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### Immediate effect of mulligan bent leg raise versus neurodynamic sliding on hamstring tightness in non-athletic college students

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#### ABSTRACT

##### Background

Flexibility is important for normal functioning of humans. Hamstring tightness is a common problem in non-athletic young adults. Hamstrings tightness can further lead to back problems and also can cause hamstring strains.

##### Aim

To study immediate effects of Mulligan bent leg raise and Neurodynamic sliding on Hamstring tightness in non-athletic college students.

##### Methodology

A comparative study between immediate effects of Mulligan bent leg raise and Neurodynamic sliding was performed on 60 college going non-athletic young adults which were randomly divided into two groups (A & B). 30 subjects in group A received Mulligan bent leg raise technique and 30 subjects in Group B received Neurodynamic sliding technique. Hamstrings flexibility was measured of dominant leg at baseline and immediately after the intervention by using 90°-90° straight leg raise test.

##### Results

In both the groups Mulligan bent leg raise and Neurodynamic sliding had shown increase in 90°-90° straight leg raise test. But there was highly significant increase in hamstring flexibility range of motion in Mulligan bent leg raise as compared to Neurodynamic sliding group.

##### Conclusion

The study concluded that Mulligan Bent Leg Raise and Neurodynamic Sliding technique both showed immediate decrease in hamstring tightness but Mulligan Bent Leg Raise is more effective than Neurodynamic Sliding on hamstrings flexibility in non-athletic college students.

**Keywords:** Mulligan Bent Leg Raise, Neurodynamic Sliding, Hamstrings Flexibility, 90°-90° Straight Leg Raising Test.

## INTRODUCTION

Flexibility is important for normal functioning of humans. Flexibility means that a single or multiple joints can be moved through unrestricted range of motion. [1] The commonest muscle that always go for tightness is the Hamstring muscle. The incidence of tightness of hamstring muscle is higher in males than females. [2] Prevalence of hamstrings muscle tightness is more in undergraduate physiotherapy students. [3] Good flexibility provides relaxation, reduces stress and also keeps the body loose. [4, 5]

When hamstring muscle undergoes tightness it causes a profound effect on body's normal postural alignment. Studies have shown that tightness of hamstring always led to low back pain with lumbar intervertebral disc pathologies. [6, 7] Hamstrings tightness also causes plantar fasciitis, patellar tendinopathy and patello-femoral pain syndrome. [8]

Various Physiotherapy treatment techniques like stretching techniques, muscle energy technique, position release technique, myofascial release techniques are available for the hamstrings stretching. [9, 10] Mulligan Bent Leg Raise (BLR) is a newer technique which is recently utilized in the management of hamstring tightness in subjects with limited Straight leg raise (SLR). [11] It is a painless stretching technique that involves movement with mobilization.<sup>1</sup> Hamstrings tightness could be associated with altered neurodynamics which causes enhanced neural mechano-sensitivity. Neurodynamic sliding intervention decreases neural mechanosensitivity by providing movement which changes the neurodynamics and modifies sensation, and helps to increase hamstrings flexibility. [12] Thus, the present study was conducted with an aim to find out best technique which will help in improving the hamstring flexibility and decrease the muscle tightness.

## MATERIALS AND METHODOLOGY

A comparative study between immediate effects of Mulligan bent leg raise and Neurodynamic sliding technique on hamstring tightness was conducted on Non-athletic College students at MAEER's Physiotherapy College, Talegaon Dabhade, Pune, Maharashtra. Screening of hamstring tightness was done among physiotherapy students in the age group

of 18 to 25 yrs. Total 60 subjects with hamstring tightness less than  $160^{\circ}$  were included in this study based on inclusion and exclusion criteria. After obtaining written informed consent from all the subjects, they were allocated randomly into two groups by computer generated randomization i.e. 30 subjects in Mulligan bent leg raise (Group A) and 30 subjects in Neurodynamic sliding (Group B).

Subjects who were performing regular lower limb stretching exercises or involved in sports activities, those with history of intervertebral disc herniation, spine or lower limb fractures, any type of spinal surgery cases were excluded from the study.

Demographic data such as age, height, weight, BMI and dominant side were recorded. Hamstrings flexibility was measured of dominant leg before the study began by using  $90^{\circ}$ - $90^{\circ}$  straight leg raise test (SLRT). Subject was in supine position both hips at  $90^{\circ}$  while the knees were bent. Subject was asked to grasp behind the knees with both hands and actively extend knee. For normal hamstrings flexibility knee extension should be within  $20^{\circ}$  of full extension. A universal Goniometer was used to measure knee angle in  $90^{\circ}$ - $90^{\circ}$  SLRT.

## PROCEDURE

### Procedure of Mulligan bent leg raise (Gr A)

Subject was in supine lying position with contralateral leg resting on the plinth. The dominant leg is resting such that the subject's popliteal fossa of knee rested on therapist shoulder. The therapist grasps near the distal end of the femur. A distraction is applied over the distal end of the femur and this should be maintained throughout the treatment. After distraction is applied, the subject is asked to push the therapist shoulder with the knee resting on it, so that there is isometric contraction of hamstrings for 5 seconds and then ask the subject to relax voluntarily and the hip is taken into flexion, in such way that the leg is moved to  $5^{\circ}$  greater hip flexion position provided there was no pain. The end position is held for 10 seconds. This was performed 3 times with 1 minute rest in between. If therapist felt restriction, the leg was taken into abduction and lateral rotation. The measurements were taken immediately after the treatment.

### Procedure of Neurodynamic Sliding (Gr B)

Subject was in supine lying position. The subject was supported on wedge with pillow such that the subject's thoracic and cervical spine was flexed throughout the treatment. Subject contralateral leg was resting on plinth. Therapist performed passive movements for 180 seconds with hip flexion, knee flexion, ankle dorsiflexion and hip extension, knee extension and plantar flexion. 3 repetitions were performed and measurements were taken immediately post treatment.

### DATA ANALYSIS & INTERPRETATION

Data analysis was performed by using graphpad prism software. Within the group Pre and post test values of the Mulligan BLR (Group A) and Neurodynamic sliding (Group B) were statistically analysed by using paired t-test whereas post test values of the Group A and Group B were statistically compared by using unpaired t-test.

**TABLE 1: Comparison of pre and post intervention in 90°-90° straight leg raise test within the groups.**

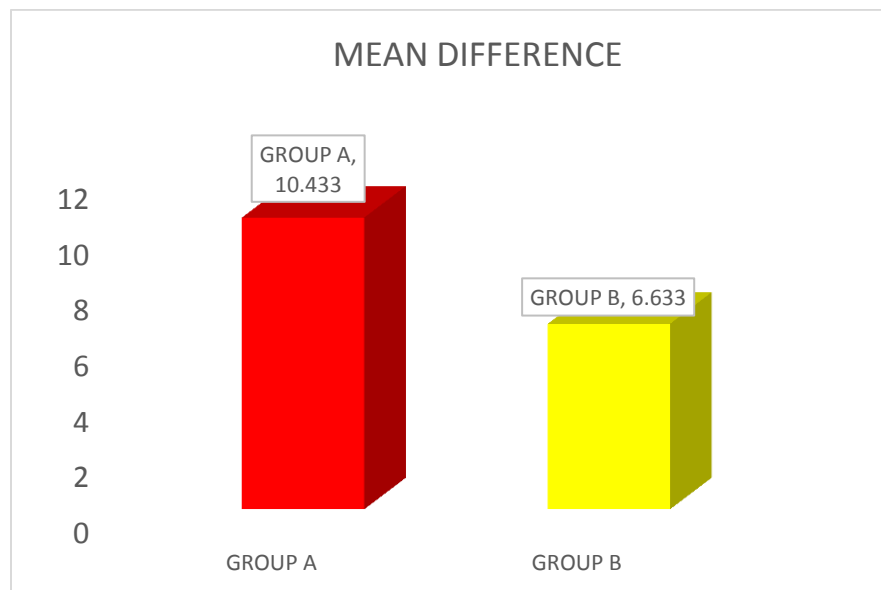
Groups	Mean $\pm$ SD		t-value	P-value
	Pre	Post		
Group A	127.30 $\pm$ 6.808	138.03 $\pm$ 7.355	11.25	<0.0001**
Group B	130.43 $\pm$ 8.394	137.07 $\pm$ 8.026	11.51	<0.0001**

\*\* Extremely significant (p< 0.0001) by using paired t-test

**TABLE 2: Comparison of post intervention improvement in 90°-90° straight leg raise test between Mulligan BLR (Group A) and Neurodynamic Sliding (Group B).**

Post (Mean $\pm$ SD)		t-value	P-value
Group A	Group B		
10.43 $\pm$ 5.015	6.633 $\pm$ 3.157	3.512	0.0009**

\*\* Extremely significant (p< 0.0001) by using unpaired t-test



**Graph 1: Comparison of average improvement of Hamstring flexibility between Group A & Group B as measured by 90°-90° straight leg raise test.**

## RESULTS

When compared pre and post intervention within the group there was increase in Hamstring flexibility range of motion as measured by 90°-90° SLRT from 127° to 138° in Group A and from 130° to 137° in Group B respectively, which was statistically extremely significant in both the groups (Table 1).

When comparing the mean difference between two groups, Group A (10.43±5.015) was found more effective than Group B (6.633±3.157). When means of 90°-90° SLRT was compared between the groups there was extremely statistically significant difference found between the groups (Table-2).

## DISCUSSION

The statistical analysis of this study showed Mulligan bent leg raise (Group A) was extremely statistically significant ( $P > 0.0001$ ) than Neurodynamic sliding (Group B) technique to improve hamstring flexibility.

Pre and post comparison within Mulligan bent leg raise (Group A) showed extremely statistically significant difference in this study. Similar findings were reported by Toby Hall et al<sup>11</sup> when comparison between Mulligan bent leg raise and placebo group in which there was increase in range of motion in intervention group than placebo group but after 24 hours latency period.

The participants of Neurodynamic sliding group also showed extremely statistically significant difference between Pre and post comparison within the group in this study. Yolanda Castellote-Caballero et al [12] study of comparison between neurodynamic sliding versus passive stretching showed an immediate increase in neurodynamic sliding group when compared to passive stretching group. When it comes to between groups comparison of values post interventional it was found that there was highly significant improvement in active knee extension of dominant leg in 90°-90° straight leg raise in group A treated with Mulligans bent leg raise than in Group B treated with Neurodynamic sliding technique. Thus, the above study findings showed Mulligans bent leg raise to be effective statistically than Neurodynamic sliding

technique in improving active knee extension and 90°-90° straight leg raise.

In contrast to the result of this study Shrinivas Shinde et al [13] showed that Neurodynamic sliding technique to be more effective than Mulligans bent leg raise.

Vinodbabu et al [14] concluded that both mulligan bent leg raise and neurodynamic sliding are effective on hamstrings flexibility in asymptomatic individuals. It was hypothesized that when tension is applied to the nervous system in neurodynamic sliding technique, there is reduction in cross-sectional area and an increase in pressure in the nerve that results in extension and movement of the sciatic nerve together with the hamstring and this compliance of the nerve, results in increased hamstring flexibility. When applying neurodynamics, tension that occurs in the nervous system and pressure within the nerve increases due to the decrease in cross-sectional area, and the axonal transport system lengthens the sciatic nerve after shortening because of the influence of the surrounding related structures and hamstring flexibility [13, 15]

In mulligan bent leg raise technique there is flexion at hip that results in caudal loading of lumbosacral nerve roots and sciatic nerve which lies in the pelvis, following active hip extension. In hip extension there is unloading of neural tissues and they tend to move in the cranial direction. While doing BLR there is lumbar flexion and during this there is opening of lateral intervertebral foramina and central canal which facilitates caudal movement of neural structures which is effective in dispersing intraneural edema thus restoring pressure gradients and hypoxia. Mulligan BLR also involves isometric contraction of hip extensors and stretching of same muscles which is referred to as Post-isometric relaxation [14-16]

Limitation of the present study was that, the evaluator was not blinded and only immediate effects of the two techniques were studied. Subjects with 18-25 years of age were considered for study thus results cannot be generalized to all age group. Further studies are needed to find the effects of these techniques in conditions with secondary hamstring tightness and long-term effects of these techniques on hamstring flexibility.

## CONCLUSION

From the results of this study we conclude that there was immediate improvement in Hamstring flexibility range as measured by 90°-90° SLRT in both Mulligan bent leg raise and Neurodynamic sliding technique but the improvement in Mulligan bent leg raise was more as compared to Neurodynamic sliding group on hamstrings flexibility in asymptomatic, non-athletic college students.

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