ORIGINAL ARTICLE

EFFECTS OF STATIC STRETCH VERSUS HOLD RELAX IN IMPROVING FLEXIBILITY OF TIGHT HAMSTRINGS

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ABSTRACT

Introduction: Hamstrings are a group of muscles which acts on two joint systems, performing multiple functions, thus prone to various injuries. Muscle tightness can be caused by active or passive mechanisms. Active mechanism involves shortening by spasm or contraction while passive mechanism involves postural adaptation or scarring for muscular shortening. Nevertheless, hamstring muscles usually become tight regardless of active or sedentary lifestyle. It is proved that hamstring tightness is the main leading factor to the risk of disorders of the knee and spine. This study was designed to find out immediate effect of Hold Relax versus Static Stretch on hamstrings tightness.

Material & Methods: Seventy subjects were included (age 18-30) without excessive hamstring muscle flexibility and were randomly assigned to the one of two stretch groups. Group A was treated with static stretching and Group B was treated with hold relax technique. The left leg was treated as a control and did not receive any intervention. The Right leg was measured for Range of motion pre and post stretch intervention. Data was analysed with paired sample t-test and independent sample t-test to see the effectiveness of hold relax and static stretch in hamstring tightness. Self-made questionnaire was used and asymptomatic participants having tight hamstrings were included in the study after their consent form was signed. Only those subjects who fulfilled inclusion criteria were included in the study.

Results: Paired sample t-test for both case and control group showed that there was significant improvement in the hamstring flexibility as the p value for both groups were less than 0.05 (p value 0.00). So, both HR and SS improves SLR. Independent sample t-test showed that there was no significant difference between the two groups as p value was greater than 0.05 (p value 0.011). So, both of these treatment techniques have same effect in the improvement of hamstring tightness with mean difference -3.543 and standard error 1.360.

Conclusion: The results of this study concluded that both Hold Relax and static stretch techniques are equally effective in the release of hamstrings tightness.

Key Words: exercise, hamstrings, hold relax, static stretch, tightness

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INTRODUCTION

Hamstrings are a group of muscles which acts on two joint systems, performing multiple functions and are thus prone to various injuries. Normal Hip flexion range (measured by placing the person in supine lying position and asking him to lift leg off the floor with knee in extension) allowed by the hamstrings is 80-90 degrees. Less than 80 degrees of hip flexion range are considered 'tight'.[1]

Muscle tightness can be caused by active or passive mechanisms. Active mechanism involves shortening by spasm or contraction while passive mechanism involves postural adaptation or scarring for muscular shortening. Nevertheless, hamstring muscles usually become tight regardless of active or sedentary lifestyle. It is proved that hamstring tightness is the main leading factor to the risk of disorders of the knee and spine. Tight hamstrings can cause posterior pelvic tilt and flattening of lower back as a result of which back problems occur.[1] Flexibility is an important factor for physical fitness of muscles for which stretching is required. Flexibility is an integral part of fitness which is defined as the "ability to move a single joint or multiple joints through an unrestricted pain free range of motion that is affected by muscles, tendons, ligaments, and bones".[2] Physical therapists, coaches and rehabilitation workers have a long-time concern on flexibility of the muscles. Lack of flexibility has been considered as a leading factor to muscular tightness. Muscular tightness contributes to muscular injury.[3]

Fatima, et al. reported that tight hamstrings were allied with a dysfunctional motor control pattern foremost to a submaximal firing pattern of postural muscles resulting in hamstrings functioning as stabilizers rather than their main function of prime movers. Numerous reasons can prompt the advancement of hamstring snugness because of some constant condition, for example, hereditary inclination, muscle injury and versatile shortening.[4] Modern sedentary style of living is one of the main

reasons for postural abnormalities evident in modern society. The drawn-out sitting hours required in by far the majority of the occupations, and the enlightening courses of action can affect the flexibility of sensitive tissues, particularly two joint muscles.[5]

Ghanbari, et al. reported that hamstrings tightness may result in several conditions of knee and spine. The resultant flexion moment following hamstrings tightness may cause anterior knee pain owing to excessive patellofemoral forces. Furthermore, decline in knee expansion range may develop grower fascitis because of anomalous forefoot loading. In patients with hamstrings tightness anterior pelvic tilt is decreased during trunk forward bending, therefore, mobility in lumbar vertebra decreases and leads to low back pain. Because of these problems it is important to consider the length of hamstrings muscle group.[6]

Flexibility can be increased by different techniques which include hold relax and stretching. It has been assumed that increased flexibility caused by stretching activities may decrease the incidence of musculoskeletal injuries, reduce spasm, and increase physical fitness. It has been shown that people adopting prolonged sitting position at least eight hours a day are susceptible to hamstrings and other lower limb muscle tightness.[1,7]

Stretching is a preventive and therapeutic technique which is applied on musculotendinous structures in order to change their length in two joint ROM. It reduces stiffness, improves performance, decreases risk of injuries, improves posture and promote relaxation. There are different types of stretching techniques including static, active, passive, PNF and ballistic. Static stretching is most common form of stretching technique because of its safety, effectiveness and easily performed. PNF stretching performed in both active contractions and neuromuscular reflexes decreases the resistance against stretching.[8]

In spite of many research studies performed on issue of stretching; there are still disagreements about the most effective and safe method, intensity, duration and frequency of stretching. Several studies have focused on comparing different methods of stretching. Some of these studies have found that PNF stretching and static stretching were equally effective in improvement of muscle extensibility.[8] One study investigated the effects of Hold relax for 15 sec and Static Stretch of 15 secs on the extension range of knee of young people and revealed that no significant difference was observed between these two techniques regarding the increase in range of knee extension.[10]

Various studies have been carried out to analyse the effects of hold relax and static stretching. Some studies showed that hold-relax is more effective than static stretching. Others show that static stretching has better effects than hold-relax.[11] A study compared the effects of 3 types of stretching including PNF stretching, sustained stretching and active self-stretching on contracted hamstrings muscles. Study was conducted among adult population. PNF stretching technique was repeated three times a week and the same schedule was set for all the other types of stretching. Study concluded that static stretching technique was more effective for contracted hamstrings muscles as compared to the active self-stretching and PNF stretching techniques even though same number of repetitions and frequency was incorporated in the exercise plan.[12] There are also some studies that showed that both of these techniques have the same effects. However, little information is available on immediate effects of PNF techniques and this study directly focuses on the immediate effects of static stretch and Hold relax among patients of hamstrings tightness. Thus, the purpose of the study was to compare the effects of static stretch versus hold relax in improving flexibility of tight hamstrings in order to educate the physiotherapists about which technique is more effective in reducing tightness in the hamstrings muscle.

MATERIAL AND METHODS

In this randomized controlled trial, individuals were randomly assigned into different groups. Sample size was calculated through G power analysis and total 70 participants were recruited in the study. Purposive sampling technique was used to collect data from the asymptomatic subjects at royal institute of medical sciences physiotherapy clinic, Multan. Sample size for this study was 70, divided into two groups of 35 individuals. Group A (control) = it included 35 patients who received static stretching of hamstring muscles and ROM was measured. Group B (Case) = it included 35 patients who received Hold-Relax and then ROM was measured (Figure-I). Patients with an age range of 18–30 years, asymptomatic individuals, an SLR range of below 65–70, and nulliparous women were included in this study. Participants with any pain during SLR or with previous surgery, known gynaecological problems, protruding discs, or sciatica were excluded.

PNF hold-relax

PNF Hold relax is the technique[13] in which the tightened muscle is lengthened to the extreme position that is tolerable to the subject. The extreme position must not be pain provoking and must be comfortable for the subject. At this pre-stretch, end range position, contraction of the muscle is performed isometrically and held for 5-10 seconds. Afterwards subject is asked to voluntarily relax that targeted muscle. The involved extremity is then moved to the gained new range and by this the tightened or short muscle becomes lengthened.[14] Subjects were asked to perform SLR and goniometer was placed over the greater trochanter with moving arm lying parallel to the thigh and ROM was measured. Subject's limb was placed over the shoulder and participant was asked to push the shoulder downwards (try to extend hip) and this isometric contraction was held for 5-10 seconds and then participant was asked to voluntarily relax the muscle for 5-10 seconds and then again SLR was performed by the participant and ROM was measured using goniometer.

Static stretching

Static stretching is just like placing the joint in the extreme range of motion and holding it for considerable amount of time.[15] Subject were in supine lying then he/she was asked to flex hip joint with knee also in full extension. Using universal goniometer ROM was measured placing the axes over the greater trochanter and movable arm was placed parallel to the thigh. Afterwards static stretch was applied by placing the hip further in hip flexion with knee in full extension.

Stretch was hold for 60 seconds and then subjects were asked to perform SLR and again ROM was measured with the same procedure that was used prior to the stretching technique.

RESULTS

The aim of this study was to find out immediate effect of Hold Relax versus static stretch on hamstrings tightness. To find out between group comparison independent sample t-test was used. To find out difference within each group Paired sample t-test was used. Clustered bar chart showed that minimum post-stretch ROM for case ranged from 60 to 64. Moderate post-stretch ROM for case ranged from 65 to 70 and maximum post-stretch ROM achieved ranged from 70 to 76 (figure 2). While minimum post-stretch ROM for control ranged from 55 to 64. Moderate post-stretch ROM for control ranged from 65 to 71 and maximum value ranged from 72 to 88. Descriptive statistics shows that mean value of Pre-Static Stretch ROM was 56 and Post-Static Stretch ROM was 70 (table-1). Mean value of Pre-Hold Relax ROM was 56 and Post-Hold Relax ROM was 67. SD value of Pre-Static Stretch ROM was 6.708 And Post-Static Stretch ROM was 6.732. SD value of Pre-Hold Relax ROM was 4.85 and Post-Hold Relax ROM was 4.402 (table 2).

DISCUSSION

The aim of this study was to find out immediate effect of Hold Relax versus static stretch on hamstrings tightness. Flexibility is an important physiological component of physical fitness, and reduced flexibility can cause inefficiency in the workplace and is also a risk factor for low back pain. Increasing hamstring flexibility was reported to be an effective method for increasing hamstring muscle performance. This study was designed to compare the effects of modified hold-relax stretching and static stretching in improving hamstring muscle flexibility.[16] The results of our study indicate that both modified hold-relax stretching and static stretching are effective methods to improve hamstring flexibility. Modified hold-relax stretching improves flexibility through relaxation of the contractile component of the muscles, while static stretching causes an increase in elasticity of the non-contractile viscoelastic component. Thus, our study demonstrated that both of these mechanisms play equal roles in improving the flexibility of the muscles. The finding of our study concurs with other previous studies that have reported similar results.

The results of this investigation suggested that both static stretching and hold relax are statistically effective equally as p-value is insignificant. These results were achieved by applying static stretch for 60 sec and hold relax with 10 sec isometric contraction and 10 sec relax period. However, by considering the mean value it was observed that the range improved with static stretch and had a larger maximum value.

Feland et al. reported that contract-relax and static stretching had similar benefits in improving flexibility.[17] Similarly, Gribble et al. found that static and hold-relax stretching were equally effective in improving hamstring range of motion. Recently Lim et al. reported similar effects of static and PNF stretching on hamstring muscle extensibility. A possible mechanism for the improvement of hamstring range of motion relies on the effects of autogenic inhibition. Autogenic inhibition is contingent on the function of the Golgi tendon organs, which not only detects changes in length but also changes in tension. Tension is produced in the antagonists with both static and PNF hamstring stretching techniques. Therefore, the presence of autogenic inhibition would not be affected if the measurement technique was an active or passive stretch or if the training method was a static or hold-relax stretch. Another possible mechanism for the increase in range of motion is the augmentation of stretch tolerance. This is supported by Halbertsma et al. who reported an increase in hamstring flexibility in their study. Sharma et al. reported stretching along with warming up is an effective way to improve hamstring flexibility. Moreover, their participants reported an increase in pain tolerance at the end of study.[18] They attributed the gains in flexibility to an increase in stretch tolerance.[18] The findings of current study were in favour of previous literature as Hold Relax technique and static stretching have similar effects in reducing hamstrings tightness.

It would be interesting to compare the effect of modified hold-relax stretching and static stretching in subjects with a history of hamstring injury and low back pain. It is possible that such conditions involve deposition of abnormal fibrous tissue and cross linkages and may respond differently in healthy muscles. Further research comparing active knee extension and passive knee extension measurements may be useful in determining the best method for testing the effectiveness of modified hold-relax stretching and static stretching in improving hamstring flexibility.

CONCLUSION

The results of our study concluded that both hold-relax and static stretch techniques are equally effective at making the hamstrings more flexible right after they are used. This was shown by the increased range of SLR measured with a goniometer.

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Table 1: Pairwise comparison of ROM scores within the groups

Groups	Stretching (n=35)			Hold Relax (n=35)		
	Mean diff.	SE	P-value	Mean diff.	SE	P-value
VAS						
Pre	56.000	1.134	0.000	55.943	0.820	0.000
Post	70.03	1.138	0.000	66.486	0.744	0.000

Table 2: Descriptive statistics for comparison of case and control group

	Mean	Std. deviation
Pre-Static Stretch ROM	56	6.708
Pre-Hold Relax ROM	55.94	4.85
Post-Static Stretch ROM	70.03	6.732
Post-Hold Relax ROM	66.49	4.402

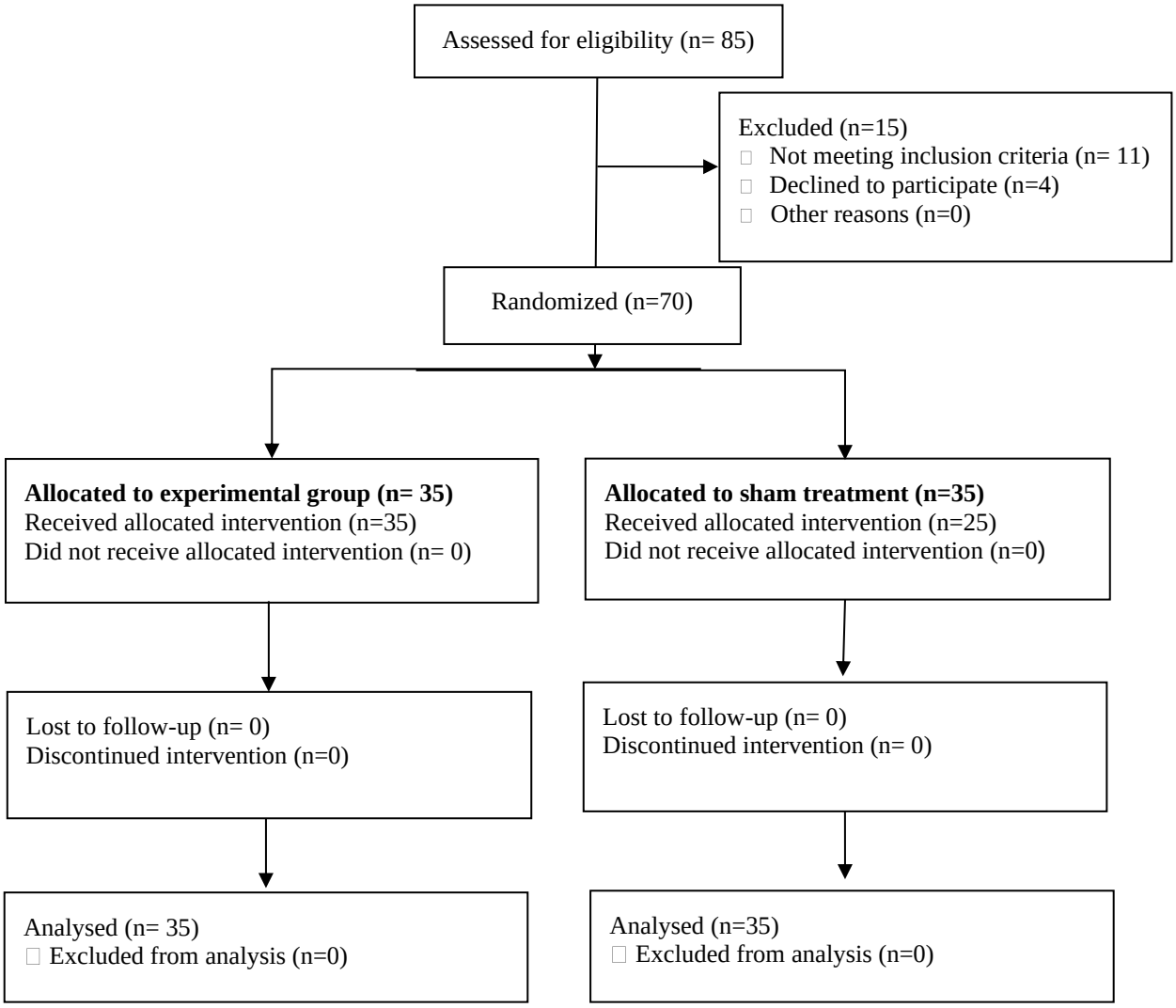

Figure 1: Flow diagram showing the Research Process

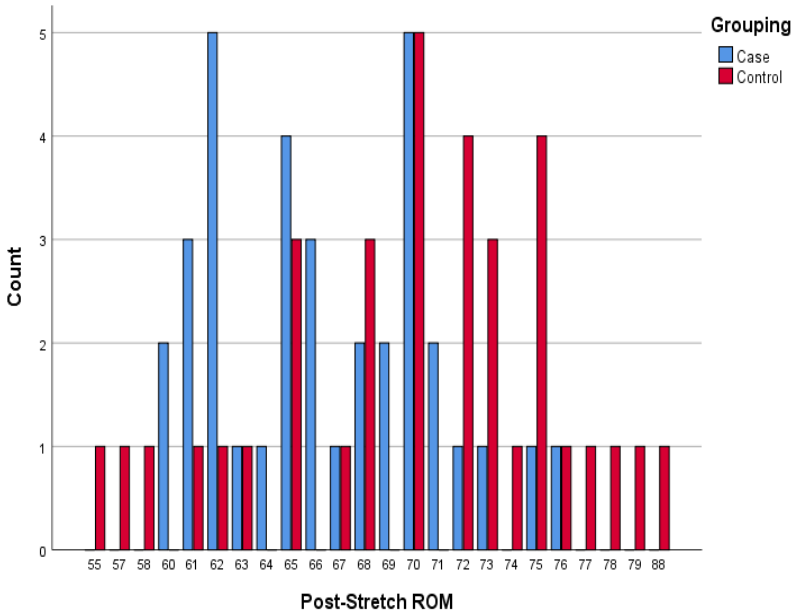

Figure 2: Figure showing characteristics of both groups