RESEARCH ARTICLE

IMMEDIATE EFFECTS OF POST FACILITATION STRETCH TECHNIQUE ON STRAIGHT LEG RAISE WITH/WITHOUT THORACO-LUMBER DIRECT MYOFACIAL RELEASE IN NON-SYMPTOMATIC ADULTS

1. *Lecturer, Department of Physical Therapy and Rehabilitation, NCS University System Peshawar Pakistan*
2. *Assistant Professor, Head of Department (Clinical), Vice Principal, Rawal Institute of Health Sciences, Islamabad Pakistan*
3. *Senior Lecturer, Faculty of Rehabilitation and Allied Health Sciences (FRAHS) Riphah International University, Islamabad, Pakistan*
4. *Clinical Therapist Clearcut Physiotherapy, Eltham London. United Kingdom*
5. *Lecturer, Department of Education, National University of Modern Languages. Islamabad Pakistan*

Correspondence
Ali Raza
Lecturer, Department of Physical Therapy and Rehabilitation, NCS University System Peshawar Pakistan
E-mail: draliraza40@gmail.com

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Ali Raza[1]: Conception, data collection, writing; revised and accountable for all aspects
Kiran Haq[2]: Analysis & interpretation of data, revised and accountable for all aspects
Jawwad Naveed[3]: Conception, Interpretation of data, revised and accountable for all aspects
Sajjad Ali[4]: Writing; revised and accountable for all aspects
Iqra Rizwan[5]: Revised and accountable for all aspects

ABSTRACT

Background: Hamstring tightness is a condition which if it is remaining untreated it could be related later to the posture imbalance and movement restriction. There are many techniques to increase the elasticity of hamstrings. Post facilitation stretching (PFS) along with thoraco-lumbar direct myofascial release (MFR) technique is emerging as a novel therapy for improving hamstring muscle length. **Objective:** To determine the immediate effects of post facilitation stretching technique on SLR with/without thoraco-lumber direct myofascial release on straight leg raise among non-symptomatic adults. **Methods:** A randomized control trial (RCT) was conducted at FIMS College of rehabilitation Abbottabad Pakistan after approval from HOD. A total of n=24 non symptomatic adults were recruited through non-probability convenient sampling technique. The inclusion criteria were non symptomatic adults with tight hamstrings, age group 18 to 40 years, normal healthy adults, both gender groups, SLR (passive) of 80° degree or less, finger floor distance of 5 cm or more. The participants were than randomly divided into two control group (n=12) and experimental group (n=12). The post facilitation stretch technique was applied in both groups, but experimental group additionally received thoraco-lumber direct myofascial release technique as well. To assess the total mobility of the lumbo-pelvic region and hamstring elasticity fingertip to floor distance was measured and straight leg raise test with the help of goniometer. The data was collected at the baseline and immediately after session. **Results:** The mean age of the study participant was 23.41±2.31 years. The pre-post analysis showed that right and left straight leg raise (SLR) as well as fingertip floor distance were significantly ($p<0.001$) improved immediately after the intervention with large effect size. When compared both groups immediately after the intervention, experimental group which received myofascial release in addition post facilitation stretch showed more significant improvement with large effect size in right & left SLR and fingertip floor distance ($p<0.001$) as compared to control group where only post facilitation stretch technique was applied. **Conclusions:** The present study concluded that post facilitation stretch along with the thoracolumbar direct myofascial release technique significantly improve hamstrings flexibility. The efficacy of thoracolumbar direct myofascial release has contributed in increasing SLR and Finger Floor Distance tests parameters.

Keywords: hamstring, muscle length, myofascial release, muscle energy technique, post facilitation stretch, stretching exercises.

INTRODUCTION

To keep the hamstring muscles in normal extent and health is very crucial [1]. There is an association of hamstring muscles with lumbo-pelvic area[2]. The prevalence of hamstring tightness is very high in young population age group 18-25[3]. There is greater percentage of hamstring muscles tightness in right leg in athletes[4]. The female gender has greater prevalence of hamstrings tightness when compare to male gender[5]. School going children are also affected and have many children are reduced lumbar and hamstring extensibility. About 18-38% children have limited hamstring flexibility[6]. Myers described the myofascial chain which caudally links the hamstrings with gastrocnemius & plantar fascia and cranially with thoraco-lumbar fascia, erector spinae & epicranial aponeurosis. Anatomical studies have already described functionally the work of these interlinked fascia regarding the transmission and communication of bio-mechanical force in between different parts of body linked by these chains[7,8].The burden increases on the back as a result of stiffening in hamstring muscles and produces imbalanced patterns of motion in lumbo-pelvic region[9]. The tightness of hamstring group of muscles is very common. By definition the hamstring tightness is the shortness of ROM with feeling of restriction in posterior compartment of thigh[10]. Hamstring strain, disturbance of pelvic rhythm, mechanical low back pain, and hamstring stiffness contributes to the onset of plantar fasciitis, patellar tendinopathy, and patellofemoral pain syndrome. Hamstring tightness also affects thoracic angle and range of motion, as well as the pelvis[11]. In healthy peoples limited anterior pelvic tilting is associated with tight

hamstrings. Due to the hamstring muscle origin from the ischial tuberosity, the anterior pelvic tilt is limited because of hamstring tightness in normal & healthy individuals[12].

Thoraco-lumbar fascia contains a greater amount of postganglionic sympathetic fibers which free nerve endings innervate it densely, as C fibers (low threshold mechano-sensitive) are highly responsive to manual therapy techniques[13]. Several stretching techniques are used to achieve this purpose, which are dynamic stretching, proprioceptive neuromuscular facilitation (PNF), ballistic stretching and static stretching[14,15,16]. Another manual therapy technique adopted by osteopaths is muscle energy technique (MET) which has got attention of manual therapy professionals[17]. The MET is a method of soft tissue management in which uses of patients performance of muscle from accurately controlled position in a particular direction against the executed therapists resistance[18]. Muscle energy technique has a sub type called post facilitation stretch technique. In this type of stretching technique the muscle experiences subsequent relaxation following an isometric contraction. Golgi tendon organs feel the effect of constant contraction and tendon go to a new lengthen position through inhibition[19].

The effect of post facilitation stretch technique on straight leg raise with/without thoraco-lumbar direct myofascial release technique in non-symptomatic adults. so that the current study was designed to assess the effectiveness of post facilitation stretch technique on straight leg raise with/without thoraco-lumbar direct myofascial release technique in non-symptomatic adults.

METHODOLOGY

The Randomized Control Trial was conducted at FIMS college of Rehabilitation Sciences Abbottabad after approval from Research and ethical committee faculty of rehabilitation and allied health sciences, Riphah International University. The inclusion criteria were non symptomatic adults with tight hamstrings, age group 18 to 40 years, normal healthy adults, both gender groups, SLR (passive) of 80° degree or less, finger floor distance of 5 cm or more. However, Any fracture of spine or lower limb, Any diagnosed medical Condition related to Spine or lower limb, Surgery of spine or lower limb, Any neurological disorder were excluded from the study.

A total of n=40 non symptomatic adults were evaluated for inclusion criteria. A total of n=24 participants fulfilled the inclusion criteria and recruited through non-probability convenient sampling technique. The participants were randomly divided into control group (n=12) and experimental group (n=12). The randomization of the participants was done through the sealed envelope method. (Figure 1)

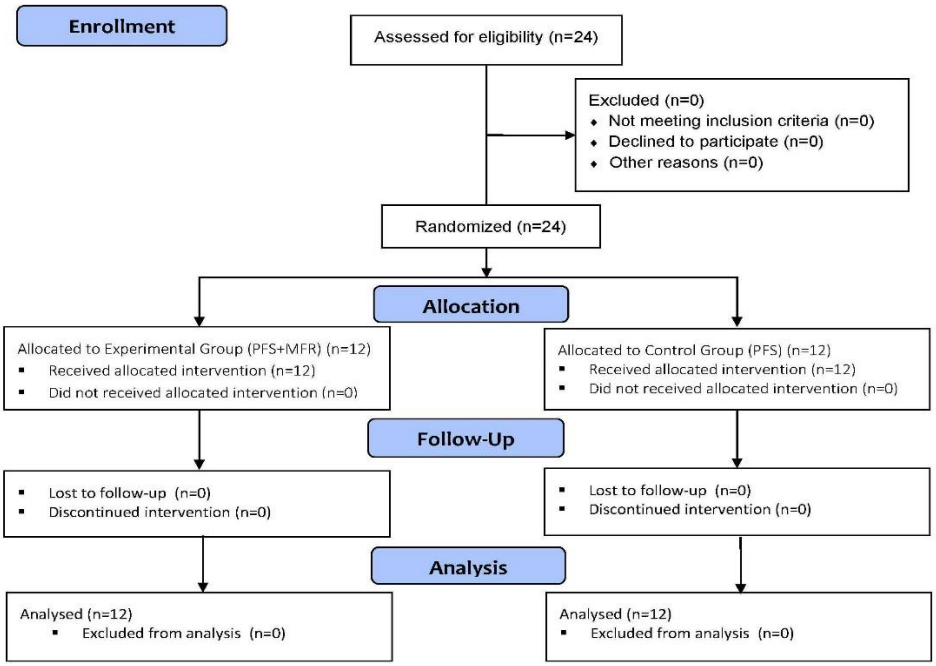

Figure: 1 Consort Diagram

Before intervention The Finger Floor Distance was used to measures hamstring elasticity while the subject bends forward and moves toward the toes. The investigator then measured the distance between the middle finger and the floor using a measuring tape. It also evaluates pelvic girdle and lumbar spine mobility[10,20]. To assess the straight leg raise for hamstring flexibility, the goniometer the subject was used in supine position and the investigator lifted the straightened leg (SLR) to end range. The greater femoral trochanter served as the goniometer's axis. The goniometer's moving arm was aligned with the lateral midline of the femur and pointed to the lateral epicondyle of the femur while the stationary arm was horizontal and parallel to the table, and the measurement was taken[21].

The experimental and control group both received post facilitation stretch technique. In which the subject isometrically contracted the hamstrings using maximum of the strength for 10 seconds while the investigator applied force against the subject movement. The investigator then passively took the hamstring muscles to the barrier and then applied a moderately aggressive sustained stretch up to 15 seconds[22]. Each subject was received 5 repetitions. After each repetition the muscles were relaxed for 30 seconds. The experimental group additionally received thoraco-lumbar direct myofascial release technique. The subject was positioned in prone direct force was applied to the skin in the direction of the limitation until the tissue barriers started to resist. Once the collagenous barrier was located, it was activated for 90–120 seconds without moving over the skin or pulling on the tissues, resulting in the fascia complex starting to give way and a feeling of softening. For each subject, this stage was repeated up to five times[23]. Each subject received single session and reassessed immediately after session.

The descriptive statistics was presented with mean, standard deviation, frequency, and percentages. The data fulfil assumption of parametric tests, so with in group changes paired sample t-test was applied. While comparing the groups, the independent t-test was applied. the Cohens'd was used to describe the clinical significance (effect size). The significance level was set at $p<0.05$ and SPSS ver 28 was used for data analysis.

RESULTS

The mean age of the stusy participant was 23.41±2.31 years. A total of n= 16 (66.7%) were males and n= 8 (33.3%) were females participated in the study. The pre-post analysis showed that right and left straight leg raise (SLR) as well as fingertip floor distance were significantly ($p<0.001$) improved immediately after the intervention with large effect size. (Table 1)

Table 1: Pre-post analysis of both groups

		Control Group (PFS) n=12					Experimental Group (PFS+MFR) n=12				
		Mean	SD	MD	p-value	Cohen's d	Mean	SD	MD	p-value	Cohen's d
SLR (Rt)	Pre	69.83	4.15	-11.25	0.00***	3.10	70.16	3.90	-14.5	0.00***	3.80
	Post	81.08	2.27				84.66	1.82			
SLR (Lt)	Pre	70.33	4.05	-11.08	0.00***	4.14	69.91	3.23	-15.5	0.00***	3.45
	Post	81.41	1.83				85.41	2.84			
FFD	Pre	12.33	4.09	7.91	0.00***	3.52	12	3.04	9.66	0.00***	2.53
	Post	4.41	1.37				2.33	1.72			

Significance Level: p<0.05, p<0.01**, p<0.001****
SLR: Straight leg raise, FFD: Fingertips to Floor Distance

When compared both groups immediately after the intervention, experimental group which received myofascial release in addition post facilitation stretch showed more significant improvement with large effect size in right ($p<0.001$, Cohens'd= 2.06) & left ($p<0.001$, Cohens'd= 2.39) SLR and fingertip floor distance ($p<0.001$, Cohens'd= 1.56) as compared to control group where only post facilitation stretch technique was applied. (Table 2)

Table 2: Comparison between both groups

		Control Group (PFS)		Experimental Group (PFS+MFR)		MD	p-value	Cohen's d
		Mean	SD	Mean	SD			
SLR (Rt)	Pre	69.83	4.15	70.16	3.90	-.33	0.84	-
	Post	81.08	2.27	84.66	1.82	-3.58	0.00***	2.06
SLR (Lt)	Pre	70.33	4.05	69.91	3.23	.41	0.78	-
	Post	81.41	1.83	85.41	2.84	-4	0.00***	2.39
FFD	Pre	12.33	4.09	12	3.04	.33	0.82	
	Post	4.41	1.37	2.33	1.72	2.08	0.00***	1.56

Significance Level: p<0.05, p<0.01**, p<0.001****

DISCUSSION

The objective of current study was to evaluate immediate effects of post facilitation stretch (PFS) technique on straight leg raise with/without thoraco-lumber direct myofascial release (MFR) in non-symptomatic adults. The results indicated that booth group showed improvement but additional effects of myofascial release technique are more significant than PFS.

The literature showed that post facilitation stretching technique are significant to increase flexibility of muscle, it could be the choice of technique in clinical practice to increase flexibility[24]. As the post facilitation technique work on autogenic inhibition signifies a reduction in the excitability of a contract or stretched muscle that has previously been entirely attributed to an enhancement in the inhibitory signal originating the same muscle's Golgi tendon organs (GTOs) [25,26]. Our results showed that the post facilitation stretch technique along with thoraco-lumbar direct myofascial release technique significantly improved the flexibility of tight hamstring than the post facilitation stretch technique alone.

Myofascial release (MFR) to relieve physical limitations brought on by the body's soft tissues. The direct physical effects include pain relief, and increased flexibility[27]. It is hypothesized that dynamic changes in the body's connective tissue and neuromuscular systems cause the changes in the tissue texture and tension brought on by the myofascial release[28]. As in our result the direct myofascial release technique on thoraco-lumbar region was used due to which the mayofascia of thoraco- lumbar region became soften and lengthen which increase the range and brought improvement in straight leg raise and finger floor distance test measurement.

Richard gajdosik conducted a study on efficacy of stretching (static) on the optimal length and resistance to stretch (passive) of short hamstrings muscle. For three weeks, participants in the stretching group engaged in daily static hamstring stretching. Stretching group SIR increased after three weeks, whereas control group SIR did not (p0.001). The maximal resistance to passive stretch (MRPS) for the stretching group was higher than the control group (p 0.05), and the knee angle was lower for the stretching group (p 0.001)[29]. However our results indicated that in experimental group showed significant improvement with both PFS and MFR while in control group, participants showed significant improvement but not that much as experimental group there is no such difference between our results and their results.

According to the literature that MET (post facilitation stretching technique) is the choice of technique that enhance the flexibility of muscle significantly and might be used as therapy of choice in clinical setup to enhance capability of muscles for being flexible [24]. Autogenic inhibition is primary principle for post facilitation stretch technique[25]. Proprioceptors located at the musculotendinous junctions such are golgi tendon organs, are responsible for detection of enhanced stretch or tightness of muscles via principles of neurology. Relaxation of contracted muscle occurs in response to detection of stretch that leads to inhibitory activity of spinal cord[30]. Myofascial release works to lengthen and soften connective tissue, resulting in three-dimensional length and width that lasts permanently. The transformation of the ground substance from a sol to a gel is crucial to this topic. This happens when crystals exposed to electromagnetic radiation realign their state phase. The electrical charge of collagen and proteoglycans inside the extracellular matrix may change, affecting the ionic state of the ground substance. This could happen as a result of a piezoelectric event (converting a mechanical force to electric energy)[28]. Considering mentioned literature above it has been understood that adding MFR with PFS is crucially beneficent for muscular relaxation and advanced outcomes in range of motion.

Justine Stanek et al. conducted a study in 2018 in which they compare the Graston technique (GT) with compressive myo-fascial release technique for increasing ankle dorsiflexion. They concluded that the dorsiflexion of ankle joint increases by compressive myofascial release with a single intervention in subjects with dorsiflexion range of motion deficits. In comparison to the GT and

control groups, post hoc analysis revealed that DF experienced standing posture improvements following CMR (both P =.001). When compared to the control group, DF in the kneeling position improved after CMR (p=.005)[31]. Our study results indicated as same improvement as the above in both groups in increasing SLR and FFD tests ranges. Another study by Masters, and Yashvant in 2014 on the impact of combining soft tissue massage and muscle energy technique (MET) on hamstrings extensibility. The conclusion of the study was that due to an improvement in stretch tolerance determined by changes in passive force, it has been shown that combining cross-fiber soft tissue massage with muscle energy technique increases passive knee range of motion more than muscle energy technique alone. PKE (p=0.041) and passive force (p=0.005) both showed greater improvements with MET with soft tissue treatment than with MET alone in both groups[32].

Similarly, our results were also significant regarding both techniques. In similarity, Neetu Rani Dhiman et all, conducted a study in 2021 Myofascial release (MFR) technique on the basis of Randomized Controlled Trials, on elasticity when applied over superficial backline structures, and to evaluate it in comparison to certain other soft tissue release techniques. They concluded that Myofascial release therapy seems to be an effective method for increasing flexibility. Little evidence supported the claim that MFRT treatment is more successful than other soft tissue release procedures for increasing flexibility, according to the analysis's findings[33]. In comparison to this study, our results also indicated that this technique is very helpful in improving the flexibility of shortened tissues.

The subjects were healthy young people, so it was not possible to generalize the results in patients or elders. The gender base difference may the confounding effects on the results. The long-term effects were determined as a Single session intervention was given.

CONCLUSION

The present study concluded that both the techniques were but post facilitation stretch along with the thoracolumbar direct myofascial release technique was more significant than post facilitation stretch technique alone for improvement of hamstrings flexibility. The efficacy of thoraco-lumbar direct myofascial release has contributed in increasing SLR and Finger Floor Distance tests parameters.

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