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## Effect of Nordic eccentric hamstring stretching exercise and sciatic nerve slider technique of neural mobilization in college students: A Comparative study

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### Abstract

**Background:** Hamstring tightness is caused by a decrease in the ability of muscles deform, resulting in a decrease in a range of motion at knee and hip Joint and limitation in many functional activities. The purpose of this study is to find out the effectiveness of Nordic hamstring exercises and sciatic nerve slider technique of neural mobilization on hamstring tightness in college students.

**Method:** 40 participants will be recruited for the study. All participants will be screened for inclusion and Exclusion criteria. Participants will be divided in two groups.

Group-1 will receive Nordic eccentric hamstring exercises and Group-2 will receive sciatic nerve slider technique of neural mobilization. Both groups will be treated for 6 days in a week for 2 weeks.

**Outcome Measures:** Sit to reach test, Sargent jump test, Active knee extension test for hamstring muscle tightness.

**Results:** Inter group comparison of SRT, SJT and AKE showed significant improvement in both the groups but in intra group comparison SRT, SJT and AKE (All with  $P=0.00$ ) suggest that students who receives Nordic Hamstring Exercise showed significant improvement in range of motion.

**Conclusion:** The study concluded that both intervention: Nordic eccentric hamstring stretching exercise and sciatic nerve slider technique neural mobilization are effective in improving range of motion, but statistically and clinically Nordic eccentric hamstring stretching exercise is more effective than sciatic nerve slider technique of neural mobilization.

**Keywords:** Nordic eccentric hamstring stretching exercise, sciatic nerve slider technique, Sit to reach test Sargent jump test, Active knee extension test

### Introduction

The hamstrings muscles occupy the posterior compartment of the thigh. The hamstrings consist of 3 muscles: semimembranosus, semitendinosus, biceps femoris and the ischial part of adductor Magnus. These 3 muscles combined are primarily responsible for the flexion of knee joint as well as extension of hip <sup>[1]</sup>.

Flexibility in hamstrings muscle group is necessary for the hip and knee movements as well as in many functional activities and in prevention of injury in which muscle group is elongated over hip and knee simultaneously <sup>[2]</sup>. The numerous factors influencing the hamstring flexibility includes the age, gender, race, tissue temperature, strength training, stiffness, awkward posture in reduce warm up period during exercises <sup>[3]</sup>.

Muscle tightness is caused by a decrease in the ability of the muscle to deform which results in a decreased ROM in the joint on which it acts. Tightness will lead to reduce flexibility of the muscle. Hamstring group of Muscles is most common group in the body to develop tightness. Inability to achieve greater than 160 degree of the knee extension with hip at 90 degree flexion is considered as hamstring tightness. The prevalence of hamstring tightness in male is 27.50% and in female 45% in the age group of 18 to 25 years of college student <sup>[7]</sup>.

Tight hamstrings were shown to decrease the lumbar lordosis in sitting and thus increase the pressure in the lumbar intervertebral discs and the loading on the lumbar spine. This increased stress on the lumbar spine may, according to several authors, highly predispose an individual to low back problems. Clinical observations have suggested that hamstring tightness influences the lumbar pelvic rhythm and may be associated with modifications in the sagittal

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spine curvatures during trunk flexion (TF). Considering that forward bending is one of the most common movements in daily activities, shortened hamstrings may increase the risk of injury to the spine from mechanical stresses [7, 9-11].

Stretching is a common practice for relieving tight hamstrings. There are two types of stretching: dynamic and static. Both of these will improve the flexibility of the hamstrings.

Various studies have been done to assess the increase in muscle strength by Nordic eccentric hamstring exercise and the increase in range of motion by sciatic nerve slider technique neural mobilization in hamstrings tightness [16].

The aim of Nordic exercise is to strengthen the hamstrings, gluteus and core muscles [9]. Eccentric strength training with Nordic hamstring exercises (combined with a warm-up stretching) reduced hamstring strain risk. This is likely due to the inability of the "Flexibility Program" to positively influence the length-tension relationship of the hamstring in the same way as the eccentric strength training.

Neural mobilization is a gentle movement technique used by physiotherapists to move nerve. This treatment relieves pain and restores functional movements [14].

The Sargent jump test is used to measure the explosive strength of the lower limb along with the jump height [18]. Active knee Extension test is used to examine the tightness of the hamstring muscles [20]. The angle of knee flexion represent the hamstring tightness [21]. Sit to reach test is used to examine hamstring extensibility [22]. The measurement is recorded in centimeter in extremities.

### Need of study

There is lack of literature comparing the effect of Nordic eccentric hamstrings exercise and sciatic nerve slider technique neural mobilization on college student with hamstrings tightness.

Therefore, the purpose of present study is to compare that which of two techniques i.e. Nordic eccentric hamstrings exercise and sciatic nerve slider technique neural mobilization is better to improve range of motion in college students with hamstrings tightness.

### Aim of the study

To determine the effectiveness of Nordic eccentric hamstrings stretching exercise and Sciatic nerve slider technique neural mobilization in college student with hamstrings Tightness.

### Objectives

1. To analyze the effect of Nordic eccentric hamstring exercises length of hamstring muscles in college student with hamstring tightness.
2. To evaluate the effect of sciatic nerve slider technique neural mobilization on flexibility in college student with hamstrings tightness.
3. To compare the effect of Nordic eccentric hamstrings exercise and sciatic nerve slider technique neural mobilization on length and flexibility in college students with hamstrings tightness.

### Hypotheses

#### Null hypothesis {H<sub>0</sub>}

There will be no change in the length and flexibility of hamstrings muscle by using Nordic eccentric hamstrings exercise and sciatic nerve slider technique neural mobilization in college students with hamstring tightness.

#### Alternate hypothesis {H<sub>1</sub>}

There will be change in the length and flexibility of hamstrings muscle by using Nordic eccentric hamstrings exercise and sciatic nerve slider technique neural mobilization in college students with hamstring tightness.

### Materials and method

Study Design: Experimental Study. [Comparative study]

Sample Design: Convenient sampling method.

Study population: Study was done on Paramedical college student studying in Parul University having Hamstring tightness both male and female college student between age of 18-25 years.

Sample size: The study was done on sixty (n=40) subjects and they were divided into two groups.

Group A= 20 Subjects. (n=20)

Group B= 20 Subjects. (n=20)

Study setting: Physiotherapy OPD, Parul Sevashram Hospital

Study duration: Six months.

Treatment Duration: five days week for two weeks.

### Inclusion criteria

- Both male and female college student age between 18 to 25 years with hamstring tightness.
- Subject with ROM of <70 degree by SLR.
- Sit to reach test: Less than 2cm beyond the toes.
- Student willing to participate in this study.
- Student who understand English or Gujarati language.

### Exclusion criteria

- History of orthopedic problems including hip and knee injury.
- Previous hamstring injuries.
- Neurological dysfunctions.
- SLR > 70 degrees.
- Patient who has previous history of fracture of lower limb or sciatic nerve injury.
- Any pathological dysfunction.

### Materials used

1. Pen and papers.
2. Pillow
3. Consent forms.
4. Universal goniometer.
5. Ruler.
6. Chalk.
7. Measure Tap.
8. Plinth.
9. Pencil.

### Procedure

The subjects for the study were selected from Paramedical colleges of (Nursing and Homeopathy college) Parul University. Total 66 subjects were screen out of this 44 subjects with Hamstring tightness were included in study. After taking concern Subjects were assigned in to two groups.

### Baseline data was taken for

1. Sit to reach test.
2. Active knee extension test.
3. Sargent jump test

Group 1 was given Nordic eccentric exercise And Group 2 was given Sciatic nerve slider technique of neural mobilization. The treatment was given for two weeks.



**Group 1:** Nordic eccentric hamstrings stretching exercise

Subject was given hip-knee in 90-90 position with an erect torso.

The therapist secured the subject's ankle to the supporting surface throughout the exercise. The subject then fell forward from the knee, resisting the fall for as long as possible with hamstring. As the subject's upper body approached the couch, the hands were quickly turned out to buffer the fall, letting the chest touch the couch. The subject's had to keep the hip slightly flexed position throughout the Movement. Upon completion of Movement, the subject had to immediately return to starting position by thrusting themselves back up using their hands to minimize loading in the concentric phase. The exercise had to be performed on relatively soft surface.

The subjects were made to perform Nordic eccentric hamstring exercises for two weeks with one session per day, in the first week increasing with two sessions in the following week.



**Group 2:** Sciatic Nerve Slider Technique of Neural Mobilization

The subjects were made to lie supine with their neck and thoracic spine supported in a forward flex position. Concurrent hip and knee flexion along with ankle dorsiflexion are made to alternate dynamically with concurrent hip and knee extension along with ankle planter flexion. These combinations of movements were performed for 180 seconds on both the extremities.

The subject were given sciatic nerve slider technique neural mobilization over a two week period, three minutes per session once a day, in the first week, increasing with two sessions in the following week for a duration of six minutes.

**Outcome measures**

**Active knee extension test**

- The subjects were made to lie in supine on a couch with their head back and arms folded across the chest.
- The hip was passively fixed until the thigh is vertical.
- The opposite leg was placed in a fully extended position on the couch.
- The foot of the leg being tested was kept in the vertical position throughout the test.
- The leg being tested was actively straightened until the point when the thigh begins to move from the vertical

position.

- Measure the minimum angle of knee flexion with the thigh in the vertical position. If the leg was fully straightened, the angle was recorded as 0 with Universal Goniometer.
- Any flexion was recorded as a positive number, e.g. 10, 20 degrees etc. The angle of knee flexion represents hamstring tightness.



**Fig 3:** Measurement for Active knee Extension Test



**Fig 4:** Sargent Jump Test Distance Measurement



**Fig 5:** Sit to Reach Test

**Sargent jump test**

- The Sargent jump test is used to measure the explosive strength of the lower limb along with their jumping heights.
- The procedure began with the subject standing near a wall and extending his hand above his head and touching the wall keeping their feet flat on the ground.
- The subject was asked to touch the wall with his finger tip dipped in chalk powder.
- Now the person stands away from the wall and flexes his knee and hip to the maximum extent and then jumps vertically as high as possible with both arms and legs to reach the maximum height.
- The best of three jumps are recorded and measured with a measured with a measuring tap in centimeters.

**Sit to reach test**

Sit to reach test is measured in long sitting position. The subject was told to sit in the long sitting position over the

couch. And maximally bends forward and try to touch the toes with the knee extended. Measurement was taken from the middle finger to the toes with measure tape. The measurement was recorded in centimeter in both the genders.

**Data analysis**

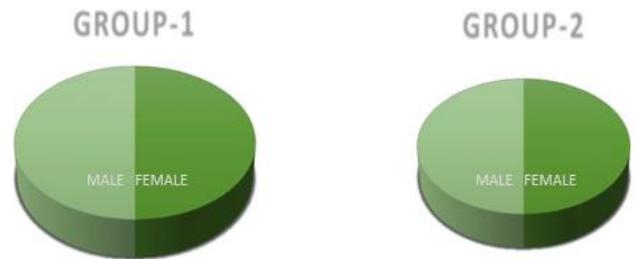
Data analysis was done using SPSS 17.0 statistical package. Mean age of both the groups were calculate. Before doing the data analysis, normal distribution of data was checked using Kolmogorov test. Paired t- test was used to analyze the out - come measures both pre and post interventions within the group and for analysis between groups for normal data independent t-test was used.

**Results and interpretation**

For statistical analysis data was collected before and after 2 weeks of interventions. Sargent jump test, sit to reach test and active knee extension were assessed pre and post interventions.

**Table 1:** Ratio of male and female in group 1 and group 2.

Groups	Male	Female
Group-1 [NEHSE]	20	20
Group-2 [SNST]	20	20



**Fig 1:** Ratio- male: female

**Table 2:** Mean age for group 1 and group 2.

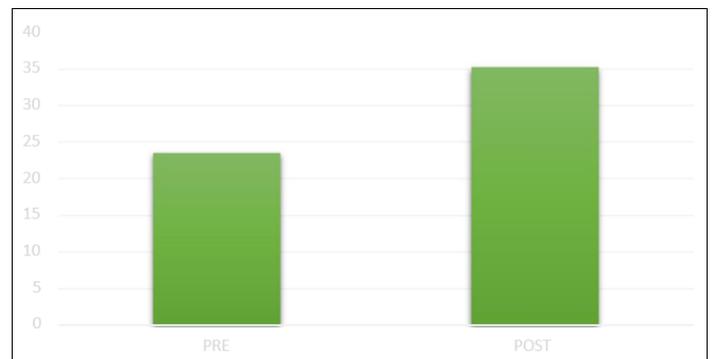
Age	Mean	Minimum	Maximum	S.d
Group-1	21.5	18	25	2.56
Group-2	21.14	19	25	2.59

**Table 3:** Intra group comparison for srt, sjt and ake for group-1.

		Mean	SD	Mean	SD		
Group-1	SRT	21.7	2.47	15.15	2.38	15.77	0.00
	SJT	23.47	1.45	35.17	3.06	18.85	0.00
	AKE	44.25	5.24	70.10	8.93	15.19	0.00



**Fig 2:** Pre and post compasion of sit and reach test group-1



**Fig 3:** Pre and post compasion of sarjan jump test group-1



**Fig 4:** Pre and post compasion of active knee extension test group-1

**Table 4:** Intra group comparisons for srt, sjt and ake for group-2

Group	Outcome	Pre		Post		T- Value	P- Value
		Mean	Sd	Mean	SD		
Group-2	SRT	16.39	3.49	12.21	2.89	12.56	0.00
	SJT	18.08	3.85	23.42	3.47	8.34	0.00
	AKE	35.40	7.02	46.75	8.42	12.89	0.00



Fig 5: Pre and post comparison of sit and reach test group-2



Fig 6: Pre and post comparison of sarjan jump test group-2

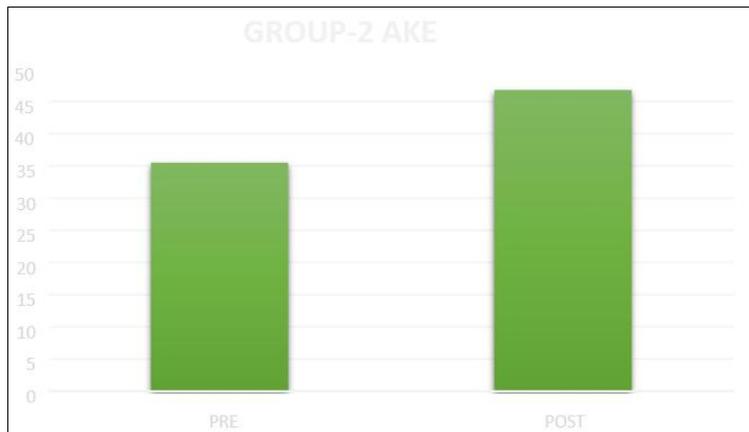


Fig 7: Pre and post comparison of active knee extension test group-2

Table 5: Inter group comparison for srt, sjt, ake for group 1 and group 2

Outcome	Group	Mean	Sd	T-value	P-value
SRT	G – 1	6.55	1.85	15.77	0.00
	G – 2	4.18	1.48	12.56	0.00
SJT	G – 1	11.70	2.77	18.85	0.00
	G – 2	5.34	2.86	8.34	0.00
AKE	G – 1	25.85	7.60	15.19	0.00
	G – 2	11.35	3.93	12.89	0.00

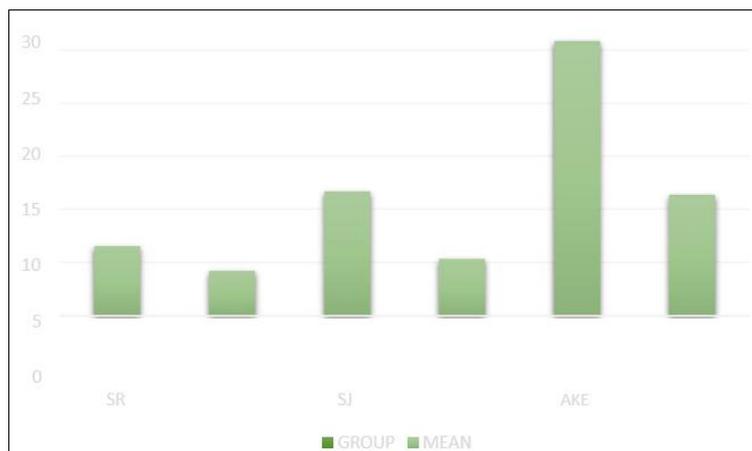


Fig 8: SRT, SJT AND AKE: Pre and post comparison between group 1 and group 2

**Discussion**

Nordic eccentric hamstring stretching exercises and sciatic nerve slider technique neural mobilization has recently received increased interest as these techniques are easily performable and less time consuming.

The novelty of this study is to focus on helping person with hamstring tightness using NEHSE as a new treatment which will help them reducing hamstring tightness, improving ROM

and strength caused due to hamstring tightness.

In Nordic eccentric hamstring stretching exercise during eccentric contraction the velocity of muscles lengthening increases initially along with the force production in the muscle the initial increase in the force production may be a protective response to the over load. The Nordic eccentric hamstring stretching exercise improves total work of eccentric hamstring musculature and has received increased interest as

it improves range of motion and flexibility.

Sciatic nerve slider technique neural mobilization improves flexibility and balance in hamstring muscles and also helps in with lumbar quadrant flexibility.

It will help in improvement of adverse neuro-dynamics, restore the dynamic balance between the relative movement of the neural tissue and surrounding mechanical interfaces, thereby allowing reduced intrinsic pressure on the neural tissue and thus promoting optimal physiological function<sup>[13]</sup>. It Facilitates nerve gliding, reduction of nerve adherence, dispersion of noxious fluids, increased neural vascularity and improve exoplasmic flow.

Possible reason for better improvement in ROM and flexibility in Group-2 is that in NEHSE directly focuses on muscles while SNST focuses on nerve stretching.

### Conclusion

Both the groups showed significant improvement in range of motion but when Nordic eccentric hamstring stretching exercise compared with sciatic nerve slider technique neural mobilization, the student with hamstring tightness showed more improvement in range of motion in group-1 (Nordic eccentric hamstring stretching exercise) rather than group-2 (Sciatic nerve slider technique neural mobilization).

### Limitations

- The short duration of the study.
- Sampling was done as per convenience.
- Long- term follow up was not done.
- The study was that the number of subjects recruited for the study were very few (40), 20 subjects in each group.

### Further recommendation

- A prospective study can be taken up to evaluate the long term effect of the present study.
- A further study can be done on the changes in the physiological parameters seen in the sciatic nerve and hamstring muscle by the 2 intervention done by the present study.

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