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RESEARCH ARTICLE
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IMMEDIATE EFFECTS OF MUSCLE ENERGY TECHNIQUE (POST ISOMETRIC RELAXATION) VERSUS PRIMAL REFLEX RELEASE TECHNIQUE ON HAMSTRING TIGHTNESS

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ABSTRACT
The hamstring muscles, which are found in the back of the thigh and are made up of the biceps femoris, semitendinosus, and semimembranosus, are crucial for the stability and movement of the hip and knee joints when walking. Reduced flexibility, poor functional ability, and even physical injury can result from tight hamstring muscles. The purpose of this study is to determine the best course of action for treating hamstring tightness. It was a randomizes clinical trial in which forty-four participants were recruited by purposive sampling from The University of Faisalabad. Two groups were randomly assigned to the participants; one group underwent Muscle Energy Technique (MET), while the other group got PRRT. The outcome measuring tools were goniometer, inches tape and NPRS. SPSS was used to examine the data. Results showed that both MET and PRRT significantly improved knee range of motion, hamstring flexibility, and pain due to hamstring tightness. The study concluded that both the Muscle Energy Technique and Primal Reflex Release Technique were equally effective in treating hamstring tightness.

Keywords: hamstring tightness, flexibility, Active Knee Extension Test, sit and reach, Muscle Energy Technique, Primal Reflex Release Technique.

INTRODUCTION
A prevalent clinical problem known as hamstring tightness causes limited movement at the hip and knee because the muscle is less able to lengthen and permit the necessary joint mobility to carry out the desired tasks(1). Myofascial adhesions, which impair the muscle's ability to glide freely and permit complete joint mobility, or a decreased capacity of the muscle tissue to elongate (which may be mechanical or neural in nature), are the two main causes of hamstring tightness(2). A certain amount of flexibility and plasticity is shown by muscles in reaction to loading by mechanical stress. Extended or recurrent muscular contractions without sufficient rest and stretching could end up in adaptations including decreased muscle extensibility and increased accumulation of collagen resulting in muscular tightness. There is some data that suggests muscular tightness may predispose athletes to lower limb muscle strains (3) and is associated to lower back and patellofemoral pain,

even with the widely held belief that it increases the risk of injury it has not been conclusively proven.

Tight hamstrings affect not just the biomechanics of movement but also the perception of physical discomfort and exhaustion. Understanding the complex effects of a sedentary lifestyle on the health of muscles emphasizes the need for preventative actions. Promoting optimum muscle function and general well-being by minimizing the negative consequences of prolonged inactivity requires the implementation of targeted stretching routines, frequent physical exercise, and ergonomic awareness. According to Saudi journal of sports medicine extended periods of sitting can be contributory factor in hamstring tightness (4) Many techniques are used to release the tension buildup in the muscle. Muscle energy technique is one of them. The Muscle Energy Technique (MET) is an interactive manual method wherein the physiotherapist doesn't control over the corrective force. Instead, the patient is expected to generate a directed voluntary contraction with adjustable intensity. It is considered as the most useful clinical tool and some authors consider its effect equivalent to manipulation (5).

The type of MET for relaxing and lengthening a hypertonic and shortened muscle is post isometric relaxation (PIR). In post isometric relaxation, isometric contraction is applied on the agonist followed by the stretching of that muscle. It is usually used in the chronic conditions. In non-symptomatic conditions post isometric relaxation is used. Some studies shows that post isometric relaxation give better results than that of reciprocal inhibition (6).

Primal reflex release technique is another technique which can be used to treat tightness in the muscles .This mechanism has resemblance to mechanism of the pain gate theory (7). This technique addresses muscle tightness by manipulating the interplay between agonist and antagonist muscles. Researches has showed that it is more effective than stretching (8). This study includes comparison of primal reflex release technique and post isometric relaxation on hamstring muscle especially focusing on flexibility.

METHODS

This study is Randomized clinical Trial. The study was conducted in the University of Faisalabad. The study was completed within the time duration of 3 months after the approval of ethical committee of University of Faisalabad. Sample size was 44. Sample size of each group was 22. Purposive sampling technique was used to collect the data.

Inclusion criteria **selected for this study is as follows:**

- Age group between 17 to 25 years healthy subjects (females).
- Should have long sitting in daily routine (at least 6 hours) (4).
- Willing to participate.
- NPRS scale 3 or more.
- Sit and reach score below 19 (according to YMCA).

Exclusion criteria **selected for this study is as follows:**

- Any history of lower extremity injury in past 3 month
- Upper Motor Neuron Lesion and Lower Motor Neuron Lesion due to spasticty and flaccidity
- Subjects involving in any sports and gymnasium activity e.g running, football, yoga etc.
- Unwilling to participate and sign in the informed consent
- Systemic issues e.g irritable bowl syndrome, hemophilia
- Pregnancy
- Open wounds
- Other musculoskeletal issues e.g arthritis, rheumatoid arthritis etc.

In this study following are the measure *outcomes.*

- Rom with active knee extension test
- Pain with numeric pain rating scale
- Flexibility with straight leg raise test

The data tools included were, goniometer, inches tape and sticking tape. 22 participants in each group were included after screening and signing the consent form. The initial readings were taken before the treatment and final readings were taken after the treatment. The treatment protocol used was as follows.

Hot pack (moist) was used for 10 minutes in prone position on hamstring muscle as baseline treatment.

Treatment protocol for Group A

METs: post isometric relaxation of hamstring

22 subjects were allocated randomly in group A. Baseline treatment was given for 10 minutes and then METs were applied. Post isometric relaxation technique of METs was used. Patient was lying supine. Effected leg was placed in full flexion of hip while patient hold it with both hands and therapist extend the knee of the subject, until the first barrier is reached. The therapist will ask the patient to flex the knee with 20 percent effort and resist it simultaneously. This isometric contraction of hamstring will be held for 7-10 sec. Patient was instructed to inhale and exhale during isometric contraction. Then physiotherapist asked the patient to stop isometric contraction and then therapist stretched the hamstring to the next barrier. This stretch was held for 30 sec. Subjects performed isometric contractions with 20% effort for 7-10 seconds followed by the passive stretch applied for 30 seconds with 3 to 5 repetitions (5).

Then to work on the upper fibers of hamstrings the patient was asked to raise the leg straight without knee flexion until the first barrier is reached. The therapist then asked the patient to extend the hip with 20 percent effort and resist it. The isometric contraction was held for 8-10 sec and then the leg is moved to the next barrier. The entire process was repeated for 3-5 times. The stretch was held for 30 seconds.

Treatment protocol for Group B

PRRT: application of PRRT for hamstrings

The Primal Reflex Release Technique was used on the hamstrings after the initial treatment. The PRRT intervention's particular steps were as follows:

Patient Positioning: The individual was placed in a supine (back-lying) position. This posture guarantees the patient's ease and stability during the procedure and makes it simple to reach the hamstrings. Flexion of the Hip and Knee: The patient's knee was flexed to 20 degrees and his hip to 45 degrees. This particular alignment properly targets the hamstrings, the prime muscle for the intervention.

Simultaneous Tapping: This method includes tapping particular body spots to activate the deep tendon reflexes. In this instance, the patellar tendon and the mid-belly of the hamstring muscle were the targets. The tapping was done for a duration of 12 seconds.

By applying a sensory input that disrupts the ingrained reflex patterns that lead to muscular tension, the Simultap approach aims to trigger reflexes and promote muscle relaxation and release.

Following to PRRT: The hamstrings were passively stretched following the completion of the Simultap procedure. Because by lengthening the muscle fibers, the passive stretch improves the hamstring release and relaxation brought about by PRRT.Technique: Although the precise technique

for passive stretching was not specified, it usually entails the therapist gradually stretching the patient's leg without the patient's active involvement (9).

Statistical analysis

For the statistical analysis, SPSS version 22 was used. To identify the key characteristics of the data and offer concise summaries of the sample and measurements, descriptive statistics and frequency distributions were computed for variables including age, side involved, and the sit-and-reach test scores. Utilizing the Shapiro-Wilk test, the assumption of normality was tested to make sure the data satisfied the requirements for parametric testing where statistical significance was set at p=.05 .

When the data were normally distributed, the paired t-test was used to compare means within a group. The non-parametric Wilcoxon signed-rank test was utilized in place of the paired t-test when the data were not normally distributed. The independent t-test was used to compare means between groups when the data were normally distributed. The Mann-Whitney U test, a non-parametric test, was used to assess the differences between two independent groups when the data did not follow a normal distribution.

RESULTS

The results of descriptive statistics showed that 22 patients were included in each group. The control group's mean age, which was determined to be 21.135 years, can be seen in the table. The degree of variance or dispersion from the mean age was shown by the 2.6-year which is the standard deviation that was obtained for this group. Additionally, the control group's minimum and maximum ages were 18 and 26, respectively. The participants are 23 years old on average, according to the mean value. A standard deviation of 2.4. The range was 19 to 26 years.

the mean of the sit and reach score in control group. It is 12.1 and the deviation recorded was 3.03. The minimum score and maximum score recorded were 7.50 and 17 respectively. The mean of the sit and reach score in experimental group. It is 12.6 and the deviation recorded was 2.4. The minimum score and maximum score recorded were 7.50 and 17 respectively.

The distribution of affected sides within the experimental group exhibits a notable imbalance. In particular, the right side is the most commonly impacted. There is a noticeable disparity in the distribution of afflicted sides in the control group. In particular, the right side is more commonly impacted—14 people report problems on this side.

Shapirowilk test was used to check the normality of data. The test is applied to the pre values of active knee extension test, NPRS and straight leg raise test. The test showed that data of NPRS is non –normal.

Paired sample t-test on active knee extension test in experimental groups

The below table shows that there is significant improvement in the ROM in both groups

	N	Mean	Std. deviation	P value
Pre value of active knee extension test	22	37.5	11.7	<.001
Post value of active knee extension test	22	40.9	10.9	

Result of Paired t test on active knee extension test in control group

	N	Mean	Std. deviation	P value
Pre value of active knee extension test	22	42.88	13.19	<.001
Post value of active knee extension test	22	48.04	12.51	

The below table shows that there is significant improvement in the flexibility in both groups

Result of Paired t test on straight leg raise test in control group

	N	Mean	Std. deviation	P value
Pre value of straight leg raise test	22	66.4	7.9	<.001
Post value of straight leg raise test	22	72.04	8.5	

Paired sample t-test on Straight leg raise test in experimental groups

	N	Mean	Std. deviation	P value
Pre value of straight leg raise test	22	64.6	7.99	<.001
Post value of straight leg raise test	22	68.7	7.34	

Result of Paired t test result on NPRS in control group:
The below table shows that there is significant improvement in the pain

	N	Mean	Std. deviation	P value
Pre value of numeric pain rating scale	22	4.2	1.05	<.001
Post value of numeric pain rating scale	22	3.4	1.07	

Wilcoxon test result on NPRS in experimental groups
The below table shows that there is significant improvement in the pain

	N	Mean	Std. deviation	P value
Pre value of numeric pain rating scale	22	4.2	1.25	<.001
Post value of numeric pain rating scale	22	3.3	1.42	

The below tables shows that there was no significant difference between both groups in terms of ROM (AKE) , flexibility (SLR) and pain (NPRS)
Independent t test

	Groups	Mean ± S. deviation	P value
Pre value of active knee extension test	Control	42.88 ±13.192	.161
	Experimental	37.5 ±11.76	.161
Post value of active knee extension test	Control	48.04 ±12.51	.052
	Experimental	40.94 ±10.9	.052

	Groups	Mean ± S.deviation	P value
Pre value of straight leg raise test	Control	66.43 ± 7.90	.460
	Experimental	64.64 ± 7.99	
Post value of straight leg raise	Control	72.05 ± 8.53	.173
	Experimental	68.71 ± 7.34	

Mann- Whitney U tesr

	Groups	Mean ranks	P value
Pre value of numeric pain rating scale	Control	23.25	.689
	Experimental	21.75	
post value of numeric pain rating scale	Control	23.36	.651
	Experimental	21.64	

DISCUSSION

Primal Reflex Release Technique (PRRT) for hamstring release was used in this research. "Exploratory Case Series Analysis of the Use of Primal Reflex Release Technique to Improve Signs and Symptoms of Hamstring Strain" by Erica et al. served as the inspiration for this application methodology. In order to treat the overregulation of the autonomic nervous system (ANS) in the hamstring area, this study used hamstring release as a part of the therapy regimen (9).

This research's findings are consistent with a study by Ballantine that showed that muscle energy technique (MET) considerably changed the hamstrings' degree of flexibility. In particular, Ballantine's study showed that knee extension improved with the use of MET. Similar outcomes from current research support the notion that MET is useful for improving knee extension. To be more specific, Ballantine's research on the effects of MET on the hamstrings shown that those who employed this technique had significant increases in their capacity to extend their knees (10).

The outcomes of current investigation are also similar to another study by Seemal et al. that compares the benefits of static stretching and the Primal Reflex Release Technique. Seemal et al.'s study discovered that patients with coccydynia can get pain relief from both static stretching and the Primal Reflex Release Technique. This discovery aligns with this study's findings, which showed that the Primal Reflex Release Technique and the Muscle Energy Technique are both useful in easing the pain brought on by tight hamstrings (8). A thorough comparison analysis was carried out in the work by G. Bose et al. to assess the effectiveness of reciprocal inhibition (RI) against post-isometric relaxation (PIR). The results of this extensive study showed that PIR was more successful than other treatment approaches in producing the intended therapeutic effects, especially in terms of reducing tension and relaxing muscles (11). Using post-isometric relaxation as a central approach, the current research has made a deliberate decision based on the strong evidence presented in this study. This choice is well grounded in the empirical evidence highlighted by Bose et al.'s findings, which emphasize PIR's superior efficacy over RI. The physiological processes of PIR, which include promoting muscle lengthening and decreasing muscle spindle sensitivity to provide longer-lasting muscular relaxation, also influence the choice of PIR (11).

Current study's findings also align with a series of case studies examining the application of the Primal Reflex Release Technique (PRRT) to alleviate hamstring strain symptoms. According to this case series, PRRT can help patients who first arrive with hamstring strain symptoms by reducing pain and improving function in the near term. Through physical reflex stimulation, the Primal Reflex Release Technique is used to downregulate malfunctioning of the autonomic nervous system's defensive response. In this series of cases, the new therapy resulted in rapid improvements in function and discomfort (9).

CONCLUSIONS

In summary, we observed no significant difference in significant clinical outcomes between the two groups after removing bias and confounding.

Conflicts of Interest

The authors declare no conflict of interest

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