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BRIEF STUDY

Effectiveness of myofascial release in increasing hamstring flexibility: a brief study

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Hamstring tightness is a common issue that affects many people. The flexibility and range of motion of the joint are both limited when this muscle is contracted. Lower back and lower extremity problems are frequently linked to poor hamstring flexibility. Active release technique and myofascial release technique can improve hamstring flexibility. The major goal of this study is to increase hamstring flexibility so that we can compare active release technique with myofascial release technique for effectiveness. The appropriate course of action for treating those with tight hamstrings to increase their hamstring flexibility can then be determined.

Keywords: myofascial, hamstring muscle, hamstring injuries, hamstring flexibility

Introduction

Fascia is a thin layer of connective tissue that surrounds the muscles. It provides a support structure for the muscles, organs, and blood vessels, which keeps them in place. Myofascial therapy is used to release the stiff muscles using various movements and keep them flexible. A chiropractor uses gentle touch to locate the stiffened muscles in myofascial therapy. Although the pain is triggering in nature and often difficult to locate the source of stiffness, a health-care professional can manually locate the trigger point with light pressure. Highly focused pressure along with stretching can reduce the stiffness and restore the flexibility of the concerned muscle.

The hamstring is one of the muscles in the back of the thigh that allows the legs to move with the knee as the pivot. Gait speed and chair rise are some of the assessment methodologies used to assess physical performance. This usually depends on the lower limb of the human body. The hamstrings, being one of the major muscles in the lower limb, have an important role to play. Hip flexion angle is influenced by the quadriceps, hence flexibility of the hamstring must be maintained.

The inability to completely extend the hamstring muscle across its range of amplitude is known as hamstring tightness. The Golgi tendon organs and the muscle spindle, which serve as the body's primary mover and stabilizer, dictate the size and function of each specific muscular component. The rear of the thigh is home to a collection of long, robust muscles known as the hamstrings. Strain on this muscle can result in lumbar spine problems, general low back pain, and sports injuries (1).

A frequent issue that can affect both symptomatic and asymptomatic individuals is hamstring tightness. One muscle group that is prone to shortening is the hamstrings Turner et al. (1988). The most common cause of hamstring injuries in athletes was a lack of hamstring flexibility (2). When the hip is flexed, hamstring tightness limits the range of motion in the knee extension. When the hamstrings are tight, it may lead to knee flexion contractures, which prevent the knee from fully extending.

A tight hamstring may contribute to patellofemoral syndrome by increasing the compressive tension on the patellofemoral joint. In cross-sectional studies of both adults and adolescents, low back pain has been associated with insufficient hamstring flexibility (3).

Both active release techniques and dynamic soft tissue mobilization increase hamstring flexibility. This study compares the effectiveness of active release technique and dynamic soft tissue mobilization for improving hamstring flexibility. This will allow us to select the approach that will stymie our efforts.

Ham: Fat and muscle behind the knee and

String: Tendons.

The hamstring muscles, which extend from the ischial tuberosity and cover the hip and knee joints, are innervated by the tibial nerve. The hamstrings work together to flex the knee and lengthen the thigh at the hip joint.

The following characteristics are shared by the hamstrings:

1. Originated from the ischial tuberosity.
2. Insertion into one of the leg bones.

The semimembranosus and semitendinosus rotate the leg medially when the knee is semi-flexed, whereas the biceps femoris rotates the leg laterally. The semimembranosus and semitendinosus rotate the leg to the center when the hip is extended, whereas the biceps femoris spins the leg to the side.

References	Types of studies	Conclusions
Alshammari et al. (2019)	Original Article	Quadriceps muscle activation following passive stretching of the hamstrings appears to be superior to the PS and ND techniques in improving hamstring muscle flexibility.
Joshi et al., (2018)	RCT	The findings of this study indicated that all three interventions were effective in improving hamstring flexibility in young asymptomatic individuals when performed by the therapist.
Sakhalkar et al. (2022)	Original research article	The study concluded that myofascial release was more effective over passive stretching technique for improving hamstring flexibility among amateur football players.
Itotani et al. (2021)	Article	MFR for hamstrings affects not only the improvement in flexibility but also the improvement in physical performance.

Aims and objectives

- To determine whether active release technique is effective in enhancing hamstring flexibility.
- To ascertain if dynamic soft tissue mobilization is effective at enhancing hamstring flexibility.
- To contrast the effectiveness of dynamic soft tissue mobilization and active release technique in enhancing hamstring flexibility.

Research methodologies

Online medical journals available on popular search engines for the MEDLINE database, like PubMed and Google Scholar, were searched with keywords like “myofascial,” “hamstring muscle,” “hamstring injuries,” and “hamstring flexibility.”

Review of literature

Woodley et al. (2005) reviewed the anatomical literature to determine which muscles frequently attach to the sacrotuberous ligament. They discovered that the sacrotuberous ligament’s attachment to the biceps femoris muscle’s long head muscle can influence the stability or range of motion of the sacroiliac joint. However, descriptions of this mechanism focus primarily on these two elements, disregarding any potential effects of neighboring tissues.

Tate et al. (2006) used magnetic resonance imaging (MRI) to investigate the morphology of the lower extremities. This study’s objective was to contrast the lower leg muscle morphology (volume and peak cross-sectional area) of adolescent athletes with previously published data.

A secondary goal was to see if there were any significant differences in muscle morphology values between the two sides, implying that measurements taken unilaterally do not fully represent both limbs. They found that the mean volumes and CSA of the current sample of athletes were greater than previously reported values (primary 8 from cadaver studies, nonetheless).

The average ratio of the total volume of the quadriceps to the total volume of the hamstrings was over 3:1 (2.9 ± 0.2), whereas in prior studies, it was more along the lines of 2:1 (2.1 ± 0.2). The volume of the hamstrings and quadriceps’ proportional contribution differed for different athletes.

It was subsequently determined that the morphological information provided here should be employed when investigating young athletes rather than corpse data. These findings should increase sports biomechanical modeling’s accuracy.

With reference to typical MRI images, Ripani and Continenza sought to describe the architecture of the ischial tuberosity and the proximal thigh region in their 2006 study. They created a link between anatomical samples and MRI scans. Coronal scans showed that the hamstring muscles were both long and dense.

The hamstring muscle origin is on the dorso-medial side, the quadrates femoris muscle with its constant bursa and the ischial tuberosity are on the antero-lateral side, and the gluteus maximus and its bursa are on the dorsal border. Both cadaver dissections and MRI pictures showed this junction region. Making the correct diagnosis is much easier with the help of these MRIs and anatomical descriptions.

Biarticulated movement requires the biceps femoris muscle, a hamstring muscle, which Dahmane Djordjevic and Smerdu (2007) attempted to quantify using mechanomyography methods. They showed that the biceps femoris muscle had a stronger capacity to develop into a faster contracting muscle following sprint training than the group that engaged in sedentary activities. The

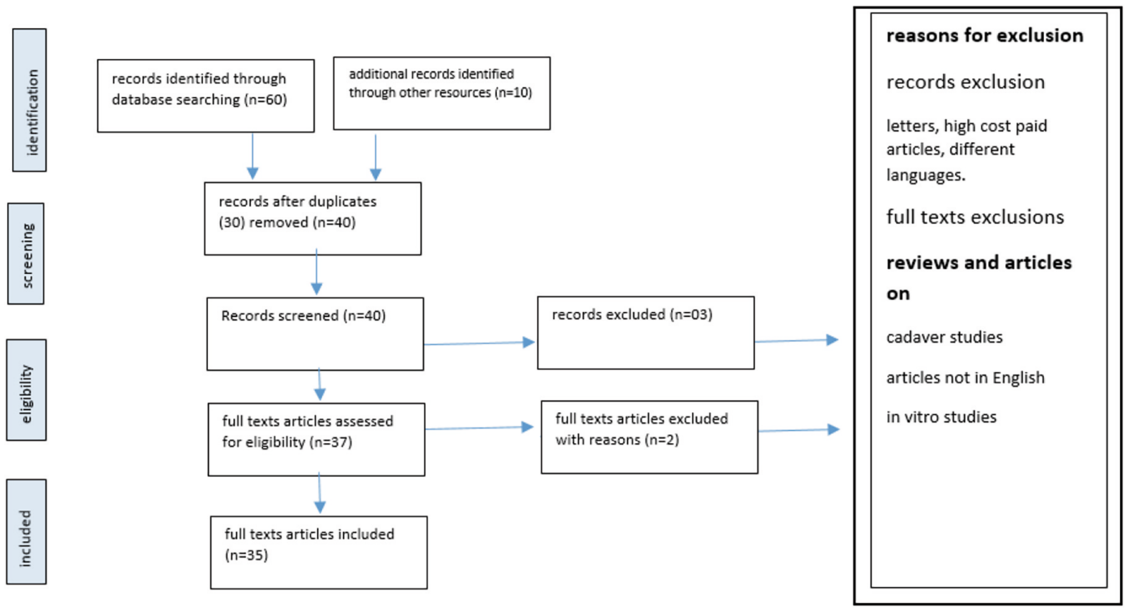

FIGURE 1 | Study selection process using the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines.

results of the histochemical and immunohistochemical examination of the biceps femoris muscle also show that this muscle is highly adaptable.

There were also found to be a considerable number of intermediate type 2c fibers that coexpressed MyHC and -2a, in addition to type 1a, type 2a, and type 2b fibers. To tailor the functional response of the biceps femoris muscle to the organism's actual functional needs, type 2c could be a future source of fibers with the potential to evolve into either slow type 1 or quick type 2a.

In a study on electromyographic activity in the quadriceps and hamstrings measured at various ranges of motion, Crosiers et al. (2007) found proof that the repeatability of strength or EMG ratings obtained from the routinely utilized ROM of 90 degrees is not hampered by testing knee muscles at short (30 degree) ROMs. The error band for strength, on the other hand, was broader and was established by comparable EMG readings. Strength was also repeatable within accepted clinical standards.

Biomechanics of hamstring muscle

The function of the hamstrings as knee flexors is undeniable. The medial and lateral muscle groups, however, are used in pure knee flexion because they attach to the knee joint on both the medial and lateral sides. The only muscle responsible for knee flexion during medial rotation of the knee joint is the medial hamstrings, while the only muscle responsible for knee flexion during lateral rotation of the knee joint is the lateral muscle mass.

Pathomechanics of hamstring muscle

Effect of weakness

Weak hamstring muscles result in a significant loss of strength in knee flexion. Because the erect posture does not require knee flexion, there is less impairment. Hamstring weakness may lead to additional functional issues in the hips, where the hamstring muscles are crucial to extension strength.

The additional weight causes hip flexion in addition to knee flexion when performing a squat. That flexion moment is opposed by a muscular extension moment generated, at least in part, by the hamstring muscles. As a result, bending and lifting could be very challenging for someone with hamstring weakness.

Effect of tightness

Hamstring tightness is defined as the inability to fully extend the hamstring muscle. Muscle is the primary mover and stabilizer of the body, and the length and usefulness of individual muscle fibers are significantly influenced by the Golgi tendon organs and the muscle spindle, which serves as its functional unit.

A group of long, powerful muscles that run along the back of the leg are known as the hamstrings. Sports injuries, general low back pain, and difficulties with the lumbar spine can all be caused by tightness in this muscle.

It is a common problem that can affect people with and without hamstring tightness. The hamstrings are one set of muscles that are prone to shortening Turner et al. (1988). The main cause of sports-related hamstring injuries is athletes' lack of hamstring flexibility.

Hamstring stiffness prevents the knee from fully extending during hip flexion. Knee flexion contractures, which prevent the knee from fully extending, might be the result of a very tight hamstring. A tight hamstring may aggravate patellofemoral syndrome by raising the compressive tension on the patella femoral joint. In cross-sectional studies of both adults and teenagers, tight hamstrings have been connected to low back discomfort.

Prevalence of hamstring injuries

Importance of hamstring flexibility

The connection between hamstring muscle tension and stretching is currently one of the topics in orthopedics and sports medicine that has received the most research. Hamstring tightness affects the majority of people on earth. Hamstring tightness is linked to a variety of conditions that physiotherapists regularly treat.

Lower back and lower extremity ailments are frequently associated with poor hamstring flexibility. People with insufficient hamstring flexibility will be unable to do simple daily chores requiring knee bending or hip extension.

Warming up and stretching are typically advised before engaging in sports or physical activities since it is thought that doing so will enhance joint range of motion (ROM). A number of stretching exercises have been advised in the literature to maintain or restore muscular flexibility and avoid a loss in ROM, which can make it more difficult for someone to conduct functional activities.

Among the techniques used to promote hamstring flexibility are active release technique, passive stretching, static soft tissue mobilization, ballistic stretching, PNF stretching, dynamic stretching, muscular energy technique, and Bowen technique.

Stretching muscles while the body is at rest is known as static stretching. To gradually extend a muscle to an uncomfortable point and keep it there for 30 to 2 minutes, a series of exercises are utilized. Stretch for no less than 30 seconds and no longer than 2 minutes (if a position can be held for more than 2 minutes, a farther stretch should be performed).

During or shortly after this holding period, participants may feel a slight pain or warmth in their muscles. The specialized tension receptors in our muscles are activated during static stretching exercises. Correct static stretching techniques enable the muscle to be relaxed as well as stretched by reducing the sensitivity of the tension receptors.

An osteopath invented the muscle energy technique (MET), which is now used by a variety of manual therapy professionals. To relieve restricted motion in the spine and limbs, a light manual therapy known as the muscular energy technique is employed. It is an active technique where the patient, as opposed to the clinician, controls the force of the correction.

The patient is required to perform voluntary muscle contractions of varying intensities in a specific direction while the practitioner applies a counterforce to prevent movement. Another name for this approach is "active muscular relaxation." Physical therapy and occupational therapy techniques called proprioceptive neuromuscular facilitation (PNF) stretching were developed in the 1940s and 1950s to help people with paralysis.

PNF frequently involves both passive and isometric stretching. Sport therapists used PNF components on healthy athletes for the first time in the 1980s. The most typical PNF arm or leg postures enhance coordination and flexibility throughout the whole range of motion of the limb.

In order to quickly increase an athlete's range of motion and boost performance, PNF is utilized as a supplement to routine stretches. A wide range of motion has several advantages, including improved biomechanics, decreased wear and tear, and defense against overuse injuries. PNF is used by medical professionals such as physical therapists, chiropractors, occupational therapists, massage therapists, and others.

Various techniques used are the following:

- Hold-Relax Agonist
- Hold-Relax Antagonist
- Hold-Relax-Swing/Hold-Relax Bounce
- Rhythmic Initiation
- Rhythmic Stabilization.

Bowen technique

Instead of focusing only on the evident symptoms, Bowen treats the complete body. The muscles, nerves, ligaments, and tendons of the human body are massaged in this therapy using the hand, finger, and thumb. The latissimus dorsi, gluteal, hamstring, receiving bilateral rolling movements, tensor fasciae latae (TFL), and a medial hip adductor move are all used.

These motions have an effect on the erector spinae, which connect the lumbar spine to the cervical spine. The actual pressure is about equal to what your eyeball could withstand if your eyelid were closed. The skin is initially pulled to one side of the building. The next step is a small push against resistance at the muscle edge. The outcome is that the muscle is overworked and forced to operate outside of its normal range.

Then, with light pressure still applied to the medial site, the construction is slowly rolled over. This method stimulates particular body areas in groups of 2–8 points at a time. To give the body time to react, certain events should be spaced by at least 2 minutes. At this point, the therapist will leave the room to give the patient as much space as possible to unwind.

Recent research has demonstrated that only one Bowen technique session can significantly increase hamstring muscle flexibility and maintain it there for a whole week. Due to the lack of any sort of tissue loading, stretching, loading, or exercising, explanations of tissue creep and viscoelastic theories are invalid. According to Bowen's research, mechanoreceptor stimulation is what leads to facially induced plasticity. More investigation into these proprioceptive systems is required in order to know more.

Several studies have been conducted to investigate how temperature affects range of motion. The effects of both cold and superficial heat can considerably boost the efficacy of stretching by reducing muscular pain and muscle guarding. Cryotherapy may be used to treat inflammation and can help reduce the stretch reflex response to elongation.

Several physiological changes, such as reduced local metabolic function, edema, nerve conduction velocity, muscular spasm, and an increase in local anesthetic effects, may occur when cold is applied to the skin. Studies suggest that the cold may enhance hamstring flexibility.

Active release technique

Physiatrists and others treat soft tissue soreness with the proprietary active release technique (ART). According to the method's developer, Dr. P. Michael Leahy, myofascial diseases including headaches, plantar fasciitis, sciatica, and carpal tunnel syndrome may be treated with it. It encourages flexibility, enhances athletic performance, and hastens the recovery from a number of ailments.

ART, a type of manual therapy, is used to address soft tissue issues in muscles, joints, and connective tissue. In order to keep the tissue's fibers taut while it transitions from a shorter posture to an extended condition, a tactile touch is employed. To find adhesion or tension in a particular tissue, medical professionals employ palpation.

Joint mobilization and ART work well together to address soft tissue issues. The method requires precise, expert movement that includes more than 500 different sorts of concentrated motions that change depending on the situation. The length of the treatment plan may vary depending on the circumstances. Most soft tissue issues can be resolved in 4–11 sessions that last 15–30 minutes each.

Myofascial release technique

Although massage treatment for delayed-onset muscle discomfort has not received much investigation, it has been demonstrated in certain trials to increase muscular flexibility (DOMS). It has been demonstrated that massage can maintain joint range of motion, relieve sore muscles, and stop strength loss.

Few of these studies have shown favorable findings [42–45], and many of them have major methodological flaws that prevent us from developing a trustworthy evaluation of the impact of massage on DOMS. Since there are so many different soft tissue treatments addressed in the massage research that has previously been done, it is difficult to directly compare studies. A total of 46 it is clear that a useful method of influencing flexibility has not yet been discovered.

Myofascial release technique with muscle lengthening: Traditional massage is enhanced with a dynamic component that moves the limb through its range of motion. The dynamic component's initial step is to pinpoint a specific problem area where therapy will be focused. The massage settings on the DSTM model have also been improved for quick clinical use.

Flexibility

A healthy biomechanical system is thought to strongly rely on flexibility in sports. According to the study, flexibility provides a number of benefits, including improved athletic performance, a lower risk of injury, the avoidance or reduction of post-exercise soreness, and improved coordination. Lower hamstring flexibility has been associated with increased patellar tendinopathy, patellofemoral pain, hamstring strain injuries, and muscle injury signs and symptoms during eccentric exercise.

Strains of the posterior thigh muscles are a common sports injury with a high likelihood of recurrence. According to some studies, a lack of flexibility can be a risk factor for hamstring injuries. Flexibility training is often considered by doctors to be an essential part of injury prevention and recovery, as well as a means of improving performance in everyday life and sport. As therapists, we often teach stretching exercises to athletes in the hope that the improved flexibility will last long enough to have at least a temporary positive effect.

Hamstring Injury

Sportspeople regularly have hamstring injuries, which can quickly turn into a chronic, paralyzing ailment. Hamstring injuries frequently repeat due to inadequate healing and returning to sport before the affected muscle group has fully healed.

Conclusion

Choosing the most appropriate course of treatment for patients will assist manual therapists in preventing injuries and supporting patients in maintaining enough muscular flexibility while healing from injuries, so it is critical to determine which strategy is most beneficial in our clinical setting.

Hamstring flexibility is essential for preventing injuries since it has been connected to a number of sports-related illnesses.

Among the various stretching techniques, the myofascial release technique has been shown to be one of the most well-liked and effective ways to increase hamstring flexibility. On the other hand, a recent study found that the active release technique is an efficient stretching method that is also proven to promote hamstring flexibility.

Each workout that increases hamstring flexibility uses a distinct physiology. Furthermore, no research has looked at how well dynamic soft tissue mobilization and the active release method work to increase hamstring flexibility; as a consequence, this investigation is required to discover which strategy works better.

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