



## Research Article

IJSEHR 2024; 8(1): 7-10  
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www.sportscienceresearch.com  
Received: 11-08-2023  
Accepted: 02-02-2024  
DOI: 10.31254/sportmed.8102

# Effectiveness of Nordic Hamstring Exercise Vs Static stretching in Hamstring flexibility among football players

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## Abstract

Background: Hamstring injuries are widespread in regular activities and sports. Hamstring muscle group flexibility is essential for hip and knee movements as well as numerous functional activities. Nordic hamstring exercise (NHE) is an eccentric hamstring training that can both reduce the risk of hamstring injury and increase muscular performance. Muscle flexibility, strength, and endurance serve as essential fitness factors for injury prevention. As a result, the purpose of this study was to look into the effects of Nordic eccentric exercise and static stretching in football players. Methods: A Experimental study was conducted on 40 football players in the football academies, Bangalore, The assessment is done through AKE test. 20 participants (Group A) were allocate to the Nordic hamstring exercise(n=20) and (Group B) 20 participants were allocated to the static stretching for 4 week. Results: Nordic hamstring exercise and static stretching do not differ significantly. Both exercises are useful for increasing hamstring flexibility. The analysis shows that the average decrement in right leg ROM of group A was 15.65 and group B was 12.05 with  $p>0.05$ , indicating that there is no significant difference between groups A and B. The analysis also shows that the average decrement in left leg ROM of group A was 14.9 and group B was 12.95 with  $p>0.05$ , indicating that there is no significant difference between groups A and B. Conclusion: This study concludes that there is no significance difference between Group A (NHE) and Group B (Static stretching). Both stretching maneuver are effective in hamstring flexibility.

**Keywords:** Nordic hamstring exercise, Static stretching, Active knee extension test, Hamstring flexibility.

## INTRODUCTION

The hamstring muscles are located on the back of the thigh and are made up of the semitendinosus, semimembranosus, and biceps femoris. Hamstring strains are common injuries sustained during sports at the high school, collegiate, and professional levels, which is exacerbated by the high injury recurrence rate<sup>[1]</sup>. The Sports involving running and kicking, such football, basketball, soccer, rugby, and track & field, are the main causes of hamstring muscle injuries. While the precise timing of occurrence is unknown, it is hypothesized that hamstring strains can occur when the hamstring is in an eccentric contraction and stretched position<sup>[2]</sup>.

One of the most popular leisure activities and a shared cultural component of contemporary countries is football. Football players most frequently get hamstring injuries, and within a year after the initial injury, 12% to 33% of those who sustain a hamstring injury experience a recurrence<sup>[3,4]</sup>. The eccentric contraction of the hamstring muscle is necessary for performing ADLs such as ascending stairs, standing up from a chair, walking, running, etc. Eccentric muscle contraction lowers the metabolic demand since it requires less oxygen<sup>[4]</sup>. Eccentric training creates more muscle tone than concentric training. it creates an elongation contraction<sup>[5,6]</sup>. As a result of its benefits in decreasing damage by sacromerogenesis ,eccentric muscle exercise is becoming more and more popular today.<sup>[7]</sup>

Nordic hamstring exercise (NHE) is eccentric hamstring training that can increase muscle power while reducing the risk of hamstring strain. The exercise known as "Nordic hamstring lowers" was first introduced by Brockett in 2001. The Nordic Hamstring Lowers were later altered by Mjolsnes in 2004, who dubbed it the Nordic Hamstring Exercise. Standing on his knees, the individual executes the nordic hamstring exercise with his arms by his sides, his hips and back straight. It's best to clutch to their ankles and sit behind the individual. and he is told to descend to the ground slowly. When a player is in this position, the hamstrings begin to contract erratically as soon as the player begins to descend. Additionally

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helping to prevent the person from falling on his chest are the gluteus maximus, lower back extensors, and gastrocnemius<sup>[5,6,7]</sup>.

Stretching is a common way to improve flexibility. A few stretching techniques that can assist you in achieving this aim are static stretching, proprioceptive neuromuscular facilitation (PNF), dynamic stretching, and ballistic stretching. The most popular technique is static stretching because it is reasonably simple to execute, doesn't take a lot of time or effort, poses little risk of injury, and has been proven to increase flexibility<sup>[7,8,11]</sup>. Therefore, the goal of this study was to find out how Nordic hamstring workout and static stretching affected football players.

## METHODS

An experimental study was conducted on 40 football players in the football academy, Bangalore. The participants consist of male football players having hamstring tightness with age of 18 to 25. All subjects signed an informed consent before they were included in the study. There were two groups of twenty subjects each. The players received stretching three days a week for four weeks. Twenty participants in Group A (20 participants) were assigned to the Nordic hamstring exercise, while twenty participants in Group B (20 participants) were assigned to static stretching.

### Measurement of hamstring muscle flexibility

By assessing the extent of restriction in the knee extension range of motion, the flexibility of the hamstring muscles was determined. The subjects of the AKE test were placed in a supine posture, their dominant knee and hip flexed to 90 degrees, and the contralateral lower extremity in a relaxed position. The patients were then told to extend their leg as far as they could while maintaining a relaxed foot, and to hold the posture for five seconds while the therapist used their right hand to monitor the femur's position. To get comfortable with the activity, each participant gave the exercise one repetition. A universal goniometer was used to measure the angle of knee extension after a second repeat and the five-second holding time. The goniometer was positioned over the palpated lateral epicondyle. Next, marks were made on the greater trochanter of the femur and the lateral malleolus of the tibia. The proximal and distal landmarks were lined up with the goniometer's arms. At the limit of knee extension, a goniometer measurement was made and recorded<sup>[12]</sup>. A lag of 20 degrees is considered normal from full extension, anything less than 20 degrees is considered as hamstrings tightness.

### Nordic hamstring exercise Protocol

Nordic hamstring exercise: The participants learned about the function of the hamstrings and potential ailments that can occur due to tension and inadequate stamina and strength, the significance of hamstring strengthening, etc. The presentation of NHE included an explanation of its anticipated impact on the thigh muscle. With their head and neck in a neutral position, the patient knelt on the mat. Hands next to or in front of the chest, with the therapist providing firm ankle stabilization, the back and pelvis straight, and the knees bent ninety degrees.

The therapist supports the patient's ankles by standing behind them. The therapist or other partner held the patient's legs steady. The participant was instructed to gradually bend forward at a constant pace while attempting to extend their leg muscles as far as they could. He falls on their arms, letting his chest hit the floor as he loses his balance trying to stop herself from going forward. Push back right away to lessen the hamstring strain. Use two sets of five repetitions for the first week, then progressively raise the number of sets to three and the number of repetitions each week in accordance with the protocol<sup>[5]</sup>.

Week 1: One session, two sets, with five reps in each set. Week 2: two sessions, two sets, with six reps in each set.

Week 3: Three sessions, three sets with six reps in each set. Week 4: Three sessions, three sets, eight reps in each set.

### Static stretching protocol

During the static stretch football players performed static stretch, held for 30 seconds with 2 repetitions, 3 days per week for 4 weeks at the point of maximal stretch with mild discomfort. The hamstring stretch was executed by the subjects while standing straight, with their left foot on the ground and their toes pointed forward. With the toes pointed up toward the ceiling, the heel of the foot that needed to be stretched was positioned on a plinth or chair. The individual then extended their arms forward while flexing forward at the hips to keep their spine in a neutral position. The knee was still completely extended. The individual kept flexing at the hips until the posterior thigh began to gently stretch. The participant held this posture for thirty seconds after achieving it<sup>[2]</sup>.

## RESULTS

Statistical analysis of the data was performed using SPSS 20.0. The continuous variables (height, age and weight) were presented using mean  $\pm$  SD. Pre post comparison was done using paired t test and between group comparison was done using unpaired t test. A p value  $<0.05$  was considered statistically significant.

**Table 1:** Showing mean and standard deviation of Age, Height, weight, in NHE and SS

Characteristics (n=40)	Nordic hamstring exercise (n=20)	Static stretching (n=20)
	M $\pm$ SD	M $\pm$ SD
Age (Years)	19.8 $\pm$ 1.96	22.0 $\pm$ 2.152
Height (m)	175.8 $\pm$ 5.06	175.5 $\pm$ 5.67
Weight (kg)	64.05 $\pm$ 5.62	66.30 $\pm$ 6.39

**Table 2:** Pre and Post comparison of Nordic hamstring exercise

	Mean of Goniometric measurement in degrees		Mean Difference	P value
Right Leg	Pre	19.35	15.6	P<0.001
	Post	3.70		
Left Leg	Pre	19.0	14.9	
	Post	4.1		

**Table 3:** Pre and Post comparison of Static stretching

	Mean of Goniometric measurement in degrees		Mean Difference	P value
Right Leg	Pre	16.5	12.05	P<0.001
	Post	4.45		
Left Leg	Pre	18.8	12.95	
	Post	4.45		

**Table 4:** Pre and Post hamstring flexibility between 2 groups

	Mean of Goniometric measurement in degrees		Mean Difference	P value	
Right Leg	NHE	Pre	19.5	15.65	
		Post	3.70		
	SS	Pre	16.5	12.05	P>0.05
		Post	4.45		

Left Leg	NHE	Pre	16.8	14.90	P>0.05
		Post	4.1		
	SS	Pre	18.8	12.95	
		Post	5.85		

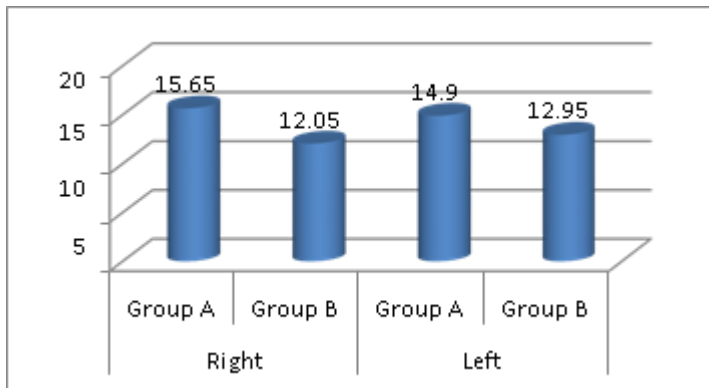


Figure 1: Representation of average decrement in angle

Group A- NHE, Group B- SS

The result shows average decrement in right leg ROM of the NHE group was 15.65 and the SS group was 12.05, with  $p>0.05$  indicating no statistically significant difference between the two groups.

The result shows average decrement in left leg ROM of NHE group was 14.9 and SS group was 12.95 with  $p>0.05$ , indicated there is no significant difference between both group. This results indicates that both groups are equally effective in increasing Hamstring flexibility.

## DISCUSSION

The goal of the current study was to compare Nordic hamstring exercises vs static stretching on hamstring flexibility among football players. The study's findings are consistent with the theory that hamstring flexibility has improved. When comparing the pre- and post-data for the experimental groups' increased hamstring muscular flexibility, group A (Right leg 15.65 and Left leg 14.9), GROUP B (Right leg 12.05 and Left leg 12.95) with P value ( $P>0.05$ ) Shows no significant difference between group A and group B. NHE (Group A) there is a significant difference on the right leg and left leg of football players with  $P<0.001$  and SS (Group b) there is also a significant difference on the right leg and left leg with  $p<0.001$ . The Our study result Shows that, both stretching exercises are more effective in increasing hamstring flexibility.

The mechanism underlying improved hamstring flexibility following NHE is unknown; however, it could be associated with an increase in fascicle length produced by the addition of serial sarcomeres in muscle fibers. Injury prevention with eccentric hamstring muscle strengthening has already been proven in professional soccer. Askling found a significant reduction in hamstring injury rates in a subset of professional football players who underwent additional hamstring strength training with eccentric loading compared to a control group who completed routine training. Arnason and Petersen also investigated the preventive impact of eccentric

strengthening on hamstring injury incidence in a much larger sample population of professional football players. Although a protective effect was observed, these studies were largely undertaken on professional [10].

The improvement in ROM witnessed after static stretching training could be explained by the fact that static stretching has a high potential

for increasing the number of sarcomeres in series (muscle length) due to greater exposure to the stresses generated in the specific degree of stretching that remains constant. Stretching also promotes viscoelasticity and lessens muscle and connective tissue stiffness [9].

As a result of the above discussion, it is possible to conclude that both Nordic Hamstring Exercise (NHE) and Static Stretching are successful in improving hamstring flexibility instantly, which supports the initial hypothesis. The comparison between the two exercises (Group A: NHE and Group B: Static Stretching) shows that there is no significant difference in their effectiveness for improving hamstring flexibility. Future Research studies can be focused on comparing the different stretching procedure in perspective of reduction in injury rates among football players. Further studies can be conducted in future regarding Nordic eccentric exercise impact of strength and endurance on the players.

## CONCLUSION

Players who participated in a four weeks of training, had got significant improvements in their hamstring flexibility through Nordic Static stretching and hamstring exercises. According to the study's findings, both the stretchings are equally effective in increasing hamstring flexibility. This study can be utilized as a training guide to increase young football players hamstring flexibility. This study can be done with other sports teams, and its impacts can be looked at. When the exercise duration kept longer and the results are compared, subsequent studies may find that additional beneficial benefits are produced his study gave an option to the coaches, athletes, health care and medical professionals to effectively increase hamstring flexibility in various stage of rehabilitation and Hamstring injury programs.

## Acknowledgements

The authors would like to thank the players of BPSS FC (Bangalore) and ROVERS FC for their participation.

## Conflict of interest

The authors have declared no conflict of interest.

## Financial Support

None declared.

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