee Extension Pre Treatment - Active Knee Extension Post Treatment	.000
Muscle Energy Technique	Pair 1	Straight Leg Raise Pre Treatment - Straight Leg Raise Post Treatment	.000
	Pair 2	Active Knee Extension Pre Treatment - Active Knee Extension Post Treatment	.000

130.46 ± 6.49 and the post treatment Active knee extension (AKE) was 140.77 ± 6.73. The difference between pre and post AKE among hold-relax group was statistically significant (p-value <0.001). Among muscle energy technique group, Pretreatment straight leg raise was 55.00 ± 3.89 and post treatment straight leg raise was 76.48 ± 9.76. The difference between pre and post SLR in MET group was statistically significant (p-value <0.001). Similarly, Pre-treatment Active knee extension (AKE) among MET was 131.92 ± 8.68, and Post Treatment Active knee extension (AKE) was 151.77 ± 11.71 for MET. The difference between pre and post AKE was statistically significant (p-value <0.001) **TABLE 3**.

Discussion

Although numerous stretching techniques are being used to decrease muscle shortening, the possibility of muscle injury, as well as different soft tissue relaxation techniques are being used that result in enhanced flexibility, there is still confusion over the most effective and time-saving method. To date our knowledge, it is the first study which compares hold-relax stretching and muscle energy technique for improving hamstring flexibility in young adults among Allied Health Science students

This study recruited 50 participants between the age of 18 to 25 years. After obtaining consent from participants who meet the inclusion criteria, subjects were divided into two groups Group A and Group B, to be treated with hold-relax stretching and muscle energy technique after measuring range of motion with goniometer in straight leg raise and Active Knee Extension (AKE) test. To measure the effects of both treatment methods, treatment was provided 3 times with each sequence separated from each other by a 20 second interval to reduce fatigue.

This study was designed to determine the immediate effects of MET in comparison with hold-relax stretching for improving hamstring flexibility of tight hamstring muscle.

The main findings of this study can be summarized as follows. The findings of this study showed that both muscle energy Technique and static stretching improve the hamstring flexibility within the group but the muscle energy technique was more effective in improving hamstring flexibility than hold-relax stretching when both groups were compared. Good reliability has been found for the active knee extension test in the results of one of the previous studies on healthy individuals. However, Literature also supports the use of the Straight Leg Rais for the assessment of hamstring flexibility because of its high reliability as well as its easy method of application.

The present study data analysis and results demonstrated that hamstring flexibility improved more by muscle energy technique, as muscle energy technique showed significant differences. Other studies which compared muscle energy technique to hold-relax stretching showed that hamstring flexibility improves more efficiently by hold-relax stretching. A study was conducted to see the effect of muscle energy technique on the flexibility of hamstring muscle in futsal players which showed that MET can increase the hamstring flexibility among futsal players, and thus will be able to reduce the injury rate.

However, just like many previous studies, the results of another study illustrated that hold-relax stretching led to instant flexibility gains [20]. Other previous studies that have reported similar results agree with the findings of our study.

In another study Muscle Energy Technique was found to be more effective in improving hamstring flexibility according to the findings reported that muscle energy techniques of two different types had similar benefits in improving flexibility and the primary difference in both techniques was that their post-contraction stretch phase was not equal in duration.

However just like many previous studies, results of another study illustrated that hold-relax stretching led to instant flexibility gains.

It is concluded that hamstring flexibility improves by both techniques i.e. Muscle Energy Technique and Hold-Relax Stretching. However, when comparison is made between these two stretching techniques, significant statistical

difference was noticed in Muscle Energy Technique. Improvement in hamstring flexibility was greater in subjects in which Muscle Energy Technique was applied.

Conclusion

Statistical analysis for group A and B showed that there was significant effect after applying MET than hold-relax stretching. Hence, Muscle energy technique is much effective than hold-relax stretching in improving hamstring flexibility.

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