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Review Article

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A Review Study on Effects of Multimodal Therapy on Hamstrings Tightness – A Systemic Review

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Abstract

Background: Hamstring tightness is a prevalent musculoskeletal condition affecting individuals across various age groups and activity levels. It often leads to reduced flexibility, increased injury risk, and impaired functional performance. Multimodal therapy, which combines various therapeutic interventions, has been proposed as an effective approach for managing hamstring tightness. However, the cumulative evidence supporting its efficacy remains unclear.

Objective: This systematic review aims to evaluate the effects of multimodal therapy on hamstring tightness by synthesizing findings from recent studies to determine its clinical relevance and effectiveness.

Methods: Inclusion criteria encompassed randomized controlled trials, cohort studies, and comparative studies investigating multimodal interventions for hamstring tightness. Multimodal therapy was defined as the combination of two or more therapeutic techniques, such as stretching, manual therapy, strengthening exercises, and physical modalities.

Results: Common combinations included static stretching with myofascial release, dynamic stretching with eccentric strengthening, and neuromuscular facilitation with cryotherapy.

Conclusion: Multimodal therapy is a highly effective approach for alleviating hamstring tightness, surpassing the efficacy of standalone techniques. The integration of stretching, manual therapy, and neuromuscular training yields superior outcomes in flexibility and functional performance. Future research should explore the long-term effects of these interventions and establish standardized protocols for clinical practice.

Keywords: Hamstring tightness, multimodal therapy, flexibility, stretching, manual therapy, systematic review

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1. Introduction

Hamstrings are a group of muscles and their tendons situated at the posterior part of the thigh. The muscles include the biceps femoris, Semitendinosus and Semimembranosus. These muscles are the primary muscles which are responsible for flexion of knee, and an important role in normal performance of functional activities.

The biceps femoris muscle has two components, the long head arising from the medial facet of the ischial tuberosity and the short head arising from the lateral aspect of the linea aspera, lateral supracondylar line, and intermuscular septum. The semitendinosus and long head of biceps have a common origin from the ischial tuberosity, whereas the semimembranosus has a separate origin. Excluding the short head of biceps femoris, the hamstrings contribute to the movement of the hip and the knee joints as they span across both joints. (1)

Hamstring tightness is an adaptive shortening of the contractile and non contractile elements of muscles. The inability to achieve more than 160 degree of knee extension with hip at 90 degree of flexion. It can be caused either from increase in tension during active or passive mechanism. Actively these muscle can become shorter due to spasm or through postural adaptation.

Table 1. Type of study, Participants Details and study result

Sr no.	Type of study, year & participants details	Treatment/ Interventions	Results
1	RCT, 2018 **Inclusion criteria**: Asymptomatic female participants with hamstrings tightness aged 18-30years, tightness measured by Active knee extension test (AKE) **Exclusion criteria**: Any history of lower extremity injury in past 3 months, Subjects involving in any sports, Acute or chronic hamstrings strain and acute or chronic low back pain, (4)	**Group A**- Positional Release Technique. **Group B**- Active release technique	The group treated with Active release technique showed significant improvement in Popliteal angle and sit and reach flexibility test. As compared to positional release technique result also showed a significant difference within the groups post intervention.
2	AN EXPERIMENRAL STUDY , 2020 **Inclusion Criteria**: Patients with Hamstring tightness of 15 degrees or more on AKET , Gender – male and female both , Patients willing to participate in the study. **Exclusion Criteria**: Patients with any low back pathology, Patients with history of any recent fracture or surgery of lower limb, Patients with any neurological disorder, Patients with history of recent hamstring injury. (5)	**Group A** – MET **Group B** – Passive stretching	From the study, both MET and passive stretching techniques have an immediate effect on reducing hamstring muscle tightness. MET is slightly more effective than passive stretching although statistically significant difference is not seen.
3	RCT, 2023 **Inclusion criteria**: participants 40 years and above, subjects with tight hamstring muscles. **Exclusion criteria**: participants with positive SLR, lower limb internal fixation, previous history of lower limb arthroplasty or any type of knee surgery. (6)	**Group 'A'**- dynamic soft tissue mobilization technique (DSTM) **Group 'B'-** PNF stretching	Both approaches are significantly and equally. There is no one of dynamic soft tissue mobilization and PNF stretching is more beneficial than to another in reduction of hamstring tightness, decreasing pain intensity, and functional mobility.
4	RCT , 2022 **Inclusion criteria:** Age 20-45 years ,both male and female ,hamstring tightness ,patients having nonspecific low back pain and patients positive for 90-90 . **Exclusion criteria**: Fracture of lower limb, previous traumatic injury to hamstring tendons, pregnancy, vertebral fractures, spinal surgery, systemic or inflammatory conditions and cancer patients. (7)	**Group A**: static stretching **Group B:** Hold relax technique.	Proprioceptive neuromuscular facilitation technique Hold relax is more effective in improving functional activities, reducing pain and improving flexibility as compared to static stretching technique in the management of hamstrings tightness
5	A pilot study , 2024 **Inclusion criteria**: Females and male sex, age 18–40 years, lack of ≥20° (AKE), atraumatic back or knee pain, individuals who are willing to engage in the required therapy sessions and subsequent evaluations. **Exclusion criteria**: Any previous surgery of back, hip, or knee region, self-reported pregnancy, an indication of ligamentous tear or positive instability tests, and an indication of meniscal tears or positive meniscal tear. (8)	**Group A**: Dry needling **Group B**: Instrument-assisted soft tissue mobilization	Both DN and IASTM were found to be efficient in increasing hamstring flexibility by improving the ROM of hip and knee joints in patients with hamstring tightness with PPT. IASTM was found to be more efficient.

6	RCT , 2020 **Inclusion criteria**: Males and females with age limit 20 to 40 years , Active knee extension/90-90 test positive for Screening (With AKE range less than 160 degrees), no known history of hip joint or knee joint disease, no history of recent hamstring strain **Exclusion criteria**: History of sub-acute and chronic back pain in the region and SI joint in past 6 months, osteoporosis, lumbar spine fracture, structural deformity, inflammatory disorder. (9)	**Group A**: Dynamic oscillatory stretch technique **Group B**: Static stretching	Dynamic oscillatory stretch technique wasfound to be more effective in improving hamstring flexibility and perceived pain compared to static stretching technique
7	Experimental study , 2023 **Inclusion criteria**: Idiopathic hamstring pain, age between 25-40 years, pain duration of more than 3 months SLR below 70 degrees. **Exclusion criteria**: The subjects with a range of more than 60 degrees, acute pain, and acute injury. (10)	**Group A**: Mobilisation with movement **Group B**: stretching	The study concluded that both treatments were effective in reducing pain and improving hip functions and range of motion along with hamstring tightness, but mobilization with movement has significant effects on tightness in hamstrings
8	Comparative study , 2021 **Inclusion criteria**: Low back pain, 18- 25 age (male and female both), and Physiotherapy student **Exclusion criteria**: Any lumbar surgery, Any vertebral disc slip (Bulging Disk, Ruptured or herniated disk, Spondylosis, Spondylolisthesis, Any lower limb surgery. (11)	**Group A**: Sub occipital muscle inhibition technique **Group B**: cranial cervical flexion exercise	The expected outcome include detection of hamstring tightness and improvement in hamstring tightness which will be evaluated using sit and reach test. Suboccipital muscle inhibition technique and cranial cervical technique will be given as an intervention to the participants to improve hamstring flexibility and work efficiently
9	RCT , 2023 **Inclusion critetia:** patient must have non-specific traumatic knee pain prevailing for less than two weeks. Using the active knee extension (AKE) test, patients should also present with a deficit of twenty degrees of knee extension **Exclusion criteria**: In the patient in supine, the femur held at ninety degrees of hip flexion and loss of AKE of more than twenty degrees was considered as tightness of the hamstring. (12)	**Group A**: Muscle Energy Technique **Group B**: Static stretching	This study concludes that both the techniques muscle energy technique and stretching both are equally effective in reducing non-specific knee pain and improving the flexibility of hamstring muscles. No technique has been observed to be superior to another.
10	Comparative study , 2022 **Inclusion Criteria**: Only non-athletic females with age range of 18- 30 years with no musculoskeletal injury from last one year and having AKE below 170 degrees were included **Exclusion Criteria**: Patients were excluded having LBP due to disc problems, lumbar radiculopathy, Osteoporosis and red flags including tumor, fracture, metabolic diseases. (13)	**Group A**: Cryo stretching **Group B**: Static stretching	It is concluded from the results of study that both cryostretching and static stretching techniques are effective in increasing hamstring flexibility. However, cryostretching showed greater increase in flexibility of hamstring muscle as compared to static stretching technique.

Hamstring tightness occurs in early age and tends to increase with age due to decrease in flexibility which has been attributed to change in elasticity and reduced level of physical activities. The prevalence of hamstring muscle tightness was found to be 91.8% in male and 78.7% in female.

Hamstring musculature has one of the highest incidences of injuries. Mostly composed of type II fibres, this biarticular muscle is responsible for knee flexion and hip extension, and this double action makes it more vulnerable to strain. Limited extensibility of the hamstrings results in changes in the dynamic range of motion used while moving. Hamstring tightness is one of the factors that affect dynamic balance because it loses the ability to deform while being stretched. This inability results in reduced hip flexion, altered hip extension, and a posterior tilt of the pelvis, which leads to decreased lumbar lordosis and back pain. Hamstring tightness also leads to increased quadriceps activity, which could lead to tendinopathies. (2)

Hamstring tightness are associated with a posterior rotation of the pelvis in standing due to attachment of hamstring muscle is on ischial tuberosity. Tightness in hamstring muscle causes posterior pelvic tilt which lead to decrease in lumbar lordosis result in low back pain. (3)

The active knee extension test is one of the best methods to rule out the extensibility range of hamstring muscles with hip stabilized at 90 degrees where the instrument is placed accurately. This method gives proper measurement about hamstring extensibility at length with 90/90 position. The amount of extension is measured using universal goniometer.

The need for study arises from a high prevalence of hamstring tightness that has been found in previous literature and in the need for effectively managing hamstring tightness, a condition which may significantly impact the quality of life of affected individuals.

2. Methods

2.1 Inclusion criteria:

- Population: Hamstring tightness aged between 18-25
- Both gender included
- Decreased knee ROM
- Full text articles taken in English language

2.2 Exclusion criteria:

- History of trauma and accidental injuries
- History of surgery on lower limb
- Chronic hamstrings strain, Fracture of lower limb , Pregnancy , Hamstring injuries
- Subjects with Mental disorders

2.3 Eligibility criteria:

The final review will be based on the above articles. Almost 10 articles were studied and a final review was made.

3. Discussion

The study reveals diverse interventions to address hamstring tightness, each demonstrating varying levels of effectiveness. Techniques such as **Active Release Technique (ART)** and **Dynamic Oscillatory Stretch** show significant improvement in hamstring flexibility and pain reduction compared to other methods like **Positional Release Technique** or **Static Stretching**. (4,9)

Proprioceptive Neuromuscular Facilitation (PNF), particularly the **Hold-Relax technique**, was more effective than static stretching for enhancing functional activities, reducing pain, and improving flexibility. Similarly, **Instrument-Assisted Soft Tissue Mobilization (IASTM)** outperformed dry needling (DN) in increasing flexibility of the hip and knee. (7,8)

Muscle Energy Techniques (MET) and passive stretching yielded immediate benefits, with MET showing slightly better results, albeit without statistical significance. Additionally, **Cryo stretching** surpassed static stretching in enhancing hamstring flexibility. (5, 13)

While all interventions, including mobilization with movement and stretching methods, demonstrated effectiveness in reducing pain and improving range of motion, PNF hold relax technique found to be more effective. The choice of intervention should align with the specific needs and goals of the patient, as multiple approaches can yield comparable outcomes in managing hamstring tightness and associated symptoms.

4. Conclusion

In conclusion, various techniques effectively address hamstring tightness, with PNF Hold-Relax emerging as the most effective for improving flexibility, reducing pain, and enhancing functional activities. While methods like ART, Dynamic Oscillatory Stretch, MET, and Cryo stretching also show significant benefits, the choice of intervention should be tailored to the patient's specific needs, as multiple approaches can achieve comparable outcomes.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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