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## Immediate effect of muscle energy technique versus myofascial release technique on hamstring muscle tightness in sewing machine operators

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### Abstract

**Background:** Hamstring muscle has resulted a prevalence of 83.4%. Hamstring muscle is held in shortened position as the pelvis is rotated posteriorly and knees are flexed this leads to shortening of the muscle in a same position for a longer duration of time. Muscle Energy Technique has a mechanism of PIR and RI to reduce tightness. Myofascial Release Technique is a technique that reduces the myofascial restriction.

**Aim:** To find out the immediate effect of muscle energy versus myofascial release technique on hamstring tightness in sewing machine operator.

### Objective

- To study the immediate effect of the muscle energy technique on hamstring tightness in sewing machine operator.
- To study the Immediate Effect of the and myofascial release technique on hamstring tightness in sewing machine operator.
- To compare the immediate effect of muscle energy technique versus myofascial release technique on hamstring tightness in sewing machine operators.

**Methodology:** 53 sewing machine operators participated in study. These were divided into 2 groups. Group A was treated with Muscle Energy Technique and Group B with myofascial release technique. pre and post outcome measure was assessed with active knee extension test.

**Result:** The study Resulted as a highly significant effect of both the techniques. In further comparison Muscle Energy Technique showed a better effect than Myofascial Release Technique.

**Conclusion:** The study concluded that there is a significant immediate effect of both the techniques in hamstring tightness but in comparison muscle energy technique has shown better effect.

**Keywords:** Muscle energy technique, muscle tightness, myofascial release technique

### Introduction

As India is the 6<sup>th</sup> largest export of textile and apparel in the world, sewing machine operators have a great role in it <sup>[1]</sup>. The apparel industry contributes in total of 12% of the total exports of the India. It is the contributor to the highest value in order of foreign revenue earning. It has accommodated directly 40 million employees and indirectly 60 million workers <sup>[2]</sup>. As the increasing physical strain in the body as a sewing machine operator has to remain in a static posture for a longer duration of time which is considered as a high. This can lead to many damages on the sense organs as well as psychological area. As simultaneously it requires control of vision and much of concentration work <sup>[3]</sup>.

There are number of many musculoskeletal conditions such as low back pain, knee pain, wrist pain, ankle pain, forward head posture, carpal tunnel syndrome <sup>[4]</sup>. Hamstring tightness is one of the most prevalent muscle tightness seen in human body <sup>[5]</sup>. Prevalence of hamstring tightness in sewing machine operators is 83.4% in which the male show 91.8% and the females show 78.7% of the population. It is mostly seen due to the reduced physical Activity or ability of a person which further related to it and cause reduced range of motion. It can further lead to many complications as well as musculoskeletal disorder such as patellofemoral pain, low back pain, plantar fasciitis <sup>1</sup>. Muscle tightness is the decrease in joint range of motion due to decrease capacity of the muscle which further acts on the joint <sup>[6]</sup>.

Muscle tightness is a limiting factor for normal functioning of a muscle for daily activities [6]. Hamstring tightness has an effect on performance. The participants with greater flexibility has shown more power, speed and agility compared to the one with lesser hamstring flexibility. Thus, it has also concluded that the hamstring muscle tightness has an effect on one-leg balance [7].

It is located to the posterior side of the thigh it is a combination of 3 muscles that is semimembranosus, semitendinosus and biceps femoris. Which originates from the Ischial tuberosity and inserts at the back of the tibia and fibula [7]. It totally covers the back of the thigh and its main function is to flex the knee and extend the hip. It also contributes in the maintain the flexibility of human body [1]. The hamstring muscle is a bi-articular muscle and is supplied by sciatic nerve. The posterior compartment of thigh, the short head of bicep femoris is seen. The origination of this muscle is at the posterolateral region in the linea aspera and supracondylar region. The short head of bicep femoris is innervated by common fibular nerve and is monoarticular type of muscle. In an anatomical study, it is further described as hamstring muscle is divided in 2 portions. The upper portion and the lower portion. The upper portion is further divided into 2 facets. Semimembranosus originates from the lateral facets. Whereas, the semitendinosus and the long head of bicep femoris originates from the medial facet. The sacrotuberous ligament also originates from the same. The semitendinosus and semimembranosus inserts in pes anserinus in the posteromedial region of the thigh and posteromedial corner of the knee. The muscle function as knee flexors, medial rotators and hip extensors. Long head of bicep femoris is situated laterally, it works as a hip extensor and posteriorly stabilizes the pelvis. With addition of short head of bicep femoris muscle fibers the knee and thigh extends [8].

This job requires repetitive task and motion which leads to prone to the disorder. It requires fixed sitting position and this leads to static burden that further affects the health. Ergonomics as well as exercises play an important role to make work place a safe, comfortable and efficient place to work and enhance performance [3].

The main reason of concern of sewing machine operator are needles and driving machine in which long line foot driving mechanism which increase the work pattern of hip, knee and ankle and isolated the hamstring muscle which can further go into shortening [9]. Muscle tightness are mostly related to postural disturbance but both itself can contribute to musculoskeletal disorders. It can also lead to low back pain and influence lumbar pelvic rhythm [10]. Decreased hamstring flexibility is a hazard as they are linked with the movement dysfunctions at the level of lumbar spine, pelvis and lower limb and also leads to gait abnormality. The symptoms seen are decreased strength, instability, reduced endurance and can also lead to work impairment [11]. Overuse of the muscles can lead to injury which can cause pain and the area undergoes pull and tears or hypoxia. This causes the body to produce scar tissue that binds up the tissue and moves freely. This can also cause the muscle to become shorter and put tension on the tendons and nerves can be entrapped [11].

As the sewing machine operators has to be in seated position for a longer period of time. Hamstring is held in flexed position which makes it short and posterior pelvic rotation is seen. In prolonged sitting position it further develops

hamstring trigger points and cause muscle tightness. If seated for more in extended position can also lead to increased intravertebral pressure over the lumbar spine on the other hand forward bending also leads to increase mechanical stress on the spine and does affect hamstring muscle. There are also many more influential factors seen like age, BMI, and reduced physical activity [1].

Number of studies has proved hamstring tightness to avoid this there are various effective methods seen and used in relieving as well as treating the condition. Muscle Energy Technique is a manual technique. It involves isometrics contractions to lengthen the shorten muscle via reciprocal inhibition as these are the three are phases which are included into the mechanism of Muscle Energy Technique which further helps to release the muscle. 2 most common forms of Muscle Energy Techniques used for muscle shortening, muscle spasm and pain associated with hamstring tightness. PIR is used to reduce the agonist muscle tone after an isometric contraction in stretch receptors of Golgi tendon organ. It is a protective mechanism which inhibits the rupture and does give the lengthening effect due of sudden relaxation of the muscle stretch. Reciprocal inhibition is a functional key of the Golgi tendon organ with the single or group of muscle which is responsible for reduction in muscle after submaximal isometric contraction within the muscle [5]. Isometric contraction is the first step which starts with passive knee extension and then is further followed by the isometric contraction which is against resistance later followed by complete reciprocal inhibition this mechanism hold the muscle in same state and then relaxes which leads to elongation of the muscle and also helps to strengthen it [9]. Myofascial pain is characterized under the dull aching pain which is caused in the muscle and is increased sensitive to touch. It is a widely used technique which utilizes specifically guided mechanical forces to manipulate and reduce myofascial restriction of various somatic dysfunctions. It is also said that when MFR is used as a conventional technique with the other techniques it has been proved effective [13]. Myofascial Release Technique is a soft tissue mobilization technique and is further divided as facilitation of neural, mechanical and physiological adaptive as interfaced via myofascial system [14]. It has different effects in improving physical performance, flexibility, increase in range of motion also in daily issue [10]. Fascia has 3 layers as the fascia fibres run in many direction it is able to change and move according to the surrounding fibres. Fascia is a type of connective tissue which works as a chain therefore when a specific area is stretched it leads to pain and tightness in another part also and this can be treated with the Myofascial Release Technique. Myofascial Release Technique is a wide term and is most used in orthopaedic conditions it further takes feedback from the recipients body to determine the direction of the stretch and the specific duration to address soft tissue restriction [15].

### Material and Methodology

- **Source of Data:** Sewing machine operators in Latur.
- **Type of study:** Quantitative
- **Study Design:** Comparative Study
- **Sample Size:** 53
- **Sample population:** Sewing machine operators with hamstring tightness
- **Sampling Method:** Simple random sampling method

- **Study Duration:** 6 months.

### Materials

- Goniometer.
- Consent form.
- Measuring tape.
- Assessment sheet.
- Pen.
- Table or Plinth.

### Inclusion Criteria

- Both males and female <sup>[1]</sup>.
- Age above 18-55 years <sup>[1]</sup>.
- Popliteal Angle less than 70degree <sup>[12]</sup>.
- Work hour more than 6 hours <sup>[1]</sup>.
- Minimum 6 months of working <sup>[1]</sup>.

### Exclusion Criteria

- Injury/history of injury to lower limb <sup>[13]</sup>.
- Varicose veins /DVT <sup>[9]</sup>.
- Lower limb surgery/fracture (last 6 months) <sup>[9]</sup>.

### Outcome Measure

The outcome measure which will be used for this study will.

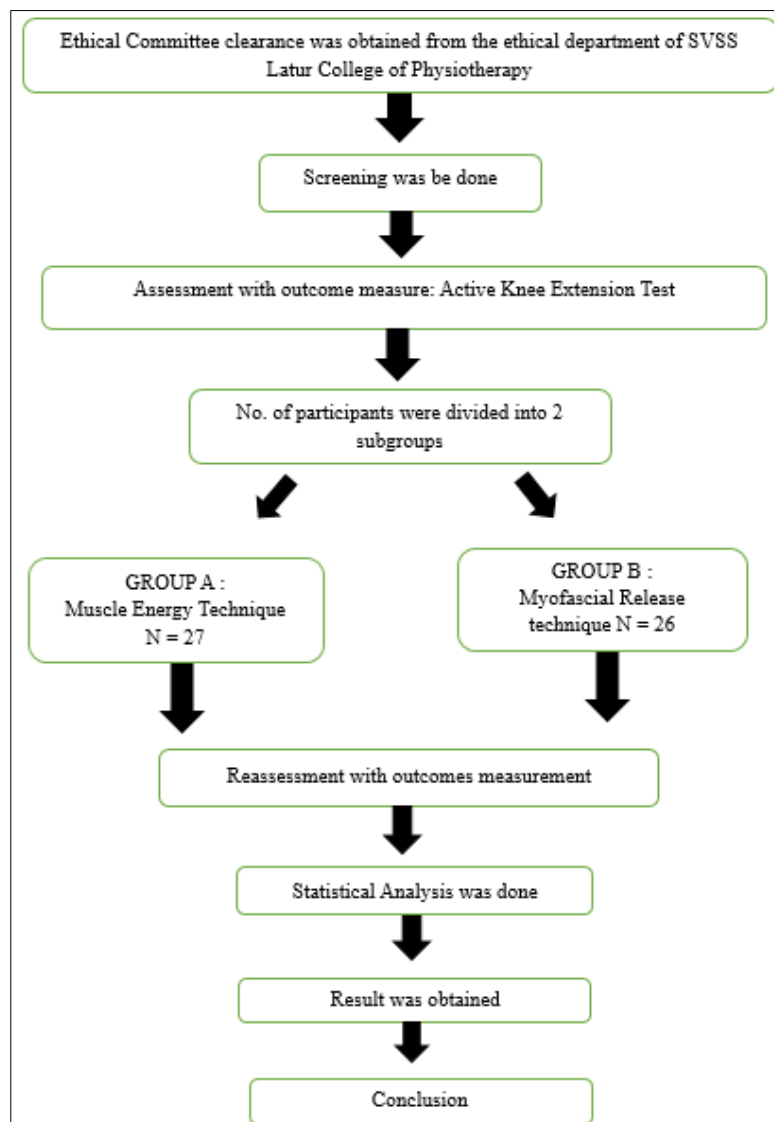
### Active Knee Extension Test

Participant lies in supine lying position hip and knee flexed

hip flexed to 90 degrees. The testing will be done on both the sides lower extremities alternatively. The pelvis will be stabilized and accessory movements will be controlled. Landmark used are greater trochanter, lateral condyle of femur and lateral malleolus used to measure hip and knee. Fulcrum-centered over lateral condyle of femur proximal and distal arm being femur and lower leg. The hip will be placed in 90 degrees later it was extended as much he or they feel a mild stretch. A goniometer will be used to measure the angle of flexion. In total 3 readings will be taken and an average of the 3 and will be finalized <sup>[8]</sup>. Normal values: Above 70 degree.

### Intervention

- All the participants will be screened first according to the inclusion and exclusion criteria mentioned above.
- The consent form will be explained and obtained regarding the procedure prior the study.
- All the participants will undergo the outcome measure that are Active Knee Extension Test.
- Accordingly, they will be divided into two groups group A and group B.
- Group A will be treated with Muscle Energy Technique
- Group B with be treated with Myofascial Release Technique.
- Pre and post both the outcome measure will be taken as an assessment tool to find the result.



**Procedure**

**Group A** were undergone the Muscle Energy Technique to see an immediate effect accompanied by hold and relax 1 set of 5 repetitions [24]

Ask the patient to lie down in supine lying position. Then ask the patient to flex both the hip and knee and then by the therapist passively extends and straightened until a barrier is felt. Later apply resistance and ask patient to flex against the resistance but slowly. The duration of hold must be 7-10 seconds following by complete relaxation. Same steps should be followed with 1 set of 5 repetitions



**Fig 1:** While performing muscle energy technique-ending position

**Group B** were undergone the myofascial release technique for 5 mins [25]

**Method-crossed hand method.**

Patient should be in prone lying position.

Therapist gives light stroking for 2-3minutes, light contact of hand is made first in hamstring.

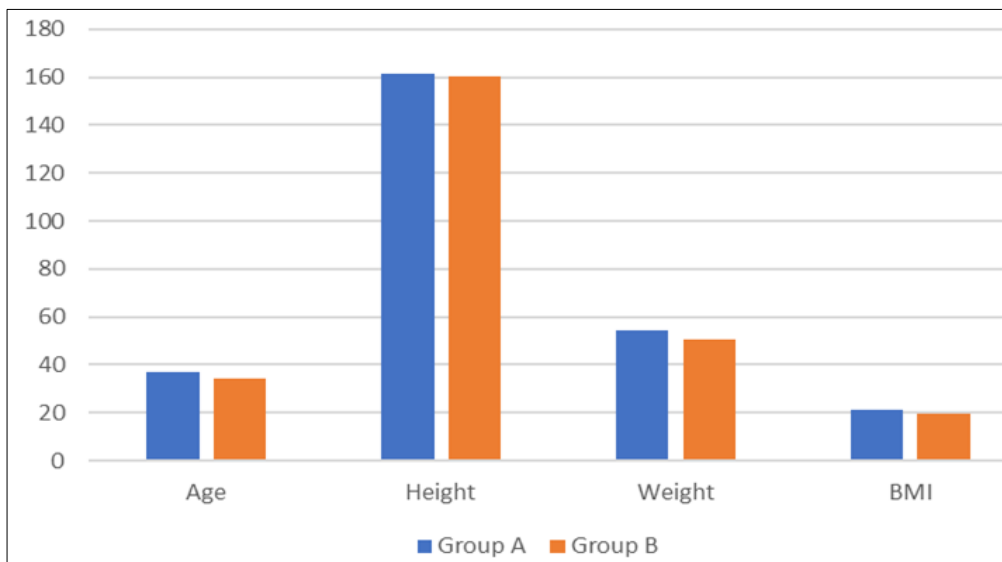
**Directions-proximal to distal**

Place one hand below ischial tuberosity and other hand wrapping around the thigh, pointing towards the ankle Myofascial release is given with the ulnar border of hand with gentle pressure over the muscles till the loosed slack in skin is seen. Each stroke has to hold for 30 seconds with 10 repetitions.



**Fig 2:** While performing myofascial release technique

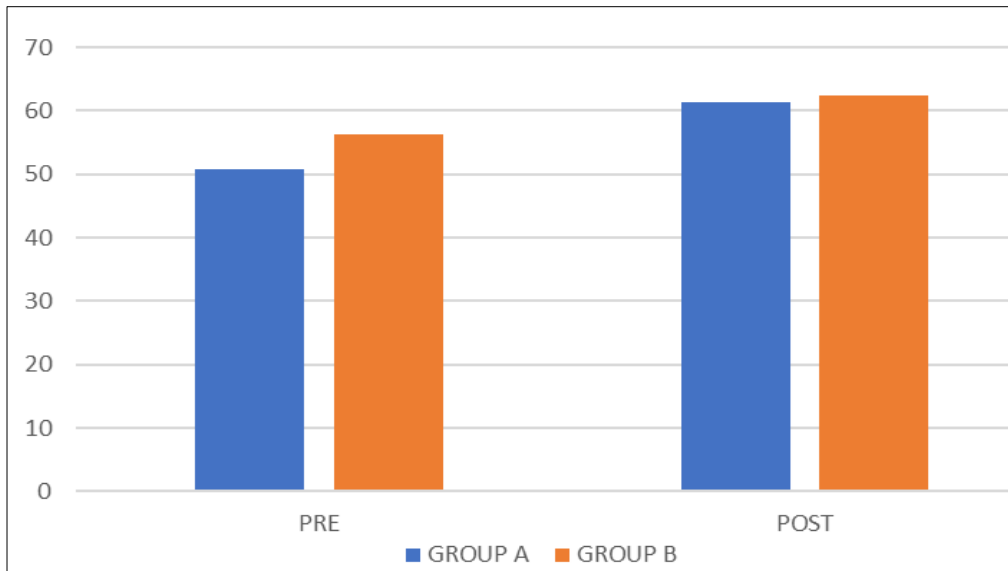
**Statistical Analysis and Interpretation**



**Graph 1:** The baseline demographic data of the participants in both the groups

**Table 1:** Show the comparison of score of pre and post in both groups

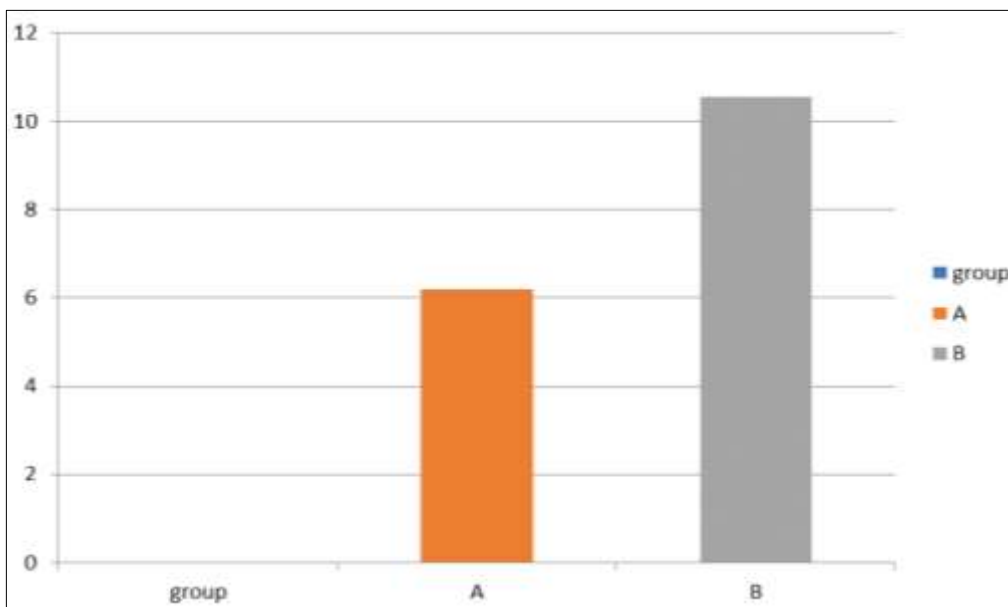
Group	Pre Test	Post Test	Mean Difference	T-Value
<b>Group A</b>				
Mean ± SD	50.84±5.10	61.39±5.70	10.55±4.49	12.20, P=0.0001,S
Range	40-60	49.50-70		
95% CI	48.89-53.05	59.71-63.99		
<b>Group B</b>				
Mean ± SD	56.20±7.39	62.38±7.49	6.18±2.45	12.82 P=0.0001,S
Range	42.50-68.50	46.50-76.50		
95% CI	53.21-59.18	59.35-65.41		



**Graph 2:** Comparison of mean of score of pre and post in both groups

**Table 2:** Comparison of mean difference in pre and post score in muscle energy technique and myofascial release technique

Group	N	Mean	Std. deviation	Std. Error mean	95% CL	
A	27	6.18	2.45	0.48	5.19-7.17	T=4.36, P=0.001
B	26	10.55	4.49	0.86	8.77-12.32	



**Graph 3:** Comparison of mean difference in pre and post score in muscle energy technique and myofascial release technique

**Results**

Immediate effect of muscle energy technique versus myofascial release technique on hamstring muscle tightness in sewing machine operators. Muscle energy technique and myofascial Release Technique resulted highly significant p value ( $p \leq 0.001$ ) using paired t-test for muscle energy technique and highly significant p-value ( $p \leq 0.001$ ) using paired t-test for Myofascial Release Technique. As a result, both the techniques are significant but in comparison of both the techniques muscle energy technique has shown a better result.

**Discussion**

The present study was aimed to find out the immediate effect of muscle energy technique versus myofascial release technique on hamstring tightness in sewing machine

operators with the use of outcome measure of active knee extension test. The present study resulted significant in both the group. But in comparison to myofascial release technique, muscle energy technique has been proved highly significant.

The sewing machine operators have a typical work pattern in prolonged sitting position. A prolonged sedentary work as well as awkward position leads to increased biomechanical stress on low back. Hamstring muscle tightness limits the anterior tilting of the pelvis and result in increased load of muscles and ligaments in the lumbar region. The major reason of the muscle tightness is the minimal ability or reduced ability of the muscle to deform. This further leads to lowered range of motion seen at the concerned joint.

Pathophysiologically, the tight hamstrings are associated with the dysfunctional motor control pattern due to which

the submaximal firing pattern of the posture muscles results in the function of hamstring muscle as stabilizers not as a prime mover. This leads to change in its primary function and lead to presentation of hamstring tightness.

Ballantyne *et al.*, conducted a study on topic effect of muscle energy technique on hamstring extensibility. Which also showed a significant effect and resulted similarly as this is possibly due to tolerance to stretch.

According to Joshua *et al.*, A study “Physiology, Muscle energy” says that Muscle Energy Technique is one of the type of osteopathic manipulation medicine. It is used to improve musculoskeletal function through mobilizing joint and stretching tight muscle and fascia. There are 3 phases in the mechanism. 1) Passive stretch-Initially therapist applies passive stretch to the hamstring muscle gently. This is given to elongate the muscle and form a stretch stimulus. 2) Post Isometric Contraction-the ‘hold’ is the crucial phase as it activates Golgi tendon organ. They carry sensory receptors located at muscle tendon junction. These detect change in muscle tension when there is high level of tension during isometric contraction they activate Ib afferent fibres to spine which put negative input on  $\alpha$  motor neurons. That receives input from cortex to the muscle. This leads to relaxation of the muscle. 3) Reciprocal inhibition – Muscle spindle has a great role in it as, stretch of muscle fibre leads to activation of Ia neurons that projects spine and activate efferent  $\alpha$  motor neuron, as the  $\gamma$  motor neurons of the same muscle leads to contraction of the intra and extrafusal fibres. This is described as stretch reflex.

A previous study conducted by John Werenski, proved that Myofascial Release Technique is used to reduce musculoskeletal pain or to relieve fascia. It is widely used manual technique which utilizes mechanical force to reduce myofascial restrictions. This is reduced as when pressure is applied, the pressure stimuli moves faster than the pain through the nervous system as they interfere in the transmission of painful stimuli to the brain which also gives calming effect and decreases pain and thus repetitive pressure stroke leads to loosening of the muscle fibres which leads to lengthening of the muscle.

In another study, conducted by Maryam Azizi *et al.*, proved the immediate effect of Muscle Energy Technique on hamstring muscle tightness. The author concluded that there was a significant effect seen in increase of hamstring muscle flexibility as the Golgi tendon reflex reduces the generated torque and reduce the tightness.

Immediate Effect of Myofascial Release Technique conducted by Daniel Martinez-Lema, *et al.*, reported that there was very much limited effect of the technique applied once without instrument for hamstring flexibility as it was a limited protocol it was not sufficient to immediately highly improve tighten muscle. Author Arun Balasubramaniam, *et al.*, performed a randomized Controlled Trial resulted that both the MET and MFR groups were significantly effective on improving Hamstring muscle tightness but there no significant difference between both the groups.

Therefore the current study results a more significant effect of Muscle Energy Technique in comparison to Myofascial Release Technique as in previous studies Mohini Dixit, *et al.*, also stated that in mechanism of MET the reciprocal inhibition plays an important role which is used to relax antagonist muscle and the best improvement is seen in hold and relax technique to release the tension within the muscle with the mechanism of post isometric relaxation and the

elongation of the fascia and muscle is seen. In one the study, Dr. Narayanavaru Priyanka, *et al.*, has also stated that the application of MFR depends on the skills of the therapist and also on the relation within the patient and therapist. And limited effect of single application of Myofascial Release Technique and was not sufficient than to provide placebo effect to immediately improve muscle tightness.

### Conclusion

The study concluded that there is significant effect of immediate effect of Muscle Energy technique and Myofascial Release Technique on Hamstring tightness in Sewing Machine Operator. But when resulted in muscle energy technique versus myofascial release technique, muscle energy technique has proven a better effect.

### Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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