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Immediate Effect of Suboccipital Muscle Inhibition Technique Versus Hip Hinge Exercise Stretching on Individuals with Hamstring Tightness - A Randomized Clinical Trial

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ABSTRACT

Objective: To compare the immediate effect of suboccipital muscle inhibition technique and hip hinge exercise stretching on individuals with hamstring tightness. [Method] 42 individuals with hamstring tightness were assigned to two groups: Group A, which received the suboccipital muscle inhibition technique, and Group B which received the hip hinge exercise stretching. Active knee extension test [AKET] was taken as an outcome measure.
Results: Analysis of data was done using nonparametric test. The data within the group was analysed using Wilcoxon signed rank test. Between group the data was compared with Mann-Whitney U test. The outcome was determined to be statistically significant (p value 0.000) for both groups. Inter group analysis revealed p value <0.05.
Conclusion: Both, Suboccipital muscle inhibition technique and hip hinge exercise stretching have an immediate effect on the flexibility of hamstring muscle. However, hip hinge exercise stretching was more effective in increasing hamstring flexibility.

Keywords: Hamstring tightness, suboccipital muscle inhibition, hip hinge exercise, active knee extension test.

INTRODUCTION

Flexibility allows one or more joints in a sequence to move through their range of motion. Flexibility is just as important in physical conditioning programs, as muscle strength and endurance training. Flexibility improves the tissue's ability to withstand stress, absorb shock, and allow for more efficient and effective movement, all of which contribute to reduce or prevent damage.[1] One of the most common muscles to become tight is hamstring.[2] In addition to contributing to a decreased range of motion, hamstring tightness can also result in a number of different musculoskeletal impairments. Shortening of the hamstring muscles adversely affects pelvic posture and increased stiffness in these muscles can contribute to lower back pain. Greater stiffness in the hamstrings increases strain on the back and leads to improper movement patterns in the lumbopelvic region.[3] In clinical practice, hamstring muscle length is assessed indirectly through angular measurements of hip flexion with the knee extended, rather than by direct

measurement. Active knee extension test (AKET) is considered the benchmark for measuring hamstring muscle length, demonstrating good to excellent interrater (0.886) and intrarater (0.882) reliability for assessing hamstring muscle length.[4] The suboccipital muscle inhibition (SMI) technique involves application of soft pressure on the suboccipital region to promote relaxation of the fascia.[3] It has been shown that when the tone of the suboccipital muscle declines, the myofascia relaxes, resulting in a reduction in the tightness of the hamstrings.[5] The hip hinge exercise stretching involves an eccentric contraction while also activating the prime movers (quadriceps) and the antagonist (hamstrings).[6] Dynamic stretching was reported to quickly improve knee range of motion.[7] Several research studies have shown that different methods can enhance hamstring flexibility. Studying the effects of treatment on the local area, which is being treated and distant region is crucial. Hence, this study aims to compare the immediate impact of SMI and hip hinge exercise stretching on hamstring flexibility.

MATERIALS & METHODS

A total of 42 individuals were enrolled using purposive sampling method for this randomized trial. After screening, 2 individuals were excluded and 40 individuals who met the inclusion criteria were selected for the study. The inclusion criteria were as follow: Individuals with positive 90-90 straight leg raise test with hamstring tightness exhibiting an active knee extension of less than 125 degrees, age group 18 to 26 years, gender - both male and female and willingness to participate in the study. Participants were excluded if they had a history of trauma in neck and back, individuals with cervical and/or lumbar prolapsed intervertebral disc, individuals with neurological disorders, knee flexion contracture, history of trauma to hip, knee and back, individuals with surgeries of lower limb. The participants were divided into two groups through a simple randomization method involving flipping a coin. Group A was given a single session of SMI, whereas group B received a single session of hip hinge exercise stretching. A blinded assessor evaluated the AKET before and immediately after the intervention, unaware of which group the participants belong to. The AKET was performed with the participant in supine position with hip flexed to 90 degree and the goniometer was used to assess their active knee extension. The goniometer was positioned so that the moveable arm pointed towards the lateral malleolus along the tibial shaft, with the lateral knee joint line as fulcrum and the non-movable arm pointed towards the greater trochanter along the femoral shaft. The participants were asked to extend the knee actively and popliteal angle was measured with goniometer. For AKET three readings were taken and the average was determined. The research was approved by Institutional ethical committee. All participants received detailed information about the study's goals, and their informed consent was obtained. They were also informed about the significance of maintaining the confidentiality of their data and had the choice to withdraw from the study at any time.

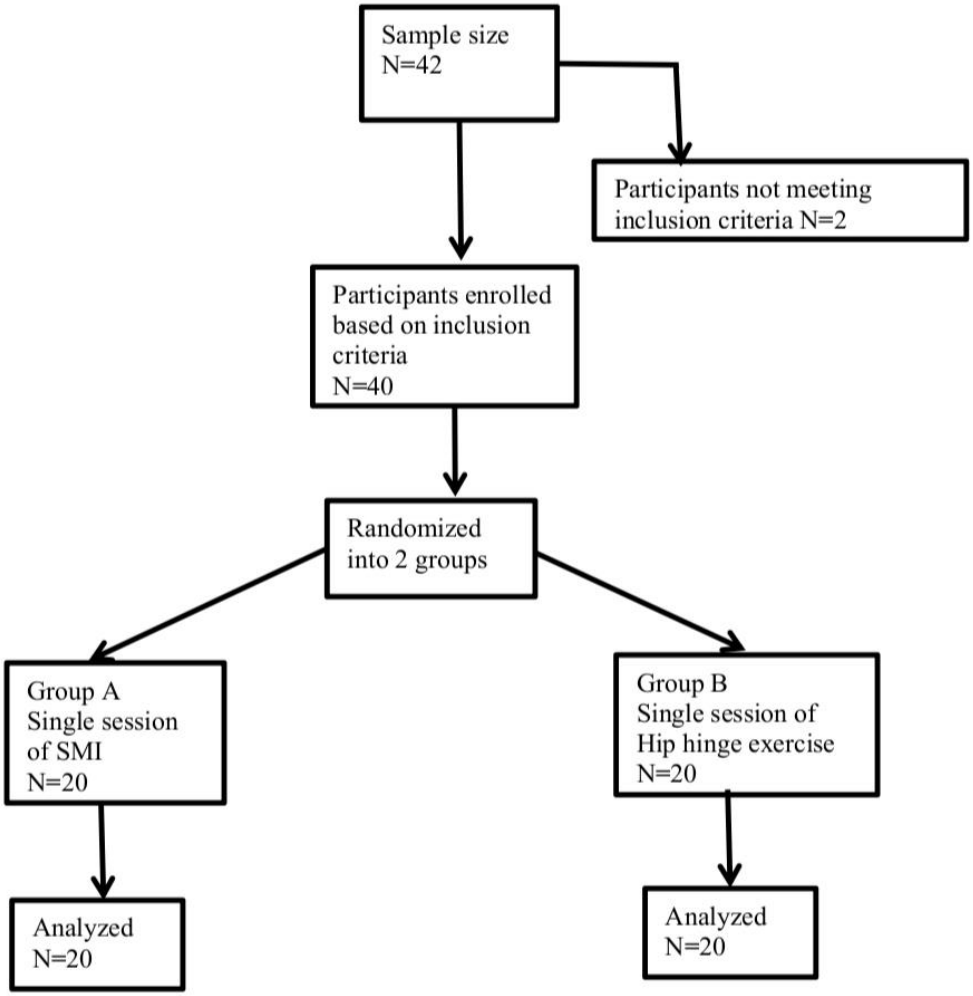

Figure 1: Flow diagram of the study.

Intervention:

Group A received SMI (Suboccipital muscle inhibition) technique. The SMI technique was conducted while the participant was in supine lying position. The therapist positioned their hands under the participants occiput and applied upward pressure over the atlas, the first cervical spine, towards the participants nose. The SMI technique was applied in a single session lasting for 5 minutes. Group B participants received hip hinge exercise. The hip hinge exercise involves dynamic active stretching. The participants were instructed to start by standing barefoot with feet positioned shoulder width apart. Bend the knees for about 10-15 degrees, ensuring that the knee do not shift forward or inward. Then, with the pelvis tilted forward, gradually lean upper body forward, until the limit of hip flexion. From this position, raise your arms overhead, then return to the starting position by extending your arms forward and backward. The hamstring muscles were stretched with an extension of knee joint and the upper body was emphasized to be in straight line. A single session of 10 repetitions was given with a break of 15 seconds between each repetition.

STATISTICAL ANALYSIS

SPSS version 26.0 was used to analyze the data with confidence interval set at 95%. P-value less than 0.05 was considered statistically significant. The Shapiro-Wilk test was used to assess the normality of data.[8] The data was analysed using nonparametric test, Wilcoxon signed rank test was applied within group and between group, the data was analysed with Mann Whitney U test.

RESULT

Table 1 demonstrates the basic demographic of the participants with a mean age of 20.9±1.41. Both the groups were similar at baseline.

Gender	Group A	Group B	Mean ± SD
Male	8	5	
Female	12	15	
Age			20.9±1.41
BMI			20.43±1.03

Table 2. A significant change in result was found with p value 0.000 for within group analysis for AKET.

Group	Pre-intervention	Post- intervention	p value
	Mean ± SD		
Group A (SMI)	113±1.05	123.6±3.02	0.000
Group B (HHE)	113.4±1.42	128.7±3.54	0.000

Table 3 shows a mean difference in AKET of 10.45 ± 2.96 and 13.72 ± 3.88 in SMI and HHE group respectively with a statistically significant difference (p<0.05).

Outcome	Group A (SMI)	Group B (HHE)	p value
AKET	10.45 ± 2.96	13.72 ± 3.88	0.03

DISCUSSION

The aim of this study was to evaluate the immediate effects of the suboccipital muscle inhibition technique and hip hinge exercise stretching on flexibility of hamstring muscle. The data analysis revealed that both group A and group B improved significantly. While, intergroup comparison however, showed that group B, which received Hip hinge exercise stretching, had a more significant effect on the flexibility of the hamstring muscles than group A, which received suboccipital muscle inhibition technique.

Insufficient flexibility is the primary cause of muscular strain injuries.[5] A single session of suboccipital muscle inhibition technique causes an improvement in hamstring flexibility. The suboccipital muscles act as "proprioceptor monitors" that play a crucial role in regulating posture and contain the highest number of muscle spindles in the human body. The SMI techniques might enhance hamstring flexibility, potentially due to the relaxation of the superficial back line through the relaxation of the suboccipital muscles. According to Schleip, reducing the tone of the suboccipital muscles - either through passive fascial treatment or active movements - would increase hamstring length due to myofascial relaxation. This is linked to the fact that the hamstrings and suboccipital muscles are part of a continuous neural system that traverses the dura mater.[9] There has been a moderate correlation between hamstring stiffness and pelvic tilt movement, possibly because the hamstring muscle pulls the pelvis into a posterior rotation. The study indicated that hip hinge exercises not only effectively helped restore pelvic movement but according to Iwata and Yamamoto, dynamic stretching also immediately enhanced knee extension range of motion and reduced hamstring stiffness.[7] One limitation of this study is limited sample size. Therefore, future study should focus for larger-scale studies.

CONCLUSION

The study concludes that both Suboccipital muscle inhibition technique and hip hinge exercise stretching have an immediate effect on the flexibility of hamstring muscle. However, hip hinge exercise stretching was more effective in increasing hamstring flexibility.

Declaration by Authors

Ethical Approval: Approved

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Conflict of Interest: The authors declare no conflict of interest.

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