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# Effect of Nordic hamstring curl and myofascial release with foam roller to reduce hamstring injury for collegiate football players

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**Abstract**
Football, being a physically demanding sport, has a high incidence of injuries, especially hamstring injuries, which account for 11% of all injuries and 32% of muscle strains in collegiate players. This study investigates the effectiveness of combining Nordic hamstring curls and myofascial release with a foam roller to reduce hamstring injury rates among collegiate football players. study includes 30 subjects of collegiate football players. The treatment was given for the duration of 6 week with 3 session per week, with the whole study duration of 6 months. The outcome used were Sit and Reach Test and Active Knee Extension Test. This study shows that with 29 degrees of freedom and 0.05 level of significance, in sit and reach test, paired "t" value (16.49) is greater than the tabulated t value of 2.045 and in Active Knee Extension of right leg, the paired t value (38.26) and left leg (31.65) is greater than the tabulated "t" value of 2.045. The study concludes that Nordic hamstring curl and myofascial release with foam roller given to a group proven for reducing hamstring tightness and increased hamstring flexibility.#

**Keywords:** Collegiate football players, Nordic hamstring curl, myofascial release, sit and reach test, active knee extension test, reduce hamstring injury

## Introduction

Football is a multifaceted sport that requires a diverse set of motor skills, such as agility, balance, coordination, speed, strength, and endurance [1]. In football, as in numerous other sports, speed and strength are essential performance metrics. The quadriceps and hamstrings muscles in the lower limbs are particularly critical, has they significantly contributed to these physical attributes [2].

Football is a physically intensive sport that experiences a relatively high rate of injuries in comparison to other athletic activities. The essential movements involved in the game encompass acceleration, deceleration, jumping, cutting, pivoting, turning, and kicking the ball [3].

Muscle strains are prevalent in football, exhibiting an injury rate of 41%. Among these, hamstring injuries represent 11% of all injuries and account for 32% of the total muscle strains [4]. Limited muscle flexibility restricts the range of motion, which can increase the risk of muscle injury and negatively impact its function [5].

Hamstring injuries are most common non-contact injuries in sports such as soccer, rugby, American football [6]. The hamstring muscles unusual properties include being diarthrodial, primarily composed of type 2 fibres, and having a lower titin protein content may increase the risk of strains in the affected muscle group. The thigh's rear component is made up of the three main muscles that are collectively known as the hamstring muscles. These include the semimembranosus, short and long heads of the biceps femoris, and semitendinosus [7]. Since they function as lateral rotators of hip and the knee is semi-flexed, football also demands rapid changes of direction and speed, which may contribute to the higher incidence of bicep femoris injuries [8].

The ability of a muscle to extend and permit one joint to move through a range of motion is known as flexibility. Loss of flexibility is characterized by a decrease in a muscle's performance. Increased flexibility is said to provide several advantages, including a lower chance of injury. When the hamstring muscles are working, there are a lot of concentric and particularly eccentric movements. The muscle contracts suddenly and lengthens during eccentric movements. As a result, significantly more force is needed to resist that strain, which could otherwise result in injury [9].

A key component of typical human function is muscular flexibility. It has been demonstrated that a person's degree of function is greatly impacted by limited flexibility, which also predisposes them to a number of musculoskeletal overuse injury [10].

Additionally, even with preventive measures, these injuries have a high recurrence rate of 12–33% and require prolonged recovery periods (of more than a month) and intensive treatment [11]. The greatest possibility for developing another hamstring injury is having previously sustained one [12]. Muscle tension is higher during eccentric exercise than during concentric exercise. It causes the contraction to expand. The total number of sarcomeres, which are arranged in parallel and series, increases with eccentric training. Sarcomeres are added during this type of exercise, which causes adaptations to occur more quickly. This causes the muscle to develop micro-lesions or subcellular damage, which causes remarkable changes. These days, eccentric muscle training is becoming more popular since it helps reduce injuries by using sarcomerogenesis to adapt the muscle to the specific action. Nordic hamstring exercise (NHE) is an eccentric hamstring training method that can enhance muscle function and reduce the risk of hamstring strain [13].

Nordic Hamstring exercise is a partner exercise that is simple to complete on the field without specialized equipment [14]. Using the hamstring muscles to increase load in the eccentric phase, the player attempts to prevent a forward-falling motion while kneeling [15]. The individual stands on his knees, with his arms by his sides, his hips and back straight, while performing the Nordic Hamstring Exercise. Sitting behind the patient and gripping their ankles is the proper position. He is then told to slowly lower himself to the ground. In this stance, the player's eccentric descent triggers the activation of the hamstrings. Also helping to keep the patient from falling on his chest are the gastrocnemius, gluteus maximus, and lower back extensions [16].

The manual massage technique known as myofascial release (MFR) aims to reduce pain, increase range of motion, and balance the body by stretching the fascia and releasing the ties that hold it to the muscles, bones, and integument. Through direct or indirect manipulation of the fascia, the Fibers of the connective tissue can realign themselves into a more flexible, useful configuration. MFR aims to relax restriction in the deeper fascial layers. MFR has been proven to be safe, effective, and appropriate for individual use [17]. There are two main classifications for MFR: direct myofascial release and indirect myofascial release [18]. In indirect MFR, a person rests his body weight on a soft roll or ball (such as a tennis or soccer ball) and then rolls his body slowly (1-2 seconds per inch) on the object to massage the fascia while applying pressure along the length of the targeted muscle or muscle groups due to gravity. To avoid putting too much strain on the muscle and fascia, the person must back up and maintain the position when experiencing severe discomfort. It is possible to give the myofascial time to relax and release before proceeding with the roll by holding it just before to the pain. Use of a softer object can be necessary if the pain does not subside [19].

## Methodology

**Aim:** This study investigates the effectiveness of combining Nordic hamstring curls and myofascial release with a foam roller to reduce hamstring injury rates among collegiate football players, assessed using the Sit and Reach Test and Active Knee Extension Test.

**Selection of the subjects:** A total of 30 players (males) ranging from 18-25 years were selected based on selection criteria using convenience sampling method**.**

**Procedure:** A total of 30 football players were selected based on the predetermined inclusion and exclusion criteria. Each participant was explained about treatment safety and simplicity of the procedure. The training sessions were held for 6 weeks (3 sessions per week), each 30 minutes per session. The single group received Nordic hamstring curl along with myofascial release with foam roller. Prior to the training session, the players were assessed for Hamstring tightness and flexibility using active knee extension tests and sit and reach test.

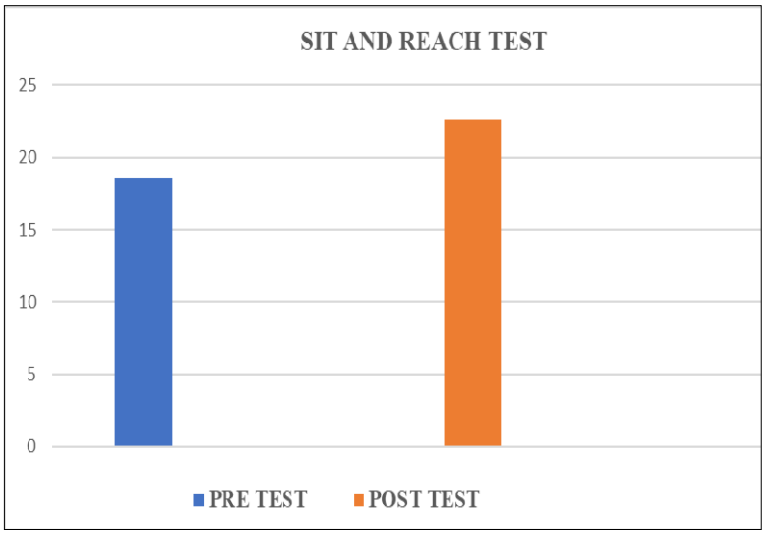
### Nordic Hamstring Exercise-Protocol

(Van der horst *et al*. (2015), te american journal of sports science)

| Week | Frequency, per week | No. of sets per training | No. of sets Per training |
|---|---|---|---|
| 1 | 1 | 2 | 5 |
| 2 | 2 | 2 | 6 |
| 3 | 2 | 3 | 6 |
| 4 | 2 | 3 | 6,7,8 |
| 5 | 2 | 3 | 8,9,10 |
| 6 | 2 | 3 | 10,9,8 |

### Pre And Post Mean Value Sit and Reach

| S. No | Sit and reach test | Mean | Mean difference | Standard deviation | Paired 't'value |
|---|---|---|---|---|---|
| 1. | Pre-test | 18.55 | 4.04 | 1.415 | 16.49 |
| 2. | Post test | 22.59 | | | |

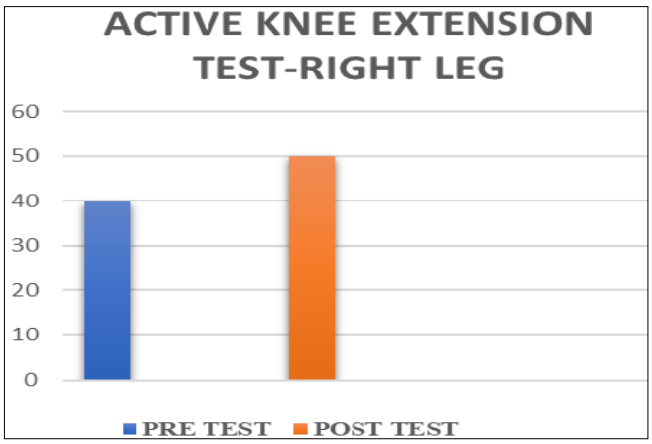


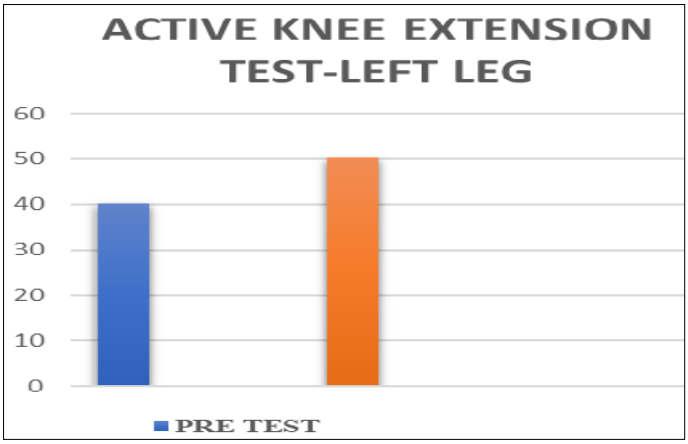
**Pre and post mean value active knee extension test right leg.**

| S. No | Active knee extension test | Mean | Mean difference | Standard deviation | Paired 't'value |
|---|---|---|---|---|---|
| 1. | Pre-test | 39.9 | 10.1 | 1.44 | 38.26 |
| 2. | Post test | 50.0 | | | |

**Pre And Post Mean Value Active Knee Extension Test Left Leg**

| S. No | Active knee extension test | Mean | Mean difference | Standard deviation | Paired 't'value |
|---|---|---|---|---|---|
| 1. | Pre-test | 40.1 | 10 | 1.73 | 31.65 |
| 2. | Post test | 50.1 | | | |




**Result**

This study shows that with 29 degrees of freedom and 0.05 level of significance, in sit and reach test, paired 't' test with 29 as degree of freedom with pre and post session value of 0.05 level of significance which was greater than the tabulated 't' value of 2.045. This shows that there was a significance difference between pre and post-test values. The pre-test mean was 18.55 and the post-test mean was 22.59 and the mean difference was 4.04 which shows that there was increase in flexibility with sit and reach test. In Active Knee Extension of right leg, paired 't' test with 29 as degree of freedom with pre and post session value of 0.05 level of significance which was greater than the tabulated 't' value of 2.045. This shows that there was a significance difference between pre and post-test values. The pre-test mean was 39.9 and the post-test mean was 50.0 and the mean difference was 10.01 which shows that there was increase in flexibility with active knee extension test (Right leg) and left leg the pre-test mean was 40.1 and the post-test mean was 50.1 and the mean difference was 10 is greater than the tabulated t value of 2.045 which shows that there was increase in flexibility with active knee extension test (Left Leg).

**Discussion**

The aim of study was to examine Effect of Nordic Hamstring Curl and Myofascial Release with Foam Roller to reduce Hamstring Injury for Collegiate Football Players.30 football players were selected for the study with inclusion and exclusion criteria. There is only one group who were given with Nordic hamstring curl with myofascial release with foam roller. The group had undergone a training period of 6 weeks, by following that pre-test and post-test values were analyzed and calculated for the results.

Nordic hamstring curl is beneficial to improve hamstring flexibility and reduce hamstring injuries among collegiate football players. Flexibility might be change due to change in optimum length of hamstring muscle fibers following repeated eccentric contractions. Based on existing literature, eccentric contractions result in change in length of the sarcomere and shift in optimum angle. Morgan D *et al* proposed that, Myofilaments are stretched and certain sarcomeres will be overstretched during active lengthening. They will become progressively weaker until the myofilaments no longer overlap. But with repeated eccentric contractions, more sarcomeres will ultimately get stronger and won't recombine at the conclusion of each contraction. Another theory suggests that eccentric contraction can cause increase in passive tension of the muscle which might be the reason for improvement in Hamstring flexibility after the Nordic hamstring exercise.

Myofascial release (MFR) therapy is a manual-therapy technique developed by Barnes, to help reduce restrictive barriers or fibrous adhesions seen between layers of fascial tissue by Macdonald *et al*, according to him by applying direct and sweeping pressure to the soft tissue, the tiny undulations stretch the tissue and create friction between the body's soft tissue and the foam roller. The friction produced by the undulations warms the fascia, which encourages it to adopt a more fluid shape (the fascia's thixotropic feature), dissolving fibrous adhesions between its layers and attaining soft-tissue extensibility.

DR. Benjungmongla, it has been reported that this friction heats the fascia, promotes the fascia to become more fluid-like, breaks down fibrous adhesions between the layers of fascia, and gives soft tissues their flexibility and suppleness back. The increased flexibility may possibly be due to the strong pressure that foam rolling applies to the soft tissue. The skin's receptors may be overloaded by this high pressure, dulling the stretch endpoint's sensation and increasing flexibility and stretch tolerance in the process.

By combining both, Nordic hamstring curl and myofascial release with foam roller has reduced hamstring injury and improve flexibility. Comparing both training Nordic hamstring curl has reduced hamstring injury and Myofascial release with foam roller improve hamstring flexibility.

**Conclusion**

The purpose of the study is to find the effect of Nordic hamstring curl and myofascial release with foam roller to reduce hamstring injury in collegiate football players. 30 players who met the criteria of inclusion and exclusion criteria were trained. A clear explanation about the study is given to each and every subject on their own language and they were assigned randomly into one group.

Players in group A underwent Nordic hamstring curl with myofascial release using foam roller for 6 weeks with 1 session per day by following the training protocols, pre and post test was conducted using sit and reach test and active knee extension test to identify the hamstring flexibility and reduction in hamstring injury, the values are analyzed and calculated for the study.

The results were analyzed using student "t" test and the study concludes that Nordic hamstring curl and myofascial release with foam roller given to a group proven for reducing hamstring tightness and increased hamstring flexibility.

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