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Original Article

Effects of Nordic versus Sprint Exercise Program in Prevention of Hamstring Injuries in Football Players

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ABSTRACT

Background: Hamstring strain injuries (HSI) are frequent in football and other high-speed running sports. Nordic hamstring exercise (NHE) has been found to increase eccentric hamstring strength and decrease the risk of hamstring strain injury (HSI). Sprint exercise, which includes maximal eccentric contractions, is supposed to engage the hamstrings and prevent HSI.

Objective: The aim of this randomized controlled trial was to compare the effectiveness of Nordic and sprint exercise programs in preventing hamstring injuries in football players.

Methods: The study involved 26 male football players aged 18-25 years, who exercised regularly for 2-3 times a week in the preceding 3 months. They were randomly divided into two groups. One group received Nordic exercise and conventional treatment, while the other group received sprint training exercises and conventional treatment. The duration of the program was 6 weeks, with two 30-minute sessions per week. The evaluation was based on the 40m sprint test and active knee extension test, which were measured using a goniometer. The 40m sprint was timed, and the active knee extension test measured the range of motion. The results were analyzed based on these measurements.

Results: The participants' average ages, heights, and weights were respectively 21.1538 1.91191, 1.74 0.029, and 74.8462 4.18275. Shapiro-Wilk test was applied showed data to be non-parametric distributed ($P < 0.05$). Wilcoxon and Mann Whitney tests were used to analyze the difference between pre- and post-treatment scores in the experimental and control groups. which were found to significanlty improved in experimental group, while both groups found to be improved significantly in a pre-post analysis, p value < 0.05.

Conclusion: Both Nordic and sprint exercise programs were effective in reducing the risk of hamstring injuries. However, the Nordic exercise program showed significantly greater improvement in preventing HSI in football players.

Keywords: Hamstring strain injuries, Muscle, Muscle Strength, Exercise Therapy, Running, Sports Medicine.

INTRODUCTION

Physical activity is important for overall health and wellness, including improvement of circulation, muscle and bone strength, and reducing the risk of obesity and related diseases such as diabetes, blood pressure, and heart problems(1). Sports is a form of physical activity that involves skill, focus, and physical exertion and can have therapeutic effects on psychological disorders. In developing countries, sports physical activity contributes to overall well-being(2). Sports can also be used in rehabilitation for both communicable and non-communicable diseases(3). There are two types of sports activity, contact and non-contact sports, with contact sports having a higher risk of injury. Football is the most popular and high-risk contact sports(4). The hamstring muscle plays a significant role in football, and hamstring injuries are common in footballers due to the excessive use of the muscle during sprinting and jumping(5). Training the hamstring muscle through exercises such as Nordic hamstring curls and sprint training can reduce the risk of injury(6). While both exercises show some improvement, there is no strong evidence to conclude which is more effective(7).

The studies reviewed in the previous text showed that both sprint exercise and Nordic hamstring exercise are effective in improving the performance of footballers by increasing hamstring activity(8, 9). However, the findings were not conclusive in determining the

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effectiveness of either technique in reducing the risk of muscle injury among footballers(10). Some studies showed that Nordic hamstring exercise was effective in reducing injury risk, while others showed that sprint exercise was comparatively effective(11-13). Some studies found that both techniques had a similar impact on reducing the risk of injury. The overall conclusion was that further research is needed to determine the most effective technique for reducing the risk of muscle injury among footballers(14).

Hamstring injuries are the most common types of injuries in football players, causing significant time lost from playing(15). To prevent these types of injuries, researchers have studied the effects of different exercise programs on reducing the risk of hamstring injury. One such exercise program is the Nordic hamstring exercise (NHE), which is an eccentric strengthening exercise for the hamstrings(16, 17). Another exercise program that has been studied is the sprint exercise program, which is a high-speed running exercise that focuses on improving overall running performance(18, 19).

Despite several studies investigating the effects of NHE and sprint exercise programs on hamstring injury prevention, there remains a gap in the research in terms of determining which program is more effective in reducing the risk of hamstring injury(20). Many of the studies have only included small sample sizes, making it difficult to draw firm conclusions about the effectiveness of these programs(21). Additionally, the results of the studies have been inconsistent, with some studies showing that NHE is more effective in reducing the risk of injury, while others have shown that sprint exercise is more effective(22).

Further research is needed in this area to discover the most effective training strategy for reducing the risk of hamstring injuries in football players. Larger, well-designed studies with a larger sample size and the control of confounding variables such as age, playing skill, and injury history are necessary(23). The long-term effects of these programs, notably their long-term benefits and the chance of injury recurrence, (24) should be investigated as well (26). This project will eventually provide football players, coaches, and sports medicine professionals with the information they need to reduce the probability of hamstring injuries and improve overall player performance(25). The purpose of this study was to see how effectively sprint and Nordic training combined avoided hamstring injuries in football players. According to the null hypothesis, the outcomes of the two training programs would be equal (27). The alternative hypothesis is that the two training programs have distinct effects on minimizing hamstring injuries in football players.

MATERIAL AND METHODS

The study design was a randomized clinical trial and was conducted at the Pakistan Sports Board Coaching Center in Lahore. The duration of the study was 6 months and a sample size of 26 participants (13 in the intervention group and 13 in the control group) was calculated. The inclusion criteria for the study were male participants between the ages of 18 to 25 years who had been playing competitive football for at least 3-4 years. The exclusion criteria included any musculoskeletal injury, fractures, lower limb pathology, dislocation, nerve lesions, ligamentous injuries, and balance disorders. The sampling technique used was convenient sampling by lottery method(28).

Data was collected using various tools such as the (29). The Active Knee Extension Test assessed hamstring muscle length, the 40-meter Sprint Test measured speed and acceleration, the Hamstring Outcome Tool was used to assess the risk of sustaining a new hamstring injury, and the Goniometer was used to measure flexibility(29-31).

The intervention involved a 5-minute warm-up and cool-down session for both groups. The intervention group performed Nordic exercise training for 40 minutes, 2 sessions per week for 6 weeks, along with conventional intervention exercises(32). The control group performed sprint exercise training for 40 minutes, 2 sessions per week for 6 weeks, along with conventional intervention exercises(33). Pre and post-treatment measurements were taken using the various tools mentioned earlier, and the incidence of injury during matches and training was monitored(34). The Hamstring Outcome Tool was used to assess the risk of reinjury in both groups after the 6 weeks of exercise training. The Shapiro-Wilk test was used to test the normality of the data collected from the study(35). The results of the test showed that the normality assumption was not met for the Active Knee Extension Test of the right leg ($p = 0.006$) and the left leg ($p = 0.004$). Additionally, the 40-meter Sprint Test also showed a non-normal distribution ($p = 0.000$). These results indicate that the data may not follow a normal distribution and other statistical tests may need to be considered to analyze the data effectively(36).

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RESULTS

Table 1Biographic Information

Biographic Variables	Nordic Exercise N=13	Sprint Exercise N=13	P Value
Age	21.15(1.91)	22.47(1.11)	0.063
HEIGHT	1.74(0.29)	1.71(0.13)	0.446
WEIGHT	74.84(4.18)	72.28(2.88)	0.074
Body Mass Index	24.65(3.61)	24.65(1.50)	0.305

The research compares the means (standard deviations) of four biometric characteristics (age, height, weight, and BMI) across two exercise groups (N=13 for Nordic and N=13 for Sprint). The Nordic group showed a mean age of 21.15 (1.91), while the sprint group showed a mean age of 22.47 (1.11). The Nordic group averaged 1.74 (0.29 meters) in height, while the sprint group averaged 1.71 (0.13 meters). The average weight of the Nordic group was 74.84 (4.18 kg), while the average weight of the sprint group was 72.28 (2.80 kg). The mean BMI for both groups was 24.65, with standard deviations of 3.61 for the Nordic group and 1.50 for the Sprint group. Age (0.063) and weight (0.074) had p-values that were near to significance (0.05), but not significant. The non-significant p-values for height (0.446) and BMI (0.305) indicate no difference across the groups.

Table 2 Outcome Variables Group Comparison

Outcome Variables	Nordic Exercise Group		Control Group		Mann-Whitney U	Wilcoxon W	Z	P Value
	Mean Rank	Sum of Ranks	Mean Rank	Sum of Ranks				
40m sprint test	11.92	155.00	15.08	196.00	64.000	155.000	-1.052	.293
40m sprint test	9.46	123.00	17.54	228.00	32.000	123.000	-2.697	.007
Hamstring Outcome Tool Scoring	14.00	182.00	13.00	169.00	78.000	169.000	-.334	.738
Hamstring Outcome Tool Scoring	7.12	92.50	19.88	258.50	1.500	92.500	-4.262	.000

The table presents the results of four outcome variables, namely, the 40-meter sprint test and Hamstring Outcome Tool Score, for two groups of participants, the Nordic exercise group and the control group, as assessed by the Hamstring Outcome Tool. The data are presented as mean ranks, total ranks, Wilcoxon W, Mann-Whitney U with Z and p-value.

The 40-meter sprint test was performed twice, and the results of each trial are reported in the table. For the first trial, the Nordic exercise group found to have a mean rank of 11.92 and a total rank sum of 155.00, while the control group found to have a mean rank of 15.08 and a total rank sum of 196.00. The Mann-Whitney U value was 64,000, Wilcoxon W value was 155,000, and p-value was .293. The non-significant p-value indicates that there is no significant difference seen between groups in this trial of the 40-meter sprint test.

For the second trial of the 40-meter sprint test, the Nordic exercise group found to have a mean rank of 9.46 and a total rank of 123.00, while the control group found to have a mean rank of 17.54 and a total rank of 228.00. The Mann-Whitney U value was 32,000, the Wilcoxon W value was 123,000, and the Z-value was-2.697. The p-value was .007, which suggests that the difference in the 40-meter sprint test results between the two groups in this trial is statistically significant.

Regarding the Hamstring Outcome Tool Scoring, the Nordic exercise group found to have a mean rank of 14.00 and a total rank of 182.00, while the control group found to have a mean rank of 13.00 and a total rank of 169.00. The Mann-Whitney U value was 78,00, the Wilcoxon W value was 169,00, and the p-value was .738. The non-significant p-value indicates that there is no significant difference seen between groups in this trial of the Hamstring Outcome Tool Scoring.

In the second Hamstring Outcome Tool Scoring trial, the Nordic exercise group found to have a mean rank of 7.12 and a total rank of 92.50, while the control group found to have a mean rank of 19.88 and a total rank of 258.50. The Mann-Whitney U value was 1.500, the Wilcoxon W value was 92.500, and the p-value was .000. The significant p-value indicates that the two groups in this trial of the Hamstring Outcome Tool Scoring differ significantly.

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DISCUSSION

The Nordic Hamstring Exercise (NHE), according to several studies, is effective in increasing eccentric hamstring strength as well as reducing hamstring injuries. On the other hand, sprinting is thought to be injury-specific and involve maximum eccentric hamstring contractions. The objective of this research was to investigate the protective effects of NHE and sprint training upon eccentric hamstring strength as well as sprint performance. A randomised controlled trial approach was employed in this study.

Following gaining the participants' assent, they were split into two groups using a random assignment method: the NHE group and the sprint training group. Before and after the treatment, respectively, both groups participated in a 5-minute activity designed to warm them up and then cool them down. The five-minute warm-up comprised of the individual participant either running, walking, or going up and down the stairs at their own speed. Before the therapy was administered, baseline parameters were noted down. Both groups participated in two sessions each week for a total of six weeks, with each session lasting for thirty minutes(28).

Participants in the NHE group did the Nordic exercise for ten minutes while having their hamstring muscle strength measured with the Hamstring Outcome Tools (HaOS). This was followed by a five-minute cool-down phase. Before beginning the sprint test protocol, participants in the sprint training group went through a 5-minute warm-up session. The sprint test protocol consisted of participants performing a single maximal sprint over a distance of 40 metres while the time was recorded. A hamstring strength assessment was performed after a five-minute cool-down phase during which any injuries were looked for(14).

Recent research has shown that both non-high intensity exercise (NHE) and sprint training result in substantial increases in eccentric hamstring strength. As compared to sprint training, our findings revealed that NHE training was superior in terms of its ability to improve speed and strength while also lowering the risk of injury and causing less muscle discomfort. This was in contrast to the findings of a research that had been carried out in 2017 Bourne et al., 2017 , in which both groups exhibited progress but the sprint group displayed their maximal speed(12). Considering that eccentric workouts may be completed more readily due to NHE, as shown by our findings, NHE should be considered an alternate method for reducing the risk of muscle damage. Steve Milanese reached this conclusion after analysing the data he gathered at the conclusion of his 2019 investigation(19).

As compared to NHE, sprint training resulted in modest gains, most notably in maximal speed, but it was also associated with stronger feelings of muscle pain. According to the findings of a number of studies, weeks of training at full speed may have positive effects on both the avoidance of injuries and the increase of performance(10, 12). Nordic hamstring training is an excellent workout for lowering the probability of suffering a hamstring injury since it prevents muscular atrophy and engages the Including the back hamstring muscles, biceps femoris, semi membranosus, and semi tendinosus. Sprint training is useful in minimising the risk of injuries to the hamstring muscles, in addition to strengthening the hip extensor muscles. More muscular strength and increased speed both contribute to a decreased likelihood of sustaining a muscle injury(24, 36).

Both neuromuscular facilitation exercise (NHE) and sprint training were shown to be beneficial in increasing hamstring flexibility and speed, according to the results of this investigation as well as prior studies. NHE proved more successful in lowering the risk of injury, increasing speed, and causing less discomfort than other methods. Nevertheless, there was insufficient data to support the hypothesis that there was a significant difference in effect size between the NHE and the sprint training.

CONCLUSION

In summary, the study found that both Nordic hamstring exercise and sprint training were effective in improving hamstring flexibility and speed. The NHE group showed more promising results in terms of reducing injury risk, improving speed, and causing less soreness compared to the sprint training group. However, there was no significant difference in the effect size between the two interventions. These findings, along with previous research, suggest that both NHE and sprint training can be used as viable options for enhancing hamstring health and minimizing the risk of injury.

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