



## LONG-TERM EFFECT OF SUB-OCCIPITAL MUSCLE INHIBITION TECHNIQUE ON HAMSTRING FLEXIBILITY IN COLLEGE STUDENTS

### Physiotherapy

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### ABSTRACT

A sedentary lifestyle may lead to hamstring flexibility. People who do not have physical activity and frequent exercise have a high prevalence and incidence of hamstring tightness. This experiment tries to examine the short-term efficacy of sub-occipital muscle inhibition procedure to enhance the hamstring pliability. It is an experimental study, involved 60 male and female students whose active knee extension was less than 160°. In Group A, subjects received sub-occipital muscle inhibition treatment for 6 days a week and in Group B, treatment was received six days. The subjects would be evaluated at the baseline and at the end of sixth session of the study and one month of treatment. The statistical outcome of the analysis of data proved that there was statistically significant difference between the two groups in terms of their mean in pretest Active knee extension, mean Active knee extension in final treatment session and mean post Active knee extension. The study has concluded the sub-occipital muscle inhibition method may be applicable to enhance the hamstring flexibility among college students.

### KEYWORDS

Hamstring muscle, Tightness, Sub Occipital muscle inhibition, Active knee extension.

### INTRODUCTION:

Inactivity leads to lack of hamstring flexibility, which is one of the issues associated with most individuals. This problem is attributed to a few causes such as age, gender, strength, stiffness, posture, BMI, occupation and physical inactivity. These biochemical imbalances may result into dysfunction and postural disorders that may have a very strong influence on the overall health and well-being of an individual. Significantly, these problems should be mitigated and the flexibility and movement should be enhanced in order to avoid further development of the complications.<sup>1</sup>

Some people have to sit on a length of time at their places of work and in their studies. Regrettably, this lengthy, sedentary lifestyle can result in the degradation of elasticity of the soft nature such as the muscles that cross two distinct joints. This is ultimately capable of discomforting, painful and even injuring those concerned.<sup>2</sup>

High rates and incidences of being tight in the hamstring are present in physically inactive individuals whose exercises are not regular. The prevalence of Hamstring tightness is 27.50% in males 18-25 years and 45 in females. Children aged 17-26 have learnt to sit with the hips and knees at 90 degrees flexion, which could lead to hamstring tightness. Hamstring tightness is a tightness in the hamstring, which is identified by the incapability to manage the knee more than 160 degrees, and flex the hip to 90 degrees. The tightness of the hamstring muscles may cause limitations in the movements of the knee extension and hip flexion that, in turn may result in the change of the postures of the pelvic area, including the anterior tilt and flat back.<sup>3,4</sup>

It is also possible that tight hamstring visibly causes the anterior pelvic tilt and reduce lumbar lordosis, as they connect to the ischial tuberosity. One can develop musculoskeletal overuse injuries and ultimately have an effect on his/her level of functioning due to limited flexibility. Sustained sitting may cause adverse effects on the body both in a biomechanical and physiological perspective, since half of the body muscles contract to hold the body in an immobile position, struggling against gravity, and even the non-dynamic forces are more expensive than dynamic motions. The restricted movements may lead to musculoskeletal diseases, the tightening of hamstring, joint hypomobility, nerve compression, or degeneration of the spinal disc that cause lower back pain.<sup>5,6</sup>

Tight hamstring may also lead to increased patellofemoral compressive forces at the swing phase of the gait cycle and during running that causes increased knee flexion than normal, leading to increased patellofemoral joint reaction forces. Enhancement of hamstring flexibility has been widely studied and different interventions formulated and subjected to testing.<sup>7,8</sup>

One of the most effective is working on the suboccipital muscles as it

can be achieved with the help of inhibition, stretching, myofascial release, muscle energy, soft tissue mobilization, static stretching, ballistic stretching, proprioceptive neuromuscular facilitation stretching, Mulligan bent leg raise techniques, and eccentric training. It has been established through research that Camilla's villain technique on muscle inhibition of the suboccipital can promptly enhance the flexibility of hamstring. In a study performed by Diulian M. Medeiros et al (2016), the suboccipital muscle inhibition technique does particularly well in enhancing hamstring flexibilities.<sup>9,10</sup>

SMI (suboccipital muscle inhibition) is a therapeutic method that would be very useful to provide relief of tension in the suboccipital. The muscles in question, that is, rectus capitis posterior major, rectus capitis posterior minor, obliquus capitis inferior and obliquus capitis superior, are found in between the occiput and the axis and are responsible of the body stance and head rotation control. It should be noted that a system of neural that runs through the dura mater which is referred to as the superficial backline interconnects the suboccipital muscles. In the SMI technique, the patient lying on his back, the therapist has to apply two gentle pressures on the suboccipital part in such a way that the fascia becomes relaxed. This procedure is a harmless and just way of alleviating stress and fostering the well-being of the patient, who can impressively be benefited by it.<sup>11,12</sup>

### OBJECTIVES:

This paper aims at researching the potential benefit of suboccipital muscle inhibition method in enhancing hamstring flexibility of college students in the long run. We will aim at determining the efficacy of this procedure in enhancing movement and reducing the chances of injury in this type of population.

### METHODOLOGY:

The design of the study is an experimental study design. Simple Random Sampling. A familiar sample of 60 subjects that met the inclusion criteria was obtained at Malla Reddy University, Hyderabad, India. Inclusion criteria consist of both sexes, age group 18-25 years, with hamstring tightness and a healthy normal individual, whose active knee extension is less than 160 degrees. Uncertain who are experiencing chronic low back pain, acute and chronic hamstring injury, protrusion or herniated disc, spinal deformities, acute back pains, injury of back or neck muscle tendon, history of trauma or neck fractures, whiplash syndrome. This study got ethical clearance from the Malla Reddy Institute of Medical Sciences ethical committee before starting the study (Ethical clearance number: MRIMS/DHR-IEC-PG/MPT/2023/101).

### PROCEDURE:

Study subjects that satisfied the criteria of inclusion were selected. They were informed of the research and treatment protocol and signed the consent to treatment. The Active Knee Extension Test is the test that

is conducted to evaluate the tightness of hamstring muscles. Measurement of the outcomes is done prior to and following 1 month treatment. The participants of the research are divided into two groups (randomly assigned).

#### Group A:

The subjects were exposed to muscle inhibition of the suboccipital on one occasion on 6 days. The individual was seated on his/her back in the supine posture. The participant was requested to close the eyes in the course of the session. The hands of the therapist were put beneath the head of the subject as the latter rested on his or her palms. Between the outer occipital protuberance and the vertebral axis spinous process, the fingertips of the therapist were pressed on the projection of the atlas posterior arch that was felt. To find the space, the therapist would place his middle and ring fingers on the occipital condyles and spinous process of the second cervical vertebra of both hands. The therapist would extend the metacarpal phalangeal joints to their maximum extension of 90 degrees, after which he or she would get the base of the skull on his or her hands. Atlas bone fingers will be sticking behind the spine as shown below. Up and to their head, push upwards, the pressure to the nose of their subject. Then hold this pressure for 2 minutes until relaxations take place in your tissue.

#### Group B:

The subjects were put under typical treatment for a period of 6 days and one day of treatment.

**1. Hamstring stretches in long sitting:** In this process, the patient was requested to sit in the ground, with his or her legs stretched out and back being straight. They then were requested to stretch their arms and bend on the hip joints to pick their ankles. The same was done with the other leg and no less than 3 repetitions with a holding duration of 15 seconds each repetition.

**2. Bilateral toe touching:** The therapist requested the patient to stand and place his hands on his/her hip joints in a bent-forward pose. To target the hamstring muscles in a particular position in the forward bend pose in an upright posture, the patient was requested to tilt his/her pelvis forward so as to extend his/her spine. The patient was further instructed never to bend at the back other than at the hip joints in order to make them feel their hamstring area being stretched. This exercise was done by the patient 3 rounds and 15 seconds.

#### Outcome Measures:

The flexibility of hamstring muscle can be effectively tested with the help of Active Knee Extension Test (AKE). The reason why this test is applied is to understand the probability of hamstring muscles injury. Concurrently, it is applicable in the testing of hamstring muscles tightness. This test involves active extension of the knee when dictating to the patient the end range of knee extension. The measure of the knee extension angle is performed when the hamstrings are actively eased to the end range as a measure of the hamstring muscles on the AKET.

#### Statistical Analysis:

In this research, data was analysed using the various statistical applications. In the case of categorical variables, a frequency and a percentage were established to have an idea about the distribution of the data. The continuous variables were addressed by giving mean and standard deviation to give a picture of the central tendency and dispersion of the data. The data were tested normally using the assistance of the Shapiro-Wilk test. The repeated measures Analysis of Variance was done to test whether there was a significant difference in the three means. The student t-test was used to test whether the difference between the two means was significant or not. Chi-square test was used to test the relationship between variables, where the variables were in the form of categorical variables. All statistical analysis was done with the use of the 26th version of the Program known as SPSS. p-value was considered to be statistically significant, and the likelihood of having the deviations obtained by mere chance was very low when the p-value was below <0.05.

## RESULTS:

**Table 1.1: Left Side Mean Pre AKE Comparison Between Groups**

AKE pre-test Left	Un-Paired t-test			
Group	Mean	SD	t value	P value
Group A	140.20	4.68	4.583	<0.001
Group B	134.83	4.38		

According to Table 1.1, it is possible to realize that the mean of all of

Group A on the left-hand side was equal to 140.20 (standard deviation is 4.68), and the mean of Group B was equal to 134.83 (standard deviation is 4.38). It was found that the difference between the mean pretest AKE of Group A and Group B was statistically significant.

**Table 1.2: Right Side Mean Pre AKE Comparison Between Groups**

AKE pre-test Right side	Un-Paired t-test			
Group	Mean	SD	t value	P value
Group A	142.33	5.35	4.095	<0.001
Group B	137.37	3.94		

According to Table 1.2, it has been stated that the resulting mean pretest AKE on right side of Group A was 142.33 (the standard deviation was 5.35) and that of Group B was 137.37 (the standard deviation 3.94). Moreover, it was established that group means difference between group A and group B is statistically significant.

**Table 2.1: Left Side Mean 6<sup>th</sup> Day Of Treatment (Last session) AKE Comparison Between Groups**

6 <sup>th</sup> DAY OF TREATMENT (Last session) - Left side	Un-Paired t-test			
Group	Mean	SD	t value	P value
Group A	142.80	4.72	4.518	<0.001
Group B	137.47	4.42		

According to Table 2.1 we have seen that mean AKE of last treatment session (6th day) of left side in Group A was noted to be 142.80 ( $\pm 4.72$ ), and in Group B was 137.47 ( $\pm 4.42$ ). It would be worth noting that in the same way, there was a statistically significant difference among the two groups.

**Table 2.2: Right Side Mean 6<sup>th</sup> Day Of Treatment (Last session) AKE Comparison Between Groups**

6 <sup>th</sup> DAY OF TREATMENT (Last session) - Right side	Un-Paired t-test			
Group	Mean	SD	t value	P value
Group A	144.57	4.58	4.244	<0.001
Group B	139.77	4.17		

According to Table 2.2, it is evident that the resultant average AKE during the final session of 6th day of treatment, based on Group A, was 144.57 (4.58) and that based on Group B was 139.77 (4.17). The variation between the two groups was statistically significant.

**Table 3.1: Left side Mean post-AKE (After 1 Month)-AKE Comparison Between Groups**

POST AKE (After 1 Month)-LEFT side	Un-Paired t-test			
Group	Mean	SD	t value	P value
Group A	145.53	4.75	4.707	<0.001
Group B	140.13	4.12		

According to the table 3.1, it can be observed that the average of post AKE (after 1 month), in left side in Group A was 145.53 (4.75), and in Group B, was 140.13 (4.12). The statistical significance of the difference between the groups was discovered.

**Table 3.2: Right Side Mean Post-AKE (After 1 Month)-AKE Comparison Between Groups**

POST AKE (After 1 Month)-Right side	Un-Paired t-test			
Group	Mean	SD	t value	P value
Group A	147.30	4.74	3.878	<0.001
Group B	142.73	4.38		

Based on Table 3.2, it was noticed that Group A gave a mean result of 147.30 (4.74) on post AKE (after 1 month) on right side, and that Group B gave a result of 142.73 (4.38). The correlations of the two groups were statistically significant.

## DISCUSSION:

The most common muscle that tightens is the hamstring, and the tightness in the hamstring is very common among the college population, where the age group 18-25 years is less literal, but 68% of the people are prone to the same. Therefore, hamstring stretching should be known to prevent the musculoskeletal issues of the lower quadrant. The myofascial chain, i.e. superficial back line which consists of hamstring and suboccipital muscle. The positive outcome

of treating any of the structures in the superficial backline could be extended to the line itself. In case of the tension present on the chain of myofascial will result in limitation of both the hamstring and suboccipital muscles, which belong to the Posterior myofascial chain. The concept of lengthening and maintaining the position of a muscle in the stretched state to improve flexibility, increase the range of motion of joints, reduce tension in muscles, and promote the mobility of their joints is called Static stretching. In this experiment the pre-test AKE means of both groups were compared in left and right. The finding indicated that there was a statistically significant difference between the two groups. The evidence of a massive difference in mean values between two groups (Group A and B) in the final treatment session was also present in Table 2.1. In the same way, Table 2.2 indicated that the mean AKE in Group A and Group B was significantly different during the final session of the 6th day of treatment. Further, the mean values of post-AKE on the right and left sides were compared between Groups A and B. The outcomes showed that there is a statistically significant difference between the two groups, which implies that there is an apparent difference between the success of the treatment in the two groups. One of the objectives of the present study was to be aware of long-term outcomes in suboccipital muscle inhibition technique on hamstring flexibility among college students. Group A used suboccipital muscle inhibition strategy and Group B used the traditional treatment method which lasted 6 days and one session of treatment per day. An active knee extension test was done on the tightness of the hamstrings before the treatment protocol was initiated. These values are supposed to be made prior to the treatment, on the sixth day of the treatment, and after 1 month of the treatment, in both groups to determine which group recorded high effectiveness. In addition, suboccipital muscle inhibition has a neurological stimulant on the proprioceptors and the mechanoreceptors that create feedback to the central nervous system that controls positions and movements of the head and neck. The state of relaxation which is caused by this technique can also be capable of affecting the autonomic nervous system and create a state of relaxation and stress elimination. Along with these pluses, the suboccipital muscle inhibition might have a long-term positive outcome on the posture, as it has the ability to resolve some of the issues or symptoms of the musculoskeletal. The limitations in this study include some weaknesses. i) The control sample is an unequal number of males and females, which could introduce gender effects in the study. ii) This study was conducted in a college environment and cannot be extrapolated to elderly and athletes. iii) This study lacks the question of following up the compliance of people to interventions.

## CONCLUSION:

The improvements of the knee extension in both groups were great at different time points. Nevertheless, Group A scored higher than Group B in AKE measurements, with some incidences indicating that intervention was more effective on those. The conclusion of the study is the intervention was positive in both groups, though Group A displayed more significant changes in knee extension. Limitations to further research with respect to this study: i) Long-term follow-up of the study, ii) Expand the study to incorporate the utilisation of alternative age groups and physical activity levels.

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