

Original article:

Comparative study on effects of instrument assisted soft tissue mobilisation and passive stretching on hamstring muscle flexibility

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ABSTRACT

INTRODUCTION: Muscle tightness is caused by the decrease in the ability of the muscle to deform, leading to a decrease in the range of motion at the joint where it acts. Inability to extend the knee completely when the hip is flexed along with the presence of discomfort or pain in the posterior thigh and/or knee is usually referred to as hamstring muscle tightness.

METHOD: Sixty subjects were taken of age group 18-25. They were further divided into two groups, of thirty each. The subjects were treated with passive stretching on one group and with IASTM on the other group.

Pre ROM and Post ROM were measured on each. Methods to assess hamstring flexibility include Active Knee Extension Test.

RESULT: The result of the study was evaluated by taking mean \pm SD of ranges and comparing among the two groups. The study was conducted on a population of 60 participants. With IASTM group, N = 30 and in Passive Stretching N = 30 between the age group of 18-25. Mean \pm SD of IASTM group 56.16 ± 9.28 , and the Mean \pm SD of passive stretching group is 44.66 ± 7.52 . there is a significant difference in both of the group, The category under IASTM proved to be more effective than the ones under Passive stretching.

CONCLUSION: Out of the two techniques - Instrument Assisted Soft Tissue Mobilisation and Passive Stretching. It can be concluded that Instrument Assisted Soft Tissue Mobilisation has proved to be more effectiveness in providing flexibility to the Hamstring muscle than the Passive Stretching.

INTRODUCTION-

The muscles of the back of the thigh are called the hamstring muscles. The hamstrings comprise of three large muscles; semitendinous, semi-membranous, the long head of the biceps femoris and ischial head of adductor Magnus.

Origin: The muscle Bicep femoris originates from the linea aspera on the femur bone. The semimembranous and semitendinosus originates from the ischial tuberosities.

Insertion: The muscle Semimembranosus inserts into the medial tibial condyle. Semimembranosus inserts into tibia medially. Bicep femoris inserts into the head of the fibula.

Action: All three muscles of the hamstrings act to flex the knee. Semimembranosus and semitendinosus also helps in hip extension.

Hamstring is referred to the threes muscles at the back of the thigh. These muscles group work tirelessly to hold the body upright and act as a powerful hip extensors and flexors of the knee.

Muscle tightness is caused by the decrease in the ability of the muscle to deform, resulting in decrease in the range of motion at the joints on which it acts. Inability to extend the knee completely when the hip is flexed along with presence of discomfort or pain in the posterior thigh and/or knee is usually attributed to as hamstring muscle tightness.

The tightness of hamstring muscles is one of the main factors obstructing the performance in daily activities and sporting activities. The reduction in the flexibility of the hamstrings has been reported to be kindred with the matter of the back pain in adolescents and adults in cross-sectional studies. In addition, decrease in the flexibility of the hamstrings has been stated to increase the risk of damage to the musculoskeletal system.

Thereby, flexibility of the hamstrings is important for general health and physical fitness.

Hamstring Stretching is a part of a program of exercise to prevent injuries. Hamstring are often overlooked during strengthening as they are at the back of the body. Out of sight and out of mind. Muscle imbalances like this can often make us susceptible to injuries.

Stretching hamstring is vital for preventing back injuries. Tight hamstrings restrict the forward tilt to pelvis while bending causing more bending of the lower back. The lower back was not designed to hold out against the forces exerted on it in a forward bending position when lifting.

Flexibility is a chief component of physical conditioning programs as an accompaniment to muscle strength and endurance training. A shortened muscle may create imbalance at joints and faulty postural alignment which may lead to injury and joint dysfunction, the hamstring muscles are an example of a muscle group that has a capability to shorten and this shortened extensibility of the muscles could be associated with several clinical conditions to appeal.

Among these, muscle stretching is a sort of exercise that strain the soft structures permitting greater mobility, leading to an increase in joint range of motion and flexibility. Apart from reducing muscle tension, muscle stretching also help in maintaining adequate levels of mobility in joints.

Several studies have stated that flexibility of the hamstrings is intensified by stretching. In fact, many stretching techniques are used in clinical practice, including ballistic stretching, static stretching, and proprioceptive neuromuscular facilitation techniques. Among the stretching methods, active and passive stretching are easy techniques to implement and are beneficial as home exercises.

Passive Stretching

Passive stretching is characterised by the addition of stretch stimulation on muscle contraction independent of the subject. This stretching can enhance mobility, flexibility and range of motion. It help to boost the performance and risk of injury. Its benefit broadens to people who may not be able to stretch on their own. Passive stretching is a kind of stretching that restore muscle growth and prevent weakening of muscle.

The acute effect of passive stretching permits the excitability reduction of alpha motor neuron for low-speed, providing better adaptations of muscle and connective tissue, and promotes the mechanical properties.

Regular stretching also reduces the chances of injury, promotes flexibility, and increases range of motion. It is important part of being active. It benefits muscle function, allowing movements with greater ease and comfort throughout the activities of daily life.

When we give a passive stretch to the muscle, the force given during stretch elongates the muscle fibres and help the muscle to attain full length and increase flexibility.

IASTM

Instrument-Assisted Soft Tissue Mobilisation is technique that enables the therapist to determine and treat myofascial restrictions to improve Range of Motion and decrease pain. This technique includes using instruments to inscript musculoskeletal pathology- related impairments and help soft tissues. It encloses a broad range of techniques to treat soft tissue deficiencies.

IASTM is executed with ergonomically designed instruments which detect and treat fascial restrictions, encourage rapid localisation and is effective in treating areas which exhibits soft tissue fibrosis, chronic inflammation, or degeneration. Among other Manual therapy treatment ,supplemental exercises and additional modalities e.g. joint mobilization designed to correct biomechanical deficiencies by addressing muscle imbalances and musculoskeletal strength throughout the entire kinetic chain that are in conjunction with IASTM.

Tools used for IASTM produce micro-trauma to soft tissue for healing and restoring normal elasticity and function. The commonly used Tools made in IASTM are made of stainless steel which vary in shapes and sizes. Treating soft tissue deficiencies needs specific strokes and pressures to be applied on the treatment area in an attempt to regain full function. Variations of IASTM exist differing in names and types of tools.

The aim of such treatment is to achieve an increase in range of motion or decrease pain resulting from injury. In most cases, IASTM may stimulate inflammation in an attempt to promote healing.

The mechanical compression of IASTM centralises on the application of forces to the tissues in a way that may not be possible to achieve with hands-on technique and the fibrocystic activity may outcome in tissue production of 'mechano- growth factor' which activates muscle cells, along with change to muscle and fascial tissue.

Instruments of IASTM effectively breaks down the fascial restrictions and scar tissue. The ergonomic design of these instruments supplies the clinician with an ability to locate restrictions and permits the clinician to treat the targeted area with the right amount of pressure.

The introduction of controlled micro trauma to affected soft tissue structure causes the stimulation of a local inflammatory response. Micro trauma commence the reabsorption of improper fibrosis or immoderate scar tissue and helps in facilitation of a rapid healing activities leading to remodelling of the affected soft tissue structures.

Also breaks down the adhesions within the soft tissue which may have developed as a result of surgery, immobilisation, persistent strain or other mechanisms, allowing full functional restoration to take place.

Instrument Assisted Soft Tissue Mobilisation techniques works by improving the range of motion. These techniques provides friction and helps to break down the adhesion which causes stiffness or limits movements. These friction are provided by the instrument and during muscle contraction, it leads to breaking down of the nodules and trigger points that are present in the muscles. Thus, leading to increase range of motion.

It can lead to a little bit of redness of the skin but is normalised and will heal within few minutes after treatment.

The area to be treated is prepared first by applying lotions or gels before the treatments for smooth functioning and also to avoid injury or harm to the subject. There should be proper examination of the skin and some contraindication may include cuts or open wounds, active implants and Deep vein thrombosis. There are various methods to approach in IASTM. Selection of tools and methods depends on the area to be treated and condition of the subject.

METHODOLOGY-

Inclusion Criteria-

- Aged between 18-25 years.
- Both male and female.
- Tight Hamstrings.

Exclusion Criteria-

- No injury on Hamstring muscles.
- No back pain.
- No ankle and knee injury.
- No pathology of Ankylosing Spondylitis.
- No Peripheral Vascular Disease and Spondylitis.
- No diabetic
- No hypertension or hypotension.

Instrumentation-

- IASTM tool: F Bar tool
- Conventional passive stretching.

PROCEDURE-

Subjects aged between 18-25 with tight Hamstrings were included in this study. All subjects signed the informed consent prior to participation, and the rights of these subjects were protected. Treatment procedure was also explained in detail to the subject.

Methodology-

A total of Sixty subjects, aged 16-25, who met the inclusion criteria were included in this study. IASTM and passive stretching were performed on the subjects.

They were divided into two categories depending upon the treatment to be provided. The two groups were in numbers of thirty each.

In the first group, IASTM were performed. On the second group, we conducted Passive stretching.

Range were measured on each subject using a goniometer, these measurements were noted both before and after the treatment.

The method used for the assessment of hamstring muscle flexibility included TheActive Knee Extension test.

1) Use of IASTM on hamstrings.

IASTM technique.

- Pin and Stretch.
- Three times, fifteen seconds.
- Patient position: Prone lying.
- Therapist position: Standing beside the subject.

Procedure: After applying lotion on the area to be treated, the tool was placed on the area to be treated and supported by the therapist on both ends. Pressure was applied and a glide was given and maintained throughout

the procedure. The subject was asked to flex the knee as instructed. This was repeated three times for fifteen seconds.

Range is measured and noted before and after treatment.

2)Use of Passive Stretching on hamstrings.

- Passive stretching.
- Hold for thirty seconds, three repetition.
- Patient position: Supine lying.
- Therapist position: Standing beside the patient.

Procedure: Keep the leg in straight leg position. Shin on the therapist shoulder. Keeping the leg straight by placing the therapist hands above the knee level. Extend to full range position and hold. Opposite leg is straight to stabilise the pelvis. Hold this position for thirty seconds. Relax back into the starting position.

Repeat three times.

Range is measured and noted before and after treatment.

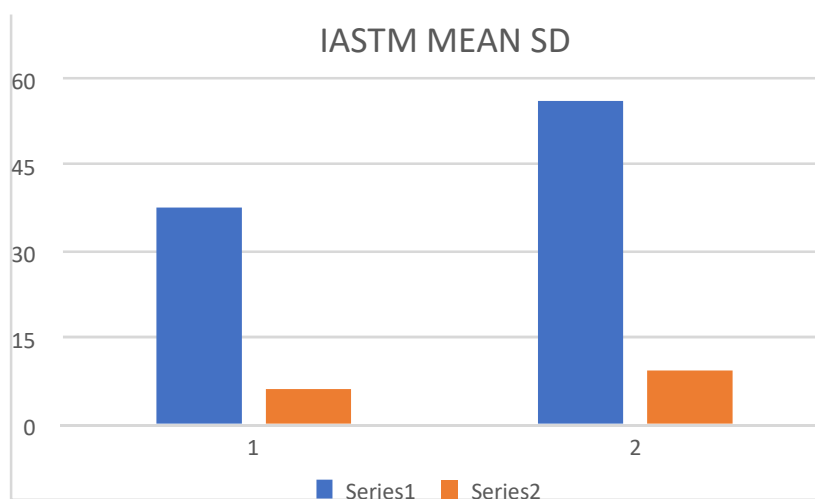
RESULT

Sixty individuals were recruited for the study and divided into two equal groups of thirty each. Pre and post Mean \pm SD were calculated. Both techniques showed effect in improving hamstring flexibility but when we compared both of the technique IASTM showed more significant result, with the significant different of Mean \pm SD ,11.5 \pm 1.76 post ROM.

IASTM

DEMOGRAPHIC DETAILS OF PRE AND POST ROM IN IASTM

	PRE ROM	POST ROM
Mean \pm SD	37.66 \pm 6.28	56.16 \pm 9.28



Series 1 represents pre rom mean and SD, Series 2 indicates post rom in the data chart

PASSIVE STREATCHING

DEMOGRAPHIC DETAILS OF PRE AND POST ROM IN PASSIVE STRETCHING

	PRE ROM	POST ROM
Mean \pm SD	36.5 \pm 6.47	44.66 \pm 7.52

DISCUSSION

This study was done to check the effectiveness of IASTM and Passive stretching on hamstring muscle flexibility. The aim of this study is solely to find out which out of these two techniques can provide more effective result in reducing the tightness of the hamstring muscle and in increasing the range of motion.

The tightness of hamstring is one of the common finding in today's population and also often overlooked, ignored and attended only when major complications arises. When such conditions are left untreated for a long time , it can lead to back pain and postural problems. When hamstrings are flexible enough, it provide better support for both the back and pelvis and prevent injury on these areas. It also lowers the chance of straining and tearing of the muscles.

In this study, we have used two approaches - IASTM and passive stretching which has both been proven to be beneficial in treating hamstring tightness. Both experimental interventions has demonstrated a statistically significant increase in Range of Motion. According to studies, IASTM has been able to improve soft tissue function and extensibility, while also helping in reduction of pain. IASTM works in improvement of ROM by resulting in the breaking down of any restrictions, adhesions and increasing extensibility. It improves the extensibility of soft tissues by breaking any restrictions and generating heat by friction which is produced by the instrument,

While on the other hand, Passive stretching works in increasing range of movement by stretching the affected muscle and effectively increasing the muscle power and preventing injury. Muscle stretching is a sort of exercise that strain the soft tissue structures permitting greater mobility, leading to an increase in joint range of motion and flexibility. Also apart from reducing muscle tension, muscle stretching also help in maintaining adequate levels of mobility in joints.

The intervention taken to assess this study includes IASTM technique- pin and stretch, which was performed over the patient on the dominant leg. This is done using the F-bar tool, where the targeted muscle was pinned and stretched. It involves active participation of the subject during the treatment, where the patient is asked to flex and extend the knee to full range of movement. This was done in sets of three, with fifteen repetitions each. This technique helps in improving the flexibility of the muscle by working in breaking down the muscle adherence and increasing the flexibility.

The other approach done during this study is Passive stretching. Such stretching involves stretching independent of the subject, where load is provided by the therapist. The subject was positioned comfortably and stretching was provided on the targeted muscle of the dominant leg, while the other leg was maintained in full extension. This was done thrice, with hold of thirty seconds each. When we provide stretch to a tight muscles, it helps in

stimulation on muscle contraction independent of the subject. Passive stretch is done to elongate shortened tissues. These interventions can also be done along with an exercise program to achieve a sustained increase in range of motion.

Both the technique has been beneficial but also has its limitation. IASTM has been found to not only help in increasing muscle flexibility but is also seen beneficial in reduction of pain. Using of these tools provide good specific pressure and friction on the muscles which sometimes maybe difficult with bare hands. But at times, this treatment can leave redness over the skin, which goes off after a while. It also requires active participation of the subject and needs a proper careful handling of the tool. It is also quite costly. This technique are often done by trained therapist.

Passive Stretching can be done without the active involvement of the subject and does not require any dependance on any tool. It also does not require any professional guidance. But people may often fail to differentiate between pain and discomfort. When stretch is too extreme, it may lead to further injury, stressing the joints and also causing tear and strain. Not holding the stretch for proper duration can be ineffective and longer duration hold can make the muscles stiffer and increases risk of injury.

The objective outcome measures for assessing hamstring flexibility used in the study is Active Knee Extension Test. This test is used to measure hamstring flexibility, specifically when the hip is in flexed position. The measurement unit is degrees. We measure the minimum angle of knee flexion. If the subject is able to fully extend, the angle would be noted as 0. The criteria includes those who are not able to attain 30 degrees of extension. The knee should extend without any thigh movement. Measurements are recorded for before and after treatment.

Sixty individuals were recruited for the study and divided into two equal groups of thirty each. Pre and post Mean \pm SD were calculated. Both techniques showed effect in improving hamstring flexibility but when we compared both of the technique IASTM showed more significant result, with the significant different of Mean \pm SD, 11.5 ± 1.76 post ROM.

Thus according to the study, it shows that IASTM is more beneficial in increasing hamstring muscle flexibility. Although both the technique has been beneficial to increase the flexibility, IASTM has proven to be more effective and better in providing faster result for those seeking to increase the hamstring flexibility.

Future Scope

In this study, we have done this to find out the acute effects of both IASTM and passive stretching. But for further study, we can do it to check for its long term effects and find its benefits in enhancing performance with increased flexibility.

CONCLUSION-

The study has shown the effectiveness of IASTM and Passive stretching on hamstrings between people aged from 18-25.

IASTM and Passive stretching have both proved to have an effect on the muscle flexibility and in increasing the ROM. Although the group under the former have shown more effective result than the group under passive stretching. Thus, It can be concluded that IASTM has proved to be more effective in providing muscle flexibility as compared to the Passive stretching.

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Author Declaration: Source of support: Nil, Conflict of interest: Nil

Was informed consent obtained from the subjects involved in the study? YES

For any images presented appropriate consent has been obtained from the subjects: NA

Plagiarism Checked: Urkund Software

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DOI: 10.36848/IJBAMR/2020/29215.55865



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