

“IMMEDIATE EFFECTS OF HOLD-RELAX PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION VERSUS DYNAMIC STRETCHING ON HAMSTRING MUSCLE”

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Abstract

As we have reviewed the incidence of Hamstring Injuries are high along with its high recurrence and its prevention by practicing stretching techniques during warm up and cool down phase. Comparison between two stretching techniques (i.e. hold-relax PNF technique versus dynamic stretching) were performed to rule out which is more effective to increase hamstring flexibility immediately. Total 30 subjects participated in the study through the random chit sampling method. College students of 18-28 years of both genders were involved in this study. According to the statistical analysis both the Dynamic stretching and Hold-Relax neuromuscular proprioceptive stretching technique shows immediate results on Hamstring muscle. But the Hold-Relax proprioceptive neuromuscular proprioceptive stretching is more effective. Both the Hold-Relax proprioceptive neuromuscular technique and Dynamic stretching technique are effective. Hence, by performing these techniques during warm-up and cool-down phase can prevent injuries to the Hamstring muscle. And we have also noticed that Hold-relax PNF stretching technique showed us commendable results in the study.

Keywords: Hold-relax Technique And Dynamic Stretching

Introduction:

The Semitendinosus, Semimembranosus, and the long and short heads of the Biceps femoris muscles are collectively known as the Hamstrings. These muscles each attach proximally to the ischial tuberosity of the pelvis, except the short head of the biceps, which has a proximal attachment on the posterior femur. The Semitendinosus muscle attaches distally to the anteromedial aspect of the tibia by way of a common tendon with the Sartorius and the Gracilis muscles. The Semimembranosus muscle inserts posterior-medially on the tibia. Both heads of the Biceps femoris muscle attach distally to the head of the fibula, with a slip to the lateral tibia. The short head of the biceps femoris muscle does not cross the hip joint and, therefore, acts uniquely at the knee joint. The rest of the hamstring muscles cross both the hip (as extensors) and the knee (as flexors); therefore, their force producing capability at the knee is dictated by the angle of the hip joint. Greater hamstring force is produced with the hip flexed because the hamstrings are lengthened and are required to contract with the hip extended and the knee flexed to 90° or more, the hamstrings are shortened across both the hip and the knee. The hamstrings produce less force as knee flexion approaches the hamstring's maximal shortened position (active insufficiency) and the hamstrings must overcome the increasing tension in the lengthened rectus femoris muscle (passive insufficiency). This posterior shear or posterior translational force can reduce strain on the anterior cruciate ligament, although conceivably it increases the strain on the posterior cruciate ligament.[1] In 1985, Agre categorized musculotendinous injuries, based on their etiology, because of either indirect or direct trauma. The clinical history of a running athlete often includes a description of being unable to finish his or her activity and “PULLING UP”. The athlete may also report feeling or a “POP” in the posterior thigh. More specifically, the classification system is based on clinical presentation and the assumed underlying soft tissue damage. [2]

Type	Severity	Clinical Signs
1	Mild, damage to a few muscle fibers	Sensation of muscle "cramping" and tightness Slight pain with muscle stretch and contraction Signs may not be present until after activity
2	Moderate, more extensive damage to muscle fibers, partially torn but still intact	Immediate pain More severe pain with stretch and contraction Soreness over hamstring muscle Slight bruising 2 to 3 days after injury
3	Severe, complete rupture of the muscle	Immediate burning or stabbing pain Inability to walk Palpable mass of muscle tissue at tear Severe bruising 2 to 3 days after injury

Table 1.1 – Different types of muscle injuries with their severity

Hamstring strength is often expressed relative to Quadriceps strength as the hamstrings: quadriceps ratio, since it is the relation between the ability of the quadriceps to generate speed and the capacity of the hamstring to resist the resulting forces that is believed to be critical. A previous injury can cause scar tissue to form in the musculature, resulting in a less compliant area with increased risk of injury.

Muscle flexibility is important for the normal functioning of a person. Limited flexibility reduces the functional level of the musculoskeletal system and can significantly be related to injury. [3] Reduction in flexibility has been pointed out as the cause of various injuries [4], and with people who spend a lot of time sitting in a chair, the shortening of the hamstrings is associated with poor posture, back pain, and walking difficulties, causing various dysfunctions. [5] Hamstring flexibility has been suggested as but one factor in the multi-factorial etiology of hamstring strain injury. With a seasonal incidence of 5.5-6.7 % hamstring strains are the most frequent of all injuries in Australian Rules football [6]. Hamstring strains accounted for 11% of injuries in British professional soccer divisions in Iceland [7]. In a study of student professional dancers in Sweden, researchers found 51% career prevalence for hamstring injuries [8]. Also, at 34% in Australian rules football and 40% in British professional soccer, reported recurrence rate is high [9]. Previous studies have applied several methods to enhance flexibility, including massage, muscle energy techniques, myofascial release techniques, proprioceptive neuromuscular facilitation and static stretching [10,11]. Stretching is necessary to manage muscle stiffness and maintain normal muscle length, and by stretching soft tissues such as muscles, tendons, ligaments, it increases joint range, maintains and improves flexibility, improves body function, and prevent injuries [12]. The effects of these stretching methods have already been demonstrated in several previous studies [13], and in the previous studies these effects were compared about range of motion, pressure pain threshold, and muscle tension [12] Stretching is often performed during the warm up before exercise to increase joint flexibility (defined as the ability to move a joint through its complete range of motion), reduce the stiffness of muscle-tendon units, and optimize performance [14]

Hypothesis

Alternate Hypothesis: Either the hold-relax PNF stretching or dynamic stretching technique is effective on Hamstring muscle immediately.

Null Hypothesis: Neither the hold-relax PNF stretching or dynamic stretching technique is effective on Hamstring muscle immediately.

Methodology :Research Design: Comparative Study.

Sample Size: Total 30 subjects participated in the study.

Sampling Method: Random chit sampling method.

Selection criteria:

Inclusion criteria :Age: 18-28 years. Gender: Females. College students. Subjects who are not having complete flexibility in Hamstring muscle (i.e. less than 80 degree in AKE Test.)

Exclusion criteria

- Pregnancy.
- Subjects having any musculoskeletal trauma.
- Subjects having any hamstring injuries in past 1 year.
- Subjects exceeding 80 degrees in AKE Test.

Instrumentation: - Static Cycle, universal goniometer, digital metronome, parallel bar, physio ball, stopwatch, diary, consent form, Pen, Laptop

Method

Firstly, all the students of TMV's College of Physiotherapy were explained about the research topic. Students were included as per inclusion criteria also checked about the excluded criteria (except the person having AKE Value more than 80 degrees). The subjects were instructed to maintain their normal dietary habits and to refrain from vigorous physical activity for two days before the experiment. At least one day before the testing day, the participants reconfirmed their health history and familiarized themselves with the equipment and experimental procedure. [15] Then the subjects were asked to book their time for the study in a group of two people when they were asked to ride the bicycle for 5 minutes. further they were asked to lie-down on the couch for Active Knee Extension Test . If they were fulfilling the inclusion criteria then they were asked to pic the chit from the 2 options According to the chit they were respectively asked to perform the either of the techniques (i.e. Hold-relax PNF or Dynamic stretching) Lastly, they underwent the post technique Active Knee Extension test.

Cycling Protocol: Ride the stationary cycle for 5 minutes maintain 70 rpm at a set resistance similar for all subjects to ensure that pre-stretching parameters were consistent among subjects. [16]

Hold-relax Proprioceptive Neuromuscular Facilitation Protocol:

Position of the subject: supine lying with examining leg on the examiner's shoulder and other leg placed erect on the couch stabilized by the examiner's knee. Procedure: The examiner will lengthen the hamstring muscle to end range; hold it for 10 seconds, after which the subject performed a 10 second maximal isometric contraction against the examiner's resistance, followed by same procedure for 80 seconds (i.e., total duration of 1 repetition). Break for 10 seconds between two repetitions and more 2 repetitions with the same protocol is performed [16]

Dynamic Stretching Protocol:

Position of the subject: the subjects stood upright with their feet parallel and facing forward while holding the parallel bars with both hands.

Procedure: the subjects were then instructed to contract hip flexors intentionally with knees extended 15 times in 30 seconds followed by 10 seconds rest for 80 seconds (i.e., total duration of 1

repetition). Break for 10 seconds between two repetitions and more 2 repetitions with the same protocol is performed. [15]

Active Knee Extension Test Procedure:

- The test is performed with the patient lying supine with both lower extremities extended. The tester flexes the ipsilateral hip to 90 degrees and maintains this angle while the ipsilateral knee is passively extended. The contralateral lower extremity is stabilized on the examination plinth. Clinically, the endpoint is reached when either the tester feels slight resistance, or the subject reports a strong but tolerable stretching sensation in the hamstring musculature. Using the universal Goniometer or two gravity inclinometer, the tester can measure the AKE, which is the degree of knee flexion from terminal knee extension. [17]

Result

According to the statistical analysis both the Dynamic stretching and Hold-Relax neuromuscular proprioceptive stretching technique shows immediate results on Hamstring muscle. But the Hold-Relax proprioceptive neuromuscular proprioceptive stretching is more effective as the “t-test” value is lower than the value of Dynamic stretching.

VALUES	HOLD-RELAX	DYNAMIC STRETCHING
MEAN 1	59.667	62.4667
MEAN 2	78.2	79.1
SD 1	10.4772	7.2242
SD 2	7.2369	6.2717
T-SCORE	-8.0149	-9.523

Discussion

As results showed us that both the techniques are giving impressive immediate results (i.e. immediate increase in Hamstring flexibility). But the more effective technique is Hold-Relax PNF stretching technique; there can be either of the reasons for the same, such as Hold-Relax PNF technique is a passive technique while, Dynamic stretching technique is an active technique. Meanwhile, one cannot perform Dynamic stretching if one does not know the procedure; while with the help of your therapist one can perform Hold-Relax PNF technique without knowing the procedure. Again, it's a controversial point that as dynamic stretching is active technique one cannot perform that till the end range but Hold-Relax PNF starts at the tissues end point. Thus, if one can perform Hold-Relax proprioceptive neuromuscular stretching during the warm-up and cool-down period than one should prefer that technique; but if one doesn't have an option than they should perform dynamic stretching technique along with knowing the proper procedure.

Conclusion

Both the Hold-Relax proprioceptive neuromuscular technique and Dynamic stretching technique are effective. Hence, by performing these techniques during warm-up and cool-down phase can prevent injuries to the Hamstring muscle. And we have also noticed that Hold-relax PNF stretching technique showed us commendable results in the study.

Future scope of study

- Can be performed on male subjects.
- Can be performed on athletes.
- Can be performed in rehabilitation of hamstring injury
- Acute and long-term effects can be seen.
- More than one outcome measure can be assessed for better evaluation.

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