Original Article

A COMPARISON OF IMMEDIATE EFFECTIVENESS OF PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION HOLD RELAX VERSUS SUBOCCIPITAL MUSCLE INHIBITION TECHNIQUE ON HAMSTRING TIGHTNESS IN UNIVERSITY STUDENTS

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Abstract

Objective: The study was carried out to determine and compare whether there is any difference between the immediate effectiveness of Proprioceptive Neuromuscular Facilitation (PNF) Hold Relax Technique and Suboccipital muscle inhibition Technique on reducing the hamstring tightness in healthy university students.

Study design: It was a Randomized Controlled Trial study.

Place and duration of study: The study was conducted at ARID agriculture university and Center of Advanced Studies in Health and technology (CASHT) for duration of 5 month from December 2023-April 2024

Material and Methods: The study was approved by the ethical review committee of Advanced Studies in Health and technology (CASHT) institute, Pakistan (CASHT/IRB/2024/40). Data was collected from 44 students by using convenient sampling technique. The sample size was calculated using the Open Epi Tool. Data was collected by using a Universal Goniometer before and immediately after the intervention. Patients who met the inclusion criteria and gave informed consent were included in the study. According to the inclusion criteria the following factors were taken into consideration. The age of the participants should be from 18 to 30 years, subjects must be having SLR less than 80 degrees, both genders can participate. The participants were randomized into two groups: Group A & Group B. Group A received the Propioceptive Neuromuscular Facilitation Hold Relax Technique while Group B received the Suboccipital Muscle Inhibition Technique.

Results: SPSS version 22 was used for data analysis. Improvement was evident in both groups regarding immediately reducing tightness of the hamstring and the difference found between the two groups is insignificant i.e ($p>0.05$)

Conclusion: The Suboccipital Muscle Inhibition Technique and Proprioceptive Neuromuscular Facilitation Hold Relax technique both were found to have equal effectiveness in immediately decreasing hamstring tightness and improving muscle flexibility in university students.

Keywords: Proprioceptive Neuromuscular Facilitation Hold Relax Technique, PNF, Suboccipital Muscle Inhibition Technique, Hamstrings Tightness, Universal Goniometer.

1. Introduction

The hamstrings are one of the most common muscle groups that undergo shortening, which can significantly affect the normal biomechanics of the musculoskeletal system, leading to a range of problems, including poor posture, limited mobility, and increased risk of injury or chronic pain.[1] The hamstring muscle is a whole complex, including the biceps femoris, semitendinosus, semimembranosus, and the hamstring component of the adductor magnus.[2] Full-range contraction and stretching rarely occur in normal daily life activities. Therefore chances of tightness are higher. So it is a common condition among the population.[3] Tightness of hamstring muscles is defined as a limitation in performing extension at the knee joint with a flexed hip or vice versa.[4] Tightness is evident when the contractile and non-contractile units of muscles undergo an alterable shortening.[5] Hamstring tightness influences the lumbopelvic rhythm.[6] It also influences sacroiliac joint stability indirectly.[7] Hamstring tightness can cause musculoskeletal problems, including back pain and muscle injuries.

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College students (18-25) are particularly susceptible. This condition also increases the risk of Scheuermann disease, disc herniation, and other mobility issues.[8,9,10] Tightness can occur due to many reasons like injury to the muscle, and prolonged sitting hours, include genetic factors, acute or chronic injuries, adaptive shortening, and sedentary lifestyle, which are part of different jobs and educational setups.[11] It generally affects both males and females.[12] But according to reports, the prevalence of hamstring tightness is significantly higher among females, affecting 45% of this population, compared to males, who experience an incidence rate of 27.50%.[13] Treatment plans suggestive to reduce tightness include Stretching programs, active range of motion exercises, Passive stretching, matrix therapy neurodynamic treatment, neural mobilization, self-myofascial release, prolonged stretching combined with shortwave diathermy, Dynamic soft tissue mobilization (STM), Ultrasound therapy.[14-20] Among the stretching methods, passive and active stretching techniques are very useful exercises.[21] In the hold relax PNF technique, the muscle performs an isometric contraction against resistance and is proven for its effectiveness to improve ROM at a joint.[22] Hold Relax refers to facilitating nerve-muscle proprioception and active inhibition, which is used to increase the length of muscles.[23] The mechanism by which this technique acts is through relaxing Golgi tendon organs.[24] and by myofibrillogenesis. Stretching also affects neuromuscular transmission. Isometric contraction may stimulate the GTOs, causing them to reflexively relax.[25] In the Suboccipital muscle inhibition technique, the decrease in tension of the suboccipital muscles leads to relaxation of the superficial backline owing to the large number of neuromuscular bundles present in that particular muscle group. These are called "proprioceptor monitors" because of their contribution to regulating the posture of the head. Soft traction removes the muscle barrier by repeatedly straining and relaxing, like "peeling an onion". Relaxation of fascia requires proper pressure, applied at the area of fascia limitation. "the end-feel" and soft tissue extension.[26] Various physical therapy interventions have been suggested for reducing tightness of the hamstring and improving the hip straight leg raising (SLR) range. The Proprioceptive Neuromuscular Facilitation Hold Relax technique restores the flexibility of the hamstring at the hip joint. suboccipital muscle inhibition technique also improves the hamstring flexibility and SLR range however, evidence of comparison regarding the instant effectiveness of the suboccipital muscle inhibition technique versus the Proprioceptive Neuromuscular Facilitation Hold Relax technique is sparse, also the methodological design is very limited as well. This study aims to compare two techniques, the Proprioceptive Neuromuscular Facilitation Hold Relax technique versus the suboccipital muscle inhibition technique based on their immediate effectiveness in decreasing hamstring tightness in university students.

2. Materials & Methods

The Randomized Control Trial was conducted at ARID agriculture university and Center of Advanced Studies in Health and technology (CASHT). The study was approved by the ethical review committee of Advanced Studies in Health and technology (CASHT) institute, Pakistan (CASHT/IRB/2024/40). The total sample size was 44 with 22 patients in each group. The sample size was calculated using the Open Epi Tool.[27] The duration of the study was 5 months from December 2023 to April 2024. Non-probability convenient sampling was used to enroll participants according to inclusion criteria and then subjects were randomly allocated into two groups by sealed envelope method. Participants who met the inclusion criteria and gave consent were included in the study. And others were exempted. Participants, both male and female between the age group 18-25 years having SLR less than 80 degrees were included. Participants with previous lumbar, hip, and knee surgery, hamstring injury in the past 2 years, Acute severe low back pain, or History of participation in a stretching or yoga program in the last six months were excluded from the study. Subjects were divided randomly into two groups A and B with 22 subjects in each group. Group A received the Proprioceptive Neuromuscular Facilitation Hold Relax Technique and Group B received the Suboccipital Muscle Inhibition technique. Prior consent was taken from all the

participants before inclusion in the study after a comprehensive explanation of the aims and procedure of the study. 60 subjects were screened out of which 44 subjects met the inclusion criteria and were recruited into the study.

Group A received the PNF Hold Relax Technique for the hamstring with 5 repetitions. The hamstrings of the subject were stretched until he first reported a mild stretch sensation and held that position for 7 seconds. Next, the subject was asked to maximally isometrically contract the hamstrings for 7 seconds by attempting to push his leg back toward the table against the resistance of the investigator. After the contraction, the subject was asked to relax for 5 seconds. Then muscles were stretched passively until a mild stretch was felt by the subject.

Group B received the Suboccipital Muscle Inhibition technique. The therapist placed the palms of the hands under the subject's head, with his fingers on the posterior arch of the atlas, with the metacarpophalangeal joints in 90º flexion, and the therapist rested the base of the skull on the hands. Pressure was exerted upward and toward the therapist. The pressure was maintained for 2 minutes until tissue relaxation had been achieved. The subject underwent 5 repetitions of this technique with a rest interval of 5 seconds between each consecutive repetition. Hamstring flexibility was measured by checking the active range of SLR through Goniometer. The data was collected at baseline and then immediately after application of treatment techniques. Statistical Package for Social Sciences (SPSS) version 21.0 was used for the statistical analysis of data and results were presented in the form of tables. Shapiro-Wilk test was used to assess the normality of the data. The data was normally distributed so an independent sample t-test was used for between-group analysis. P-values of <0.05 were considered significant.

3. Results

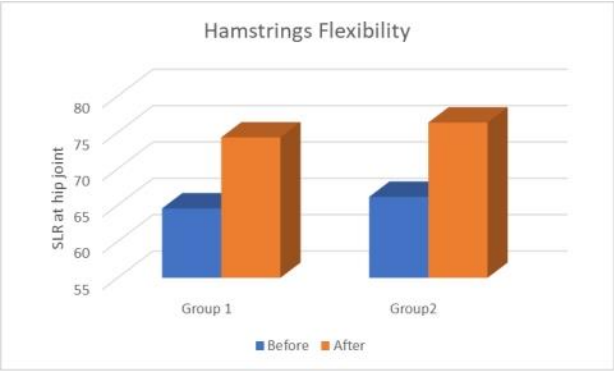
Out of 44 participants (11 males and 33 females). The mean values of age in Group A(22 years) and Group B(23 years) were compared, which was calculated as 23 years. P value was calculated for between-group analysis using an independent sample t-test which turned out to be >0.05. This shows that both techniques are equally effective. The study reports the mean difference values between the groups, with corresponding 95% confidence intervals, at two points in time: baseline (pre-treatment) and immediately post-treatment, setting the base for a comparative analysis.

Table 1: The comparison of the PNF Hold Relax Technique and Suboccipital Muscle Inhibition Technique is made on the measures of Hamstring flexibility during SLR at hip joint

Variable	Time duration	Group A (n=22) Mean±SD	Group B (n=22) Mean±SD	P-Value
Hamstring flexibility at Hip during SLR	Baseline	64.55 ± 10.225	74.32 ± 9.549	>0.05
	Post Treatment	74.32 ± 9.549	76.36 ± 9.021	

Hamstring flexibility during SLR at hip joint in group A was 64.55 ± 10.225 that was improved to 74.32 ± 9.549 after application of PNF hold relax. While after application of suboccipital muscle inhibition, it was improved to 76.36 ± 9.021 from 74.32 ± 9.549 in group B. P-value was >0.05.

Graph1: A comparison of the Hold Relax Technique and Suboccipital Muscle Inhibition Technique is made on the measures of SLR Pre-Treatment and Immediately after treatment.



Graph showing that Both proprioceptive Neuromuscular Facilitation Hold Relax technique and Suboccipital Muscle Inhibition Techniques are effective in the immediate improvement of Hip ROM (SLR), while no evidence was found for the superiority of one technique over the other.

4. Discussion

The study undertakes a comprehensive comparison of the effectiveness of two distinct techniques PNF Hold Relax and Suboccipital Muscle Inhibition in addressing hamstring tightness. Our rigorous study revealed that the difference in their immediate effects was insignificant. Furthermore, our findings align with previous studies that have consistently highlighted the interventional significance of these techniques in managing muscle tightness. A study conducted by Hashim Ahmed et al. compared the efficacy of hold-relax versus static stretching techniques, aiming to determine which approach is superior about producing more improvement in range of motion and flexibility. They concluded that hold-relax stretching demonstrates significant immediate effects in enhancing hamstring flexibility, showcasing its potential as a valuable tool for improving range of motion and reducing muscle stiffness.[28] Similarly, Gabriel Augusto Elesbao Bernardes Sbardelotto et al conducted a randomized trial aimed at comparing hold-relax PNF and lumbar mobilization on increasing flexibility in the hamstring of young, healthy adults. The intervention was delivered in an individualized manner, with each participant receiving face-to-face treatment on a one-on-one basis, and all participants benefiting from an interventional program that included unilateral lumbar mobilization, PNF hold-relax stretching, and control, which were carefully performed and monitored to ensure optimal treatment outcomes and accurate assessment effects of the interventions. Results demonstrated superior effectiveness of the Proprioceptive Neuromuscular Facilitation (PNF) hold-relax technique in enhancing hamstring flexibility compared to Lumbar mobilization immediately following the intervention.[29] Sung Hak Cho et al. conducted research to compare self-myofascial release (SMFR) versus suboccipital muscle inhibition (SMI) techniques to improve hamstring flexibility. They concluded that SMI has superior effectiveness compared and SMFR.[30] In the study of Jeong, Eun-Dong et al. comparing the effectiveness of the craniocervical flexion versus suboccipital muscle inhibition technique exercise on the flexibility of the hamstring also proved that the SMI technique improved SLR test results and is effective in instant improvement of the hamstring flexibility.[31] Also, a study by Namrata Sojitra et al. on the Immediate Effectiveness of Muscle Energy Technique versus the Suboccipital Muscle Inhibition Technique on hamstring flexibility concluded that although the muscle energy technique was effective, In addition, the suboccipital muscle inhibition technique also found to be significantly effective to improve hamstring flexibility in healthy college going adults.[32] but the techniques that were compared in our study show no significant advantage of using one technique over the other because both were found to have equal effects but individual effectiveness is supported by the studies that have been carried out in past. Our study compared two treatments with already proven individual efficacy, emphasizing the degree of effectiveness that they both carry, and proved them to have equal effectiveness, resolving prior uncertainty about their relative efficacy. The study is beneficial for future researchers in the following aspects.

1. The question of comparing these two techniques in terms of their comparative effectiveness has been dealt and shall not be a concern for future researchers. This contribution to the existing literature about the efficacy of these techniques paves the way for future researchers to progress beyond this query, enabling them to discover more relevant techniques. For example, future studies can investigate: The effectiveness of these techniques over a prolong period of time, The efficacy

of other relevant interventions, The physiological mechanisms that make the basis for these techniques to work, The applicability of these techniques in a variety of sample populations, If technique A is contraindicated for a particular subject, he/she can be treated via technique B.

Conclusion:

The Proprioceptive Neuromuscular Facilitation Hold Relax technique and the (SMI) Suboccipital Muscle Inhibition Technique have equal immediate effectiveness in improving hamstring tightness in university students. The limitations of the study are that No long term follow up of patients was done after the intervention stopped to determine the maintenance effects, Lack of resources, Poor compliance of the patient with home plan provided number of participants could be increased, other effective techniques could be compared as well.

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