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Original Research Paper

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EFFECT OF SUPERFICIAL HEAT APPLICATION AND PNF STRETCH TECHNIQUE ON MUSCLE UNDERGRADUATE STUDENTS WITH HAMSTRING TIGHTNESS.

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ABSTRACT **Background:** Hamstring tightness is one of the most common tightness. Straight Leg Raise is one of the tests to measure the flexibility and length of the Hamstring muscle. Different stretching techniques are used to release this muscle tightness. However, PNF stretch technique is a successful method that gives an immediate relief of symptoms to the patient. **Objective:** To evaluate the effectiveness of PNF stretch technique in college going students with hamstring tightness. **Methodology:** A total of 110 subjects within the age group of 18-25 years out of which 93 subjects were eligible and agreed to participate in this study. The intervention (moist pack, PNF stretch technique) was performed on the affected lower extremity with a single treatment session given to the subject. The degree of SLR was measured before the beginning of the treatment, at the end of it. **Results:** The mean difference of pre and post treatment range obtained from performing SLR in the subjects was statistically significant with p value being <0.05 **Conclusion:** Application of superficial heat and PNF stretch technique were significantly effective in reducing the hamstring tightness.

KEYWORDS : Hamstring muscle, Straight Leg Raise.

INTRODUCTION

The most important of hamstring muscle is flexion of the knee joint and extension of the hip joint[1,2]. Tightness is defined as being held or fixed in a position securely[3]. Hamstring tightness is one of the most common musculoskeletal conditions affecting many people from all age groups. It commonly affects the female population as compared to the male population. Prevalence of hamstring muscle tightness in the undergraduate students is about 40.17%[4,5]. Tightness can also occur if there is inadequate physical activity, genetic predispositions of any kind or any previous type of hamstring pathology[6,7].

There are many neuromuscular factors due to which the flexibility of a muscle can be hindered, some of which are changes in the length of the tendon or muscle, reduced stretch tolerance, gender, and genetic differences [8]. Various types of interventions are used to reduce the tightness of a muscle.

However, PNF stretch technique has been proven to be more effective than basic static stretches. PNF are exercises that enhances neuro muscular response by facilitating the proprioceptors. It is used in assisting daily stretching activities to immediately increase the range of motion. This technique is quite often used to decrease muscle tightness[11].

The application of heat is quite popular in the rehabilitative setting. Applying heat to the body surface causes alteration in the temperature of tissues which can have various therapeutic effects. Raising the soft tissue temperature by doing active warm-up exercises or using hot packs are an accepted practice. There will be an increase in the blood flow to the muscles which will improve the local circulation and clear out all the waste products [12] [13]. There are various tests and methods by which we can check the hamstring tightness. The measurement of a joint range of motion can be done using tools like a manual goniometer, a digital goniometer, or an isokinetic dynamometer.

On that account, hamstring tightness can be decreased largely by warming the muscle up using a hot pack over it and then applying PNF stretch to it. This will improve the flexibility of the tightened muscle which we can easily calculate using a manual tool. Hamstring is the most common muscle to become taut. However, as soon as the tightness decreases and the symptoms are relived, people seem to avoid performing any kind of activity to keep the muscle free of any kind of strain.

Aim:

To find the mean muscle reversibility time in individuals with hamstring tightness after being treated with a single session of PNF stretch technique.

Objectives

1. To evaluate the muscle length in patients with hamstring tightness using SLR.
2. To evaluate the effect of PNF stretch in patients with hamstring tightness.

Methodology

The study is a Quasi Experimental with the convenient sampling with 93 subjects' inclusion criteria is Age group between 18-25 years, Hamstring tightness measured by SLR $\leq 70^{\circ}$, University level students. Exclusion criteria is Any recent/existing hamstring pathology, soft tissue injuries of the lower extremity, Recent fractures, Any bony deformities.

Protocol:

The subjects will be selected keeping in mind our inclusion and exclusion criteria. Those subjects willing to actively participate in the study will be given a written consent form, after which they will be chosen for the further study. The whole procedure of the study will be explained properly to the subject before starting the treatment. These will be the pre-interventional values. After the values are recorded, moist pack will be applied over the posterior aspect of the thigh for 10 minutes. The subject will be in a high sitting position during the application of moist pack. Following the moist pack, Proprioceptive Neuromuscular Facilitation will be given to the subject's hamstring muscle. The hip will be passively flexed with knee extended till the subject feels maximum stretch over the posterior aspect of thigh before the onset of pain, this position will be held for 30 seconds. After this, the subject will be asked to actively push his/her leg on the therapists' shoulder with little force. This position will be held for 10 seconds as the therapist will meet the subject's force isometrically. Then the subject will be asked to relax and again a passive stretch will be given to the muscle until the feeling of maximum stretch recurs. This position will be held

for 30 seconds. The technique will be repeated until 4 consecutive cycles of stretch, contract and relax is repeated. The post-intervention values will be recorded. Subject's degree of motion will be observed every day after single session of the treatment until the pre-interventional values are reached again.

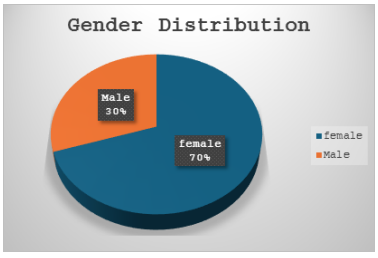
RESULTS

In the present study, 110 participants were screened for eligibility out of which 17 participants had to be excluded (not meeting inclusion criteria (n=6), declined to participate (n=6), and others (n=5), resulting in 93 participants agreeing to participate in this study. They were randomized and allocated into one group.

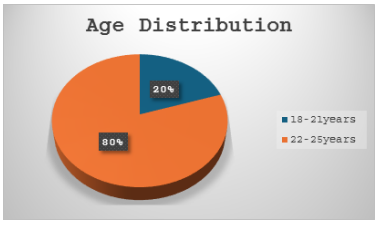
Table 1: Distribution of Demographic variables

Variables	Frequency(n)	Percentage
Gender Male Female	27 66	30% 70%
Age 18-21 years 22-25 years	19 74	20% 80%

Out of the 93 participants, 70% (N=66) were women, and 30% (N=27) were men (Graph 1). Further, the age group data shows a distribution of 20% (N=19) subjects between 18-21 years, whereas 80% (N=74) were between 22-25 years (Graph 2).



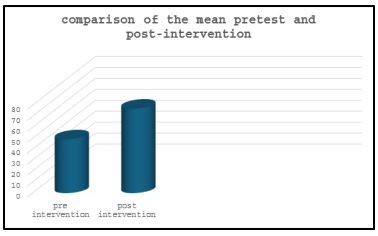
Graph 1: Gender Distribution



Graph 2: Age Distribution

Table 2: The comparison of the Mean Pre-test and Post-intervention scores obtained by measuring the SLR range of the participants in the PNF stretch technique group (N=93)

Outcome parameter	At baseline Mean±SD	Post-intervention Mean±SD	p-value
SLR range	49±7.928	77±5.528	< 0.0001***



Graph 3: comparison of the mean pretest and post-intervention

Interference: The above table illustrates the comparison of the mean pre- and post-treatment ranges obtained by measuring the SLR range of the participants in the group. The Mean scores obtained from the SLR in the group were 49±7.928 in the pre-test and 77±5.528 in the post-intervention, mean difference was -28.783 (Mean of paired differences). The 95% confidence interval of the difference was -30.293 to -27.272 which indicated that the range increased in the post-intervention and the difference was statistically significant (P < 0.05).

DISCUSSION

The study was performed to evaluate for the individuals with hamstring tightness and to check the effect of PNF stretch technique. During the analysis, it was seen that the students at university level had higher degrees of hamstring tightness because of their daily work[4,5]. The more prolonged sitting hours, standing hours, or working hours, lesser was the degree obtained while performing straight leg raise test before the intervention[6].

The statistical analysis showed significant differences in the pre and post interventional values. Percentage of tightness was more in women as compared to men between the age groups 22-25 years. A single session of superficial heat application followed by PNF stretch increased the pre-interventional values to a great extent[11]. The treatment session takes approximately 20 minutes to finish, after which immediate SLR scores were measured. Subjects felt the affected leg being relaxed after the protocol.

The tight muscle tends to get shortened over time which means that is stays in a contracted state even in relaxed positions. Length of the muscle was significantly increased after a single treatment session. It was important for the subject to know the time he/she has until the symptoms and the feeling of tightness recurs. The effects of PNF stretch technique, although immediate, started reducing to some extent every day, stating the importance of performing stretches daily.

However, there were 2 subjects who had severely weak quadriceps and gluteus which resulted in a massive reduction of SLR range. In both the subjects, the hamstring muscle returned to its original shortened (tight) position within 24 hours. In subjects of this kind, it is extremely important to strengthen the quadriceps and gluteal muscles first and then shift the focus to the tight hamstring muscle.

All the subjects had never included any kind of stretching activity in their daily regime which also played a major part in increasing the tightness of the muscle. PNF stretching technique has been shown to have greater improvement than stretching done passively[11]. For the same reason, this technique was chosen over the others. Detraining occurs at a high pace as soon as a person quits his/her daily exercise regimen. About a week later, significant reductions occur in the functions and exercise capacity.

CONCLUSION:

Proprioceptive Neuromuscular Facilitation stretching technique was found to have a significant effect in largely reducing the tightness along with the application of superficial heat on the muscle bulk.

Limitations Of The Study:

1. The age group above 25 years was not taken into consideration.
2. Gender distribution was not equal.
3. Secondary reasons for hamstring tightness were not taken into consideration.

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