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Comparison of post isometric relaxation and static stretch combined with stabilizing exercises on hamstring flexibility in young adults

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Abstract
Background: Inability to extend knee completely when hip is flexed along with pain over posterior thigh is hamstring muscle tightness.
Aim: To compare the effects of post isometric relaxation and static stretch combined with stabilizing exercises on hamstring f*l*exibility in young adults.
Methodology: 30 subjects were included in the study. They were divided into 2 groups. Each group contained 15 Subjects with hamstring tightness with age group of 18-25 years. Group A was given post isometric relaxation and Group B was given static stretch with stabilizing exercises. Each group undergone a 6week exercise program including one physiotherapy session per week and 6 sessions of daily home exercises per week.
Result: Static stretch with stabilizing exercises shows significant difference ($p<0.0005$) in finger to floor test and popliteal angle test when compared to Group A.
Conclusion: Both the techniques are effective but when compared between the two static stretch proved to be more effective.

Keywords: hamstring tightness, post isometric relaxation**,** stabilizing exercises

Introduction

Hamstring play a crucial role in many daily activities such as walking, running, jumping, and controlling some movement in trunk. In walking they are most important as an antagonist to the quadriceps in the deceleration of knee extension [1].

Flexibility has been defined as the ability of muscle to lengthen and allow one joint to move through a range of motion [2]. Hamstring tightness refers to the inability to flex the hip and extend the knee completely. Tight hamstring can lead to injury and having hamstring injury can be frustrating because pain is often persistent, healing can be slow, and the incidence of reinjury is high. Therefore, various stretching techniques to increase hamstring flexibility are used in clinical practice [1].

Post-isometric relaxation, a muscle energy technique which refers to reduced muscle tonus experienced in a brief period following its isometric contraction. Post isometric relaxation (PIR) is considered to be an effective method of increasing hamstring flexibility [3]. Another technique is static stretching (SS), which focuses on maintaining the end-range position of the joint with simultaneous slight stretch in the trained muscles.It is recommended that static stretching should be supplemented with the activation of a muscle responsible for stabilizing the musculoskeletal system (e.g. gluteus maximus) [3].

The aim of this technique is to inhibit hyperactive muscles by using nervous system reaction to elongate the muscles and to activate inhibited stabilizing muscles [3]. Hence the aim of this study is to compare the effects of post isometric relaxation and static stretch combined with stabilizing exercises on hamstring flexibility.

Methodology

It was a comparative study conducted on 30 students with bilateral hamstring tightness between the age group 18-25 residing in Nashik. Convenient sampling with random allocation method was used in the study.

Inclusion criteria

Age -18 – 25 years[(4)],No pain, injury or other musculoskeletal disorder throughout the previous year [3], Limited bilateral hamstring length [6], Finger to floor test measuring more than 10 cm [10], Popliteal angle measuring less than 60 degrees [9]

Exclusion Criteria

Hyper mobility [9], History of hamstring tear [5], previous history of lower extremity pathology [11], History of orthopaedic or cardiovascular disorder in last 2 years [8]

Procedure

Subjects were assessed for eligibility based on the inclusion and exclusion criteria and the procedure was explained to them. Informed consent was taken from the subjects. Eligible subjects were randomly assigned in two groups. Group A was given post isometric relaxation technique Group B was given static stretch with stabilizing exercises. Each group undergone a 6 week exercise program including one physiotherapy session per week and 6 sessions of daily home exercises per week.

Group A (Post Isometric relaxation)
In post isometric relaxation, kneeling on one knee was the starting position. The subject was asked to perform anterior pelvic tilt with simultaneous trunk forward shift, without the loss of the neutral position of sagittal spinal curvature, to the moment when a stretch in hamstring was felt. During the contraction phase, the subject was asked to slightly press the heel to the floor. This phase was lasted for 10 secs and was followed by the relaxation phase with a gradual increase in range of hip flexion. There were 5 sets of exercise with 10 secs relaxation phase.

Group B (Static stretch with stabilizing exercises)
In static stretch, long sitting was the starting position. In the first phase, subjects were asked to keep the pelvis and the spine in a free kyphotic position, the knees extended, the feet relaxed. Then the subject was asked to bend the pelvis forward so as to feel the stretch in hamstring muscle. This postion was held for 30 secs and was followed by a 30 secs break. This exercise was repeated for four times.

Stabilizing Exercises
In stabilizing exercises, two exercises were performed. The first one was done to activate gluteus maximus muscle in which the subjects were asked to be in a supine position with hips and knees bent and feet supported on ground. The subjects were then asked to raise the pelvis to the level determined by the line joining knees and shoulder. This position with isometric activation was kept for 10secs and was followed by a 10 secs break. This exercises was repeated for 10 times.
The second exercise was performed in standing and handswere kept on the pelvis. The subject was asked to do the posterior tilt of the pelvis at the same time activating the gluteus maximus. This exercise was repeated for 10 times 10 secs hold + 10 secs relaxation x 10 sets.

Result& Discussion
Mean value of post isometric relaxation and static stretch combined with stabilizing exercises on finger to floor are 4.53 and 6.63 respectively, the P-value is <0.0001, which is extremely statistically significant.
Mean valuepost isometric relaxation and static stretch combined with stabilizing exercises on popliteal angle for right is 8.06 and 14.06 and for left is 7 and 13.8, the P-value is <0.0001, which is extremely statistically significant.

Table 1: Comparison of mean difference for finger to floor test between group A and B

t-test	Group A	Group B
Mean	4.53	6.63
SD	1.54	1.17
P value	0.0002(Significant)	
T value	4.201	

Table 2: Comparison of mean difference for right side popliteal angle test between group A and B

t-test	Group A	Group B
Mean	8.06	14.06
SD	2.21	1.98
P value	0.0001 ((Significant)	
T value	7.81	

Table 3 : Comparison of mean difference for left side popliteal angle test between group A and B

t-test	Group A	Group B
Mean	7.00	13.8
SD	2.07	1.89
P value	0.0001((Significant)	
T value	9.37	

Discussion
The study aimed to find out effect of post isometric relaxation and static stretch combined with stabilizing exercises on hamstring flexibility in young adults.
In this study 30 young adults were randomly allocated to any one of the two treatment groups such that were 15 subjects in each group. Group A received post isometric relaxation and group B received static stretch with stabilizing exercises.
Outcome measures were assessed using popliteal angle test and finger to floor test for measuring hamstring tightness on day 1 pre-treatment and after 6 weeks post treatment.
As the p value is less than 0.0001 in group A, the result is extremely statistically significant i.e. PIR is effective in increasing popliteal angle and reducing finger to floor test.
Surojit Biswas *et al* in his study explained that in PIR a strong muscle contraction against equal counterforce triggers the GTO. The afferent nerve impulse from GTO enters the dorsal root of spinal cord and meets with an inhibitory motor neurons. This ceases the discharge from the efferent motor neuron impulse and thus prevents further muscle contraction, decreasesthe muscle tone, which in turn leads to relaxation and lengthening of agonist [4].
As the p value is less than 0.0001 in group B, the result is extremely statistically significant i.e. SS with SE is effective in increasing popliteal angle and reducing finger to floor test.
J. Brent feland *et al*. in his study explained that static stretching exercises focuses on one particular muscle or one group muscle only. When a muscle is stretched a muscle spindle will elongate. Static stretching fires the GTO and inhibits the tension in the muscle, allowing the parallel elastic component of the muscle to lengthen. The aim of stretching is to inhibit the reflex activity, which reduces resistance and thereby improve joint ROM [4].
Muragod *et al*, in his study stated that the effect of static stretching primarily focuses on tension of the muscle and improve the flexibility of the muscle thus improving the range of motion of that particular joint. Thus the static stretch helps in systemic elongation of the muscle and improve flexibility. Static stretch slowly lengthen the muscle when it held for 15-30 sec [12].
Siddiqui M. Aijaz *et al*, in his study stated that the static stretching may be effective in increasing the length of the muscle due to the prolonged stretching, which may allow the muscle spindle to adapt over time and stops firing. The result of this adaptation of muscle spindle increase in length in muscle [13].
Volkert c. de Weijer *et al* stated that A significant increase in hamstring length can be maintained for up to 24 hours when using static stretching. Muscle lengthens immediately after stretching and decline within 15 minutes. The addition of a warm-up exercise prior to stretching does not appear to significantly increase the effectiveness of static hamstring stretching [7].

Frank *et al* stated that that hamstring muscles and gluteus maximus are synergists for hip extension. If gluteus maximus is weak, the hamstring often acts as a primary hip extensors to compensate for GM weakness [14].

Conclusion

When compared between the two techniques, static stretch with stabilizing exercises proved to be more effective than post isometric relaxation in increasing popliteal angle and reducing finger to floor distance.

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