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RESEARCH ARTICLE

Comparison of post isometric relaxation and post facilitation stretching techniques on hamstring muscle flexibility in collegiate athletes: A randomized clinical trial

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ABSTRACT

Background: The multi-jointed nature of the hamstring muscles causes them to shorten which impacts the biomechanics of the pelvis and lumber region. Hamstring tightness is more common in women than in males.

Objective: To compare the effect of post-isometric relaxation and post-facilitation stretching in improving hamstring muscle flexibility among collegiate athlete's athlete.

Methods: Study was a randomized clinical trial. Patients following the inclusion criteria from Pakistan Sports Board, Lahore were categorized in two groups; group A and group B. Male patients aged from 18 to 35 years, with a history of hamstring muscle tightness (bilateral) or acute hamstring injuries were included. Group A was treated with post isometric relaxation and conventional treatment while group B received post facilitation stretching and conventional treatment; for 4 weeks and with 3 sessions per week. The baselines data was taken for range of motion, sit and reach test, active knee extension test, and straight leg raise and lower extremity functional scale.

Results: There were a total of 17 male volunteers in each group. Group A's mean age was 28.58±3.9, years whereas group B's mean age was 29.25±4.4 The groups' respective Lower Limb Functional Scores (LEFS) were 58.41±4.84 in group A and 40.52±2.85 in group B, with a p-value of less than 0.05. Lower limb functional score (LEFS) within the groups with p <0.05 was 22.17±8.63 and 40.52±2.85.

Conclusion: The current investigation found that post-isometric relaxing and stretching both improve hamstring flexibility.

Clinical Trial Number: NCT05727501

Keywords: Flexibility, Hamstring, Muscle Energy Techniques, Post Facilitation Stretching, Post Isometric Relaxation, Sports, Strain.

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Introduction:

Flexibility is important for both everyday physical fitness and for athletes like players, gymnasts, and runners. Enhancing physical activity and lowering injury risk are achieved through body fluid movement, which depends on flexibility. Flexibility refers to a muscle's ability to extend.(1) It is believed that if the muscle is not stretched, it will get stiff and may even snap. To move more easily, one must be flexible.(2)

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The tightness or shortness of the muscles is frequently examined by the therapists to determine flexibility.(3) Among the muscles involved in lower limb flexibility are the hamstrings, quadriceps, and calf muscles; among which hamstring injuries are the most common. The decreased flexibility of the hamstring muscles alters the mechanics of the lumbopelvic region and lower extremities.(4) Tight hamstring muscles have an effect on the patellofemoral joint, planter fascia, lumbopelvic rhythm, and pelvic tilt. For maintaining proper posture, the hamstrings are crucial.(5) Hamstring shortening or tightness affects posture and may aggravate musculoskeletal pain.(6)

The lower extremities' two-jointed hamstring muscle is a tonic muscle. The hamstring's flexibility is essential to body's biomechanics. The multi-jointed architecture of hamstring muscles makes them stand out for their greater propensity to shorten, and hamstring shortening can have an impact on the biomechanics of the pelvis and the lumber region.(5) Disrupted biomechanics can lead to irregularities in lumbo-pelvic rhythm, low back pain, and increased nerve stress. Furthermore, reduced flexibility has an impact on the efficiency and standard of basic movements. Most individuals with hamstring tightness are in decent physical condition. Hamstring tightness is more prevalent in women (45%) than in men.(7)

There are various hamstring strains that have been described, each with a unique mechanism of injury. Type I acute hamstring strains can occur when sprinting quickly.(8) In the terminal swing phase of running, the hamstring muscles have been shown to eccentrically contract to slow the swinging limb and to get ready for food impact.(9) The long head of the biceps femoris, which is close by the proximal muscle-tendon junction, is the site where type I hamstring strains most frequently occur. On the other hand when hamstrings have become too long, type II hamstring strains happen.(10)

Fred Mitchell, Sr., D.O. introduced a technique in 1948 that he named Muscle Energy Technique (MET). This type of manual therapy, which is commonly employed in osteopathic treatment, is built on the body's innate capacity to stretch and relax muscles through autogenic or reciprocal inhibition.(11) Autogenic inhibition METs is based on the concept of autogenic inhibition. Two basic and well-known MET kinds that utilize the concept of autogenic inhibition are post-isometric relaxation (PIR) and post-facilitation stretching (PFS). The pain can be reduced by stretching short muscles and fascia, strengthening weak muscles, moving joints, and enhancing muscle tone and circulation and applying multiple approaches on patients.(12)

Alashram et al in 2020, conducted a study to check the end results of three discrete stretching regimes on hamstring muscle flexibility in professional soccer players. During the first four weeks of the precompetitive season, 24 professional soccer players were allocated to one of three groups: static stretching, whole-body vibration stretching, or global postural re-education (N = 8). Study explained that while static stretching techniques, whole-body vibration (WBV) stretching, and global postural reeducation techniques (GPR) all increase hamstring muscle flexibility, only static stretching on WBV retains the outcomes over time in professional soccer players.(13)

Post isometric relaxation and post facilitation stretching strategies are effective in improving hamstring flexibility. The muscle energy technique, which is based on the principle of autogenic inhibition, has been shown to be beneficial in the rehabilitation process for lengthening shortened muscle tissue. However, the effectiveness of these techniques has only been compared in a small number of studies, and even fewer have been conducted on Pakistani college students. Therefore, this study compares PIR and PFS in an effort to determine the efficacy of muscular energy strategies on hamstring tightness.(14)

A study included 20 male college students of age 18–24 years who were randomly allocated in one of the two groups. For eight weeks, each participant engaged in physical activity three times each week. Testing for agility, speed, and isokinetic strength was done both before and after the two therapies. The length of semimembranosus and biceps long head of participants in the flexibility group considerably increased ($p=0.026$), and peak muscular exertions in all three hamstring group muscles significantly decreased ($p=0.004$). While sprinting, participants in the strength-regime group experienced less peak muscular strain ($p = 0.017$), and their optimal musculotendinous lengths across all three hamstring muscles increased ($p = 0.041$). They discovered that for recreational male athletes, reducing hamstring injury risk may be achieved by enhancing hamstring flexibility or strength with the aid of an exercise programme. The effects were evaluated using paired t tests.(15)

Bowen technique in comparison of muscle energy technique on asymptomatic members having hamstring tightness and they concluded that performing three alternate sessions of Bowen technique and muscle energy technique was successful in improving of hamstring flexibility, ROM, and strength. When tested using popliteal angle, the group that received treatment with the Bowen technique showed more success in increasing flexibility and ranges. By the end of the third treatment session, the muscular energy technique group had improved more in terms of hamstring muscle strength.(16) These are the studies that demonstrated how other exercise regimens and stretching techniques can affect hamstring flexibility. As a result, more research is required to focus on hamstring muscle for flexibility and injury prevention.

The main objective of this study was to compare post-isometric relaxation and post-facilitation stretching strategies in order to find an efficient method for increasing hamstring flexibility. There are few studies comparing the efficacy of these techniques. The muscle energy technique, which relies on the autogenic inhibition theory, has been shown to be effective in rehabilitation for elongating shortened muscle tissue. Numerous studies have been conducted on acute hamstring injuries, as well as hamstring tightness and flexibility, using various treatment modalities and regimens for rehabilitation. However, there isn't much data comparing post-isometric relaxation and post-facilitation stretching procedures in the recent five years' worth of literature reviews. Consequently, more research is required to address a related technique and strategy for hamstring flexibility. Therefore, this study compares PIR and PFS in an effort to determine the effectiveness of muscular energy strategies on hamstring tightness

Methods:

It was a randomized control trial with Clinical Trial ID NCT05727501. In this study the patients were blinded for their treatment group allocation. The data was collected from Pakistan Sports Board, Lahore. The study received approval from the ethical board on April 25, 2022 and was cited with reference number REC/RCR&AHS/22/0442 from Riphah University Lahore. The participant's consent was obtained prior to the commencement of the study. 34 people in total participated in the study using the simple random sample procedure, with even and odd reference numbers assigned to groups A and B, respectively. Group A was treated with Post Isometric Relaxation (PIR) and Group B with Post Facilitation Stretching (PFS). Male were included in the study aged between 18 to 35 years and athletes with hamstring muscle tightness (bilateral) or acute hamstring injuries. The selection of the participant age range was made because the athlete is more engaged in the game at this age. The study included participants who failed the 90/90 straight leg raising test, which was used to confirm hamstring tightness. Athletes with hip, buttocks and low back pain radiating to the back of thigh, history of fracture, dislocation and subluxation and any neurological disease and tumor of hip and knee were excluded from the study. The data was gathered by using Universal goniometer, straight leg raise (SLR) to, records range of motion and location of pain, the sit-and-reach test, which focuses on examining the flexibility of the hamstring and lower back muscles, is a standard way to evaluate flexibility. The Active Knee Extension Test was employed to measure the length of the hamstring muscles and the range of active knee extension when the hip is flexed. The Lower Extremity Functional Scale (LEFS) is a 20-question survey about a person's capacity to carry out commonplace tasks. Clinicians can use the LEFS to measure the initial function, continuous progress, and outcome of patients as well as to define functional goals. The maximum possible score is 80 points, which indicates exceptionally high function. The lowest possible score is 0, which represents extremely poor function. Group-A was treated with baseline treatment of electric heating pad for 15min and rehab protocol post isometric relaxation in which 3-5 repetitions for 7-10 seconds hold stretch in each session for three sessions per week on alternate days for 8 weeks were administered. Group-B was treated with baseline treatment of electric heating pad for 15min and rehab protocol post facilitation in which 3-5 repetitions for 7-10 seconds hold stretch in each session for three sessions per week on alternate days for four weeks C. Individuals' received treatment session for 8 weeks were administered.(17) There was no adverse effect noted during and after the treatment. The comparison between the groups was done using the independent t test, while the comparison within the group was done using the paired T test.

Results:

34 participants were recruited in the study with 17 participants in the group A and 17 participants in the groups B and only male participants were added in the study. Assessment after 4 weeks showed range of motion mean 128.82±0.54 in group A and 127.35±5.89 (p=0.45) in group B, mean SLR 76.58±1.69 in group A and 77.05±1.71 (p=0. 0.42) in group B, mean SIT and REACH activity 18.29±2.201 in group A 19.70±2.02 (p=0.60) in group B. Left AKE mean 15.41±3.96 in group A 40.52±2.85 (p=0.36) in group B. Right AKE mean 58.41±4.848 in group A and 16.642±3.57 (p=0.34) in group B. LEFS mean 58.41±4.84 in group A and 40.52±2.85 (p<0.001) in group B shown in table 2. The findings of the within-group analysis of the pre-treatment and post-treatment assessments for Groups A and B are shown in Table 3, which showed considerable improvements in both groups. Notably, significant differences were found within the group analyses but not between Group A's Post-Isometric Relaxation (PIR) and Group B's Post-Facilitation Stretching (PFS).

Table 1: Descriptive statistics of participants

	Group A	Group B
N	17	17
Gender	Male	Male
Mean Age (years)	28.58±3.9	29.25±4.4

Table 2: Pre and Post lower extremity functions and Lower Extremity Functional Scale (LEFS) between the group analysis T test

Variable		Group A Mean±SD	Group B Mean±SD	P value
Range of motion	Pre treatment	119.82±6.11	121.41±7.76	0.51
	Post treatment	128.82±0.5.45	127.35±5.89	0.45
SLR	Pre treatment	74.23±2.07	75.00±2.20	0.30
	Post treatment	76.58±1.69	77.05±1.71	0.42
SIT and REACH	Pre treatment	14.52±2.06	14.94±3.21	0.68
	Post treatment	18.29±2.201	19.70±2.02	0.60
Left AKE	Pre treatment	14.65±3.98	22.17±8.63	0.36
	Post treatment	15.41±3.96	40.52±2.85	0.36
Right AKE	Pre treatment	15.41±3.96	16.68±3.57	0.33
	Post treatment	58.41±4.848	16.642±3.57	0.34
LEFS	Pre treatment	21.47±10.70	22.17±8.63	0.84
	Post treatment	58.41±4.84	40.52±2.85	0.00

Table 3: Pre and Post lower extremity functions and Lower Extremity Functional Scale (LEFS) within the group analysis paired t test

Variable		**Pre Data** Mean±SD	**Post Data** Mean±SD	**P value**
Range of motion	Group A	119.82±6.11	128.82±0.5.45	0.00
	Group B	121.41±7.76	127.35±5.89	0.00
SLR	Group A	74.23±2.07	76.58±1.69	0.00
	Group B	75.00±2.20	77.05±1.71	0.00
SIT and REACH	Group A	14.52±2.06	18.29±2.201	0.00
	Group B	14.94±3.21	19.70±2.02	0.00
Left AKE	Group A	14.65±3.98	15.41±3.96	0.00
	Group B	22.17±8.63	40.52±2.85	0.00
Right AKE	Group A	15.41±3.96	58.41±4.848	0.00
	Group B	16.68±3.57	16.642±3.57	0.33
LEFS	Group A	21.47±10.70	58.41±4.84	0.00
	Group B	22.17±8.63	40.52±2.85	0.00

Discussion:

The purpose of this study was to compare how post-isometric relaxation and post-facilitation stretching affect the hamstring flexibility of collegiate athletes. 34 people were included in a randomized control trial that was carried out after the inclusion and exclusion criteria were met.

The subsequent parameters of the present research are range of motion, functional disability, and muscle flexibility pre- and post-application of the post-isometric relaxation and post-facilitation stretching on hamstring in college athletes included age, gender, range of motion, sit-and-reach test, SLR, active knee extension test, and LEFS tests. After gathering data for each outcome measure for both groups, data was analyzed. The findings indicate that post-isometric relaxing has a greater impact than post-facilitation stretching. The research indicated that there was no appreciable difference in group analyses.

A study comparing the effectiveness of the muscular energy method and the Bowen treatment in individuals with asymptomatic hamstring tightness was carried out. The popliteal angle improved significantly (p 0.001) in the Bowen technique group when compared to the muscle energy technique group. The primary findings of this study were similar to those of a recent study; however, the new research compares the MET technique rather than the Bowen approach.(18)

This new study, however, examined the effects of reciprocal inhibition therapy and PIR on the hamstrings. The findings indicated that in both the PIR and RI groups, there was a significant improvement in hamstring flexibility (p=0.000).(19)

A second study assessed the effects of Muscle Energy Technique and static stretching on pre- and post-treatment visual analogue scales, active knee extension (AKE), and straight leg raise (SLR). In every treatment group, the within-group analysis revealed statistically significant differences (p value 0.05) for all outcome indicators. The VAS showed a mean reduction of 4.40±5.26 and 6.80±6.10 in the stretching and MET groups, respectively. The mean differences between the stretching and MET groups in AKE were 4.80±5.29 and 7.80±8.90, respectively. SLR indicated that the mean differences for the stretching and MET groups were 1.12 and 1.09, respectively. However, there was no discernible difference in the group comparison overall.(20) To determine how this strategy works in connection with other strategies, more research on a broad population is required.

Conclusion:

The current investigation found that post-isometric relaxing and stretching both improve hamstring flexibility.

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Aslam N: Analysis and corrections
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Sajjad MA: Revising the manuscript critically for important intellectual content