Research Article

Effectiveness of Myofascial Release Technique Versus Instrumented Assisted Soft Tissue Mobilization among Physiotherapy Students with Hamstring Tightness

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Abstract

To compare the effectiveness of myofascial release (MFR) versus instrument-assisted soft tissue mobilization (IASTM) in physiotherapy students with hamstring tightness.

Background and Purpose: Limited flexibility has been found to increase the risk of various musculoskeletal overuse injuries and can considerably impact an individual's functional ability. Insufficient flexibility is also considered a contributing factor to hamstring strains. Myofascial release is a hands-on therapy that applies pressure and stretching techniques to muscles and fascia, aiming to enhance the mobility of the muscles and the surrounding connective tissue. Instrument-assisted soft tissue mobilization (IASTM) is a non-invasive treatment designed to improve the health of myofascial tissues. By increasing the applied force, it reduces both the length of the treatment and the therapist's physical exertion, while still producing outcomes comparable to manual methods like deep friction massage and myofascial release. The objective of this study is to compare the effectiveness of IASTM and myofascial release in improving hamstring muscle flexibility.

Materials and Methods: This research is a single-blind randomized trial involving students with hamstring tightness, who will be randomly assigned to two groups: the myofascial release group and the IASTM group. A total of 30 participants from R.D. Gardi Medical College, Ujjain, will be selected according to strict inclusion and exclusion criteria. The knee extension test, measured with a goniometer, will be used as the outcome measure for both groups.

Result: The analysis showed that group B (Instrument Assisted Soft Tissue Manipulation) had a significant increase in knee extension range of motion (ROM) by the 12th day ($t = 2.671$, $p = 0.012$) relative to group A (Myofascial Release).

Conclusion: The conclusion of the present study provided evidence that the instrument assisted soft tissue mobilization and Myofascial release techniques both increase the flexibility of the hamstring muscle in the knee extension test. But this study supports that IASTM shows a more significant effect in increasing hamstring flexibility in the knee extension test after the intervention phase than MFR in hamstring tightness.

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Introduction

Muscle tightness is often seen as an inherent risk factor for developing muscle injuries. If regular stretching is neglected, the hamstring muscles are likely to become tight and shortened, which may cause muscle knots to form. Generally, muscles that span two joints are rarely utilized to move both joints simultaneously. Instead, movement at one joint is frequently limited by factors like gravity or the action of other muscles. This tendency makes two-joint muscles prone to shortening. Postural

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muscles, which mainly consist of slow-twitch fibers, are designed for endurance. They activate easily but tend to become shortened and tight if not used correctly. Extended periods of immobilization can also cause muscle tightness due to disuse. Long-distance running can enhance the strength of actively used muscles but may reduce their flexibility, while the opposing, less active muscles often weaken [3.]

A lack of flexibility is associated with musculoskeletal overuse injuries and a decline in functional ability. In particular, reduced flexibility has been identified as a contributing factor in hamstring strains. Regular hamstring stretching enhances flexibility and lowers muscle stiffness.[1,2] Flexibility is the ability to move one or more joints easily and without discomfort. This capability relies on the extensibility of muscles, enabling the muscles that span a joint to relax and stretch when force is exerted. Often, flexibility specifically refers to how well muscles and tendons stretch as the body moves through its range of motion (ROM). Including flexibility exercises in conditioning routines is essential for improving movement, athletic performance, and injury prevention. Flexibility contributes to physical ease, improved posture, reduced muscle discomfort, quicker recovery, lower stress, and a feeling of looseness and agility. The force generated by muscles that cross two joints, such as at the knee, is influenced by the position of the other joint that the muscle spans[4]. Regular stretching is necessary to preserve muscle length and avoid stiffness, which helps lower injury risk and improves physical performance.[1,2]

Myofascial release is a hands-on method aimed at enhancing mobility by delivering specific pressure and stretches to muscles and the nearby fascia—a thick connective tissue that envelops and supports muscles and organs. Fascia is important as it delivers critical structural support, serves as a site for attachments, and helps maintain the body's flexibility. When warmed and moved, it becomes soft and flexible, but immobility caused by injury or inactivity can make fascia stiff, thereby limiting the movement of both muscles and joints. Such stiffening may restrict not only the affected muscle but also adjacent muscles along the kinetic chain, leading to reduced mobility. Factors like trauma, overuse, or illness can create adhesions between fascia and muscle, resulting in pain and limited movement. Myofascial release is among several hands-on treatments aimed at restoring joint mobility and boosting athletic performance.[6] This technique also targets trigger points — localized, tight areas in muscle or fascia that cause pain or discomfort. While research findings on the effectiveness of myofascial release for pain relief and mobility improvement are mixed, multiple studies have reported varied outcomes.[7]

Instrument-assisted soft tissue mobilization (IASTM) is a non-invasive treatment designed to improve the health of myofascial tissues.[8,9] By increasing the applied force, it reduces both the length of the treatment and the therapist's physical exertion, while still producing outcomes comparable to manual methods like deep friction massage and myofascial release.9-11 Unlike conventional hands-on techniques such as the Cyriax method, IASTM utilizes specially designed tools to mobilize soft tissues—including scar tissue and fascial adhesions—allowing for more precise and deeper therapy and minimizing hand fatigue for the therapist.[14] These tools are made from materials like polymers, thermoplastics, or aluminium, though polished stainless steel is favoured in clinical practice due to its longevity, ease of sterilization, low friction, and excellent tactile feedback during treatment.[15] Smaller instruments are suited for delicate, low-intensity treatments on small anatomical areas, while larger ones are used for treating broader regions with deeper pressure. Compared to manual massage, these tools enable more accurate detection and treatment of tissue restrictions—such as adhesions, scars, and thickened tissue—through changes in how smoothly the tool glides over the skin.[16] Practitioners may opt for a variety of tool shapes customized for specific body areas, or prefer using a single versatile instrument for most treatments. There is no single "best" tool; choice depends on personal preference and clinical style.[15]

Muscle tightness and imbalances frequently cause limited range of motion, and current evidence indicates that IASTM can help improve joint mobility in both the upper and lower extremities.[16]

Methodology

Study Design

The study is a single-blind randomized trial aimed at assessing the effects of two treatments on hamstring tightness. Thirty students from R.D. Gardi Medical College, Ujjain, who fulfill the inclusion and exclusion criteria, will be randomly divided into either the Myofascial Release (MFR) group or the IASTM group. The inclusion criteria include individuals aged 18 to 25 years, regardless of gender, who exhibit reduced hamstring flexibility and are willing to participate in the study voluntarily. Exclusion criteria include individuals with any musculoskeletal disorders, history of spinal surgery or disc prolapse, central nervous system deficits, significant cardiovascular, or psychological conditions. The primary outcome measure for both groups will be the knee extension test assessed using a goniometer (Figure 1).

Figure 1: Knee extension test

Interventions and procedures

Written informed consent was obtained from all participants in their native language, and the treatment procedures were thoroughly explained. Based on the knee extension test, participants were randomly divided into two groups, each consisting of 15 subjects. Group A underwent myofascial release therapy, whereas Group B received instrument-assisted soft tissue mobilization (Figure 2). During the knee extension test, participants were positioned lying on their backs with the tested leg bent at 90°, while the other leg was fully extended and held stable by a second examiner. With the foot in a neutral position and the knee bent at 90°, a universal goniometer was aligned over the lateral femoral condyle; one arm followed the thigh towards the greater trochanter and the other along the leg towards the lateral malleolus. Starting from this position, without prior warm-up, participants extended their knee until a firm resistance was felt and held the position for 2 to 3 seconds to record the goniometer reading. The angle measured reflected the knee-extension range from the initial 90° flexion position (considered 0°).[17]

Figure 2: Instrument-assisted soft tissue manipulation

Treatment details

Group A (Myofascial Release)

Participants lay prone while the therapist applied pressure using the ulnar border of the hand on the hamstring muscle from proximal to distal (Figure 3). Pressure was gradually increased until the tissue slack was taken up, and this position was maintained until softening occurred. The hand moved slightly to facilitate tissue release, crossing over areas to maximize efficiency. Each release was held for 30 seconds, with a total treatment duration of 3 to 4 minutes. This program was carried out over two weeks without causing discomfort.

Figure 3: Myofascial release cross-hand technique

Group B (IASTM)

Participants lay prone while the therapist used a specialized tool to apply strokes from the muscle insertion toward the origin (distal to proximal) along the posterior leg compartment, moving over the knee, pressing down the hamstring muscle, and ending at the ischial tuberosity. Strokes were applied parallel to the muscle fibres. A low-viscosity massage oil, such

Table 1: Comparison of mean pre-knee extension test (ROM) score between group A and group B

	Group	*N*	*Mean PRE TEST (ROM)*	*SD*	*t*	*p*
PRE TEST (ROM)	Group A	15	59.67	5.802	-1.598	.121
	Group B	15	64.47	10.084		

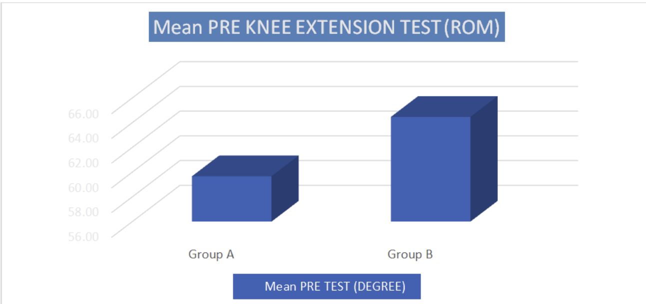

Figure 4: Mean pre-test

as sunflower oil, was used to provide good glide and is hypoallergenic. The instrument was moved slowly with deep pressure along the muscle fibres and across anatomical landmarks as needed. Typically, three to five passes over the treatment area were sufficient, with each stroking lasting about 20 seconds, repeated several times with 10-second breaks. The total treatment time was 3 to 4 minutes.[15]

Participants in both groups were instructed not to perform any lower limb flexibility or stretching exercises during the treatment period. The structured protocol lasted for 12 days over two weeks. Outcome measures were assessed before treatment on day 1 and after intervention on day 12.[4]

Statistical Analysis

The data analysis was performed using SPSS Software version 18. Descriptive statistics were applied to calculate the mean and standard deviation. A paired t-test was utilized for within-group comparisons, while an independent t-test was conducted for between-group analyses of all dependent variables. The significance level was set at 95%.

The results showed that both groups experienced significant improvements in knee extension range of motion (ROM) when comparing measurements from day 1 to day 12. However, the instrument-assisted soft tissue mobilization group demonstrated a more pronounced improvement in the outcome measure. The results are presented in Table 1.

Table 1 indicates that the mean score of ROM for group A at pre-intervention (59.67) of post-intervention. The mean score of ROM for group B at pre (64.47) of intervention (Figure 4).

Table 2 indicates that the ROM is significant on the 1st day (t = 1.598, *p* = .121) compared to the 12th day (t = 2.671, *p* = 0.012) for both treatment groups. Hence, conclude that group B treatment is more effective than Group A for the mean ROM score at 12th day (Figure 5). Figure 5: Mean post-test after 2 weeks.

Result

The analysis showed that group B (Instrument-assisted soft tissue manipulation) had a significant increase in knee extension range of motion (ROM) by the 12th day (t = 2.671, *p* = 0.012) relative to group A (Myofascial Release).

Discussion

This study aimed to compare the effects of IASTM and myofascial release on hamstring tightness among physiotherapy students. The research included 30 asymptomatic students from Ujjain College of Physiotherapy, who were randomly allocated into two groups: one received myofascial release therapy, and the other underwent IASTM treatment. Consistent hamstring stretching is crucial since neglecting it can lead to muscle tightness, which may gradually disturb muscle biomechanics, affect posture, and reduce strength, endurance, and coordination. Such changes can ultimately cause pain and impair functional ability.

The results showed that both myofascial release and IASTM significantly improved hamstring flexibility as measured by the knee extension test. According to Oschman (2000) in *Energy Medicine*, one possible

Table 1: Comparison of mean post-knee extension test (ROM) score between group A and group B

	Group	N	Mean post-test after 2 weeks (ROM)	SD	t	p
Post-test (ROM)	Group A	15	75.53	4.596	-2.671	.012
	Group B	15	80.87	6.221		

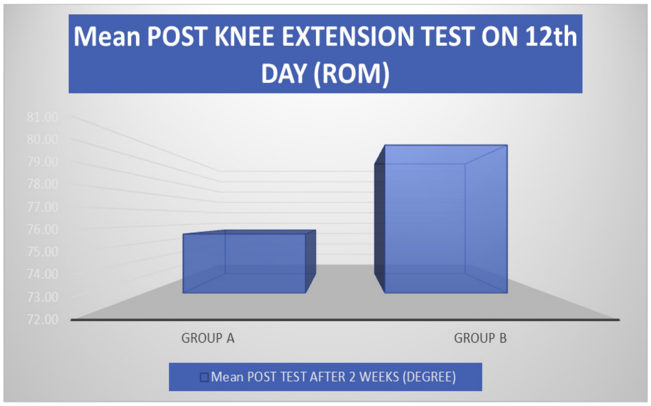

Figure 5: Mean post-test after 2 weeks

explanation for myofascial release's effectiveness is that manual pressure applied during therapy generates a charge differential through a piezoelectric effect, stimulating fibroblast cells. This process may increase local collagen synthesis—consistent with Davis' Law—and partially explains tissue repair, although it does not fully account for the immediate symptom relief often seen clinically.

IASTM offers several physiological advantages at the cellular level, including enhanced fibroblast proliferation, reduced scar tissue, improved vascular response, and realignment of collagen fibers. The tools used in IASTM are ergonomically designed to efficiently detect and target fascial restrictions and scar tissue with precise, controlled pressure. Delayed healing of soft tissues is frequently associated with disrupted collagen organization IASTM promotes collagen remodeling by increasing fibronectin, an important glycoprotein essential for tissue repair that is synthesized by fibroblasts and epithelial cells. Fibroblasts act as mechanotransducers by sensing mechanical forces like compression and shear, converting these into biochemical signals that support healing.
IASTM also improves soft tissue flexibility by releasing restrictions. The friction generated by the instruments produces heat, which lowers tissue viscosity, making it softer and more pliable, thus enhancing range of motion (ROM). Furthermore, neurological effects may contribute to improved ROM: mechanical stimulation activates mechanoreceptors in the fascia, altering sensory input to the central nervous system and influencing motor unit activity to reduce muscle tension.

To summarize, although both myofascial release and IASTM improved hamstring flexibility, the group treated with IASTM (Group B) exhibited significantly greater progress after 12 days, as indicated by the knee extension test outcomes and associated p-value..

Limitations

- Small sample size.
- Short intervention period limited to 12 sessions.

Future Directions

- Conduct studies with larger populations.
- Investigate long-term effects of the therapies.
- Include participants with various health conditions to improve generalizability.
- Examine the effects of different IASTM application parameters (e.g., force, duration, frequency) and record objective physical function changes such as muscle strength.

Conclusion

The findings of the current study indicate that both instrument-assisted soft tissue mobilization and myofascial release techniques improve hamstring muscle flexibility as measured by the knee extension test. However, the results suggest that instrument-assisted soft tissue mobilization produces a more pronounced improvement in hamstring flexibility after the intervention period compared to myofascial release in individuals with hamstring tightness.

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