

Effectiveness of Pnf Stretching in Hamstring Tightness Population Having Low Back Pain

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Abstract

Background: One of the possible contributing factors of low back ache by hamstring stiffness on the ischial tuberosity. Movement restrictions or postural asymmetry lead to compensatory movement patterns of the lumbar spine, and subsequently increases stress on the spinal soft tissues and risk of low back pain (LBP), stretching and loosening the hamstring muscles can help relieve sciatic nerve root pressure and reduce the lower back pain.

Purpose: The aim of the study to determine effectiveness of PNF stretching in hamstring tightness population having low back pain.

Materials and Methods: Subjects who are willing to participate are separated into two groups and received treatment six times/week for two weeks in RENU'S Physiotherapy & Rehabilitation Centre , PNF stretching with hamstring strengthening exercise and conventional method of stretching with hamstring strengthening exercise, and informed about the study and signed consent were obtained.

Results: The PNF stretching group exhibited a substantial improvement in the pre-test and post-test, suggesting that the PNF stretching for hamstring tightness for low back pain.

Conclusion: According to the findings, PNF stretching technique has shown high significance in reducing hamstring tightness and reduced low back pain compared to conventional method of stretching and allowing participants with LBP to recover faster.

Keywords: Numerical pain rating scale, Oswestry Disability Index (ODI), conventional method of stretching, Range of Motion,goniometer

Introduction

All industrialized nations experience a significant amount of low back pain, which is often treated in basic healthcare facilities. It is margin and above the inferior gluteal folds a may or may not be accompanied by leg pain. (sciatica). It's a complex condition, it may

have a variety of etiologies in fact identifying the risk variables becomes challenging. Pain and disability are the two main signs of low back pain. The majority of adults experience back discomfort, which is also one of the most common causes of activity restriction and occupational incapacity worldwide.^{1,2,3}

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Physical factors like intense physical strain, frequent lifting, postural stress, and vibration are just a few of the many determinants of low back pain and sciatica. Other determinants include social demographic traits and individual factors like lifestyle and physical capacity, gender, age, race, genetic factors, height, and weight, habits like smoking and alcohol use, poor general health, and, finally, psychosocial factors. There are many therapeutic interventions available for the treatment of chronic low back pain, including surgery, medication, manipulation, physical therapy,

behavior therapy.^{4,5-9,10-16} The prevalence of low back pain is a significant clinical, social, economic, and public health issue. It is a condition having a wide range of potential etiologies, occurrence in numerous demographic groups, and classifications. As a result, the extensive body of literature on low back pain is not only diverse but often contradictory. According to definition, low back pain is a symptom that can only be determined by the patient themselves.^{4,5-9} Stretching has been demonstrated to increase range of motion more effectively than warming up and massage, either alone or together.¹⁷ The resistance of the muscle to variations in length during the range of motion is referred to as passive stiffness.

Series and parallel elastic components that help to absorb, transfer, and store energy make up the muscle's passive component in the hamstrings, a loss of flexibility and a rise in low back pain. While the subject's lower limb is stabilized in a rigid constraint, the instrumented straight leg raise test (iSLR) enables a quantitative and objective evaluation of the mechanical components of muscle contraction.¹⁸ By reducing the lumbar- or low back-related movements, both hamstring tightness may well be to blame for the development or maintenance of back discomfort.

Stretching methods known as Proprioceptive Neuromuscular Facilitation (PNF) are proving to be successful in reducing hamstring tightness & it's made to stimulate proprioceptors in order to improve the response of neuromuscular processes. It improves sensorimotor control and lumbar muscle proprioception.^{19,20} To increase flexibility, muscle strength, and range of motion, simple techniques such a variety of contract-relax, rhythmic stability, dynamic reversals, and combinations of these can

be used. PNF aims to improve stability, mobility, movement control, muscle strength, and joint coordination whereas Contract relax, hold -relax, and contract-relax antagonist-contract appear to be the most often employed inhibition strategies in PNF stretching.²¹ The greatest potential for muscle lengthening is offered by PNF techniques, especially those that involve reciprocal activation, such as hold relax (HR), on the premise that increased motor pool inhibition reduces muscle contractibility and hence permits higher muscle compliance.²² The primary goals of the PNF idea are to improve joint synchronization, movement control, and mobility. As we included conventional stretching, there may be many conservative methods that have been recommended for the management of low back pain. These treatments include pelvic tilt exercises, flexion exercises, abdominal trunk curls, hamstring stretches, orthotic bracing, and general aerobic exercise like walking and swimming. Heat, cryotherapy, massage, ultrasound, traction, acupuncture, and electrical stimulation are some of the physiotherapy treatments employed. The most popular electrotherapy techniques are transcutaneous electrical nerve stimulation (TENS) and interferential current.

A low frequency amplitude-modulated medium frequency alternating current is used in interferential treatment (IFT). It has reportedly been shown to lessen pain, improve circulation, and have a soothing effect. Because of its deep skin penetration and minimal irritation, it is used efficiently and it has an advantage over other electrical currents in that it still produces low frequency effects in the tissues while having a relatively lower carrier frequency that is associated with decreased skin resistance.

Aim

The aim of the study is to determine effectiveness of PNF stretching in hamstring tightness populations having low back pain.

Material and Method

This is an experimental study done with 30 subjects with low back pain population, aged between 30 to 40 years of both genders from RENU'S Physiotherapy & Rehabilitation Centre, Vellore. Samples were randomly selected and allocated in

two groups and the study duration from October 2022 to November 2023.

Inclusion Criteria:

- Age: 30 to 40 years
- Gender: Male and Female
- Person with low back pain
- Subjects with score below 6 in numeric pain rating scale (NPRS)
- Subject willing to participate in the study

Exclusion Criteria:

- Fracture
- Neurovascular problem
- Tendinitis
- Bursitis
- Joint instability
- Tingling or numbness in the lower extremities

Outcome Measures:

Assessment was performed at baseline (before starting of treatment) and after two weeks of treatment.

- Numeric Pain Rating Scale (NPRS) ²³
- Oswestry Disability Index ²⁴
- 90-90 Hamstring test ²³
- Goniometer ²³

Procedure

A total of 30 people were chosen based on the inclusion and exclusion criteria, and their informed consent was obtained. They were also informed about the procedure's. Initially the patients underwent orthopedic assessment. The pain assessment was taken by using numeric pain rating scale (NPRS) and 90-90 hamstring special tests were done by the therapist to identify the hamstring tightness.

The duration of both groups treatments included:

- Repetitions: 8 to 12 repetitions
- Set: 2 to 3 sets.
- Rest interval: 15 to 30 seconds.
- Duration of session: 15 to 25 (minutes/ session).
- No. of sessions per day: 1 session/day.

- Frequency: 6 days/week.
- Treatment duration: 2 weeks

All the exercises were done under the supervision of a physiotherapist.

PNF Stretching for Hamstring Along with Hamstring Strengthening

Bridging Exercises for Hamstrings:

All of these bridging movements are fantastic, progressively challenging hamstring- and glute strengthening exercises.

- **Simple Bridge:** The hamstrings and glutes can be strengthened via bridging. Patient position is supine and feet flat on the floor as you lay on your back. Start with feet together, turn toes out to form a "V," and then step forward with heels. Hip distance between feet and knees should be used. Slightly flex abdominal muscles to bolster core and support lower back. A diagonal line to run from knees to hips, so tighten the glutes together and slowly lift buttocks off the ground as high as can without arching back. Hold for three seconds, then release gradually.²⁵
- **Single Leg Bridging:** The hamstrings' stage 2 bridged. Ask the patient to elevate back into a bridge posture while maintaining the same patient position as for the straightforward bridge. Instead, elevate one foot off the ground and extend the knee while maintaining the bridge posture. Hold for three to five seconds, then lower the foot to the ground. Throughout the exercise, keep hips and pelvis lifted up and level; try not to let them sag to either one or both sides.²⁵
- **PNF Stretching for Hamstring:** The PNF-hold Relax technique was used to the subjects, and while they were reclining supine, one lower extremity of each subject—the one that wasn't going to be checked or treated first—was Velcro-strapped to the couch. The hamstrings of the individual were stretched out until they felt a gentle stretch, and this position was held for 7 seconds.

One lower extremity of each patient that wasn't going to be examined or treated first underwent Velcro on PNF-hold relax technique.

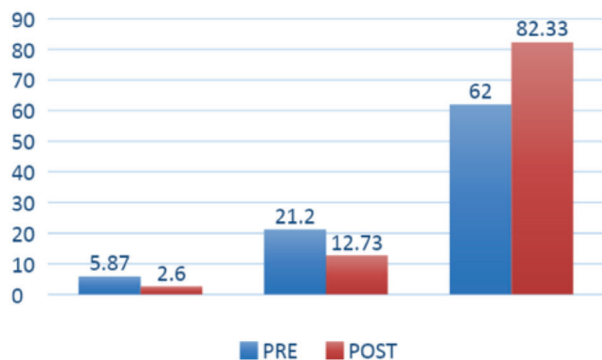
The patient was urged to relax for five seconds. After then, the patient feels a minor tension as the therapist passively extends the muscle. The posture was held for seven seconds. This technique was carried out five times each day for five days, with a 20-second rest in between.²⁵

Conventional Methods of Stretching along Hamstring Strengthening:

- **Lying hamstring stretch:** Lie flat with the legs completely extended, either on a mat or the ground. To stretch the right leg, grasp the back of the knee with both hands, lift the leg toward the chest, and gradually straighten the knee until you feel a stretch. For 10 to 30 seconds, maintain the stretch.²⁵
- **Lying hamstring stretch using a wall:** Look for an open door. Lie flat with the back straight and the left leg fully extended on the floor, either on the ground or a mat. The left leg should enter the doorway first. Next to the entryway, lean the right leg on the wall. To create a slight stress in the right leg, adjust the distance between the body and the wall. Hold the stretch for ten to thirty seconds. Three times, repeat.²⁵ Along with this hamstring strengthening was performed as mentioned in the previous group.

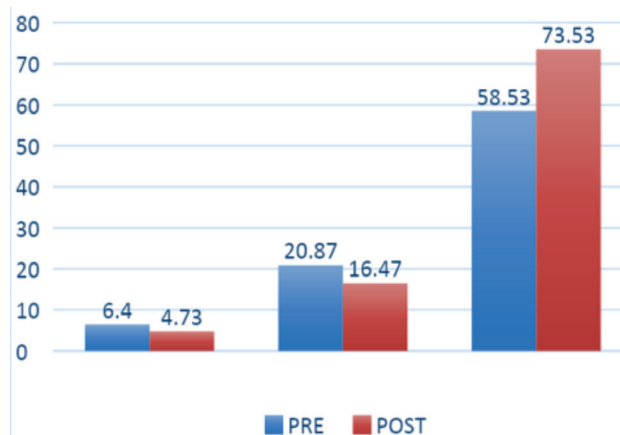
Data Analysis

PNF group:



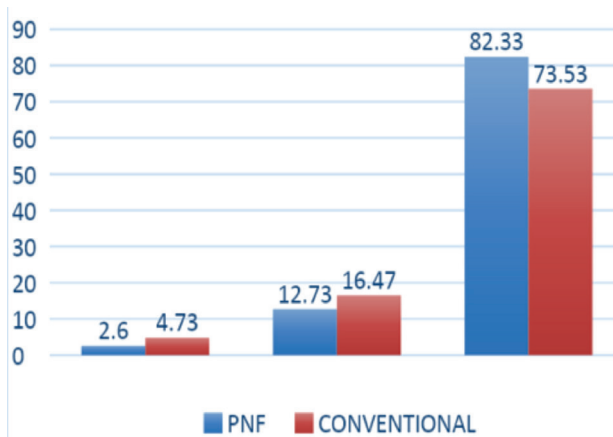
Graph -1 Comparison of pre and post value of PNF group using NPRS, ODI, ROM

Conventional group:



Graph-2 Comparison of pre and post value of Conventional group using NPRS,ODI,ROM

Post-test values of both groups:



Graph-3 Comparison of post values of PNF and Conventional group using NPRS,ODI, ROM

Results

There is a significant improvement in NPRS, ODI, goniometer for range of motion(ROM) among the PNF group and conventional therapy group.

The NPRS post mean value in PNF group is 2.60 and in the Conventional group is 4.73 indicates equally significant in both the groups, with p value <0.0001.

The ODI post mean value in PNF group is 12.73 and Conventional group is 16.47with p value <0.0001.

The ROM post mean value in PNF group is 82.33 and Conventional group is 73.53,p value <0.0001.

Discussion

The current study intends to compare the effects of traditional stretching methods and proprioceptive neuromuscular facilitation approach on flexibility in people with tight hamstrings. In this study 30 subjects having low back pain have been selected and marked pre-test values using outcome measures like ODI (Oswestry Disability Index), NPRS, and goniometer for ROM before and after the treatment. The goniometer and 90-90 test used to measure the range of motion and hamstring tightness.

Zakaria A, et al.,2012, states that PNF self-stretching through a therapist is benefited.²⁶ According to this study PNF hold-relax technique is clinically superior to conventional method of stretching in terms of increasing range of motion through 90-90 test,improving hamstring flexibility.

Lim KI, et al.,2014 According to the study, static or PNF stretching is significant in reducing hamstring tightness.²⁷ This study states, PNF promotes muscle relaxation prior to stretching in order to lessen reflexive components that trigger muscle contraction, increasing ROM through voluntary muscle contraction.

Ghanbari A, et al.,2013 study concluded that compared to static and PNF stretching, PNF is effective in hamstring extensibility.²⁸ As per this study holding a relaxed position is a sort of PNF stretching that makes passive muscle elongation more comfortable. The fact that autogenic inhibition through activation of group I fibers, thereby muscle relaxation of tight muscles, thus increasing ROM, may be the cause of the improvement brought on by PNF hold-relax. The results of the present study demonstrated that PNF stretching and conventional method of stretching were successful in reducing hamstring tightness and pain .PNF stretching was superior to conventional method of stretching by NPRS and ODI showed a marginally significant difference in the study's outcomes but less than conventional group.

Ethical Clearance: Taken from the Institutional ethical committee. ISRB number-03/100/2022/ISRB/SR/SCPT.

Funding: Self

Conflict of Interest: Nil

Conclusion

According to the findings, PNF stretching technique has shown high significance in reducing hamstring tightness and benefited in reducing low back pain and allowing recovery faster. Based on the result analysis, the PNF stretching technique proposed here might be considered in persons who require low back discomfort among the IT population.

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