



# EFFECT OF MODERATE INTENSITY NEUROMUSCULAR TRAINING ON SPEED AND AGILITY AMONG UNIVERSITY SOCCER PLAYERS

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## ABSTRACT

The purpose of this study was to examine the effects of moderate intensity neuromuscular training on speed and agility among university soccer players. Thirty subjects aged 18–24 years were randomly assigned into two groups: Moderate Intensity Training Group (MITG), and Control Group (CG). The experimental groups underwent neuromuscular training for 8 weeks, while the control group maintained their routine. Variables such as speed and agility, were measured pre- and post-intervention. Analysis of Covariance (ANCOVA) revealed significant improvements in speed and agility among experimental groups, with the moderate intensity group showing greater improvements. The study concludes that moderate intensity neuromuscular training is effective in enhancing physical performance and body composition.

**KEYWORDS:** *MODERATE INTENSITY NEUROMUSCULAR TRAINING, MOTOR FITNESS, TRAINING INTENSITY, PHYSICAL PERFORMANCE, SPEED, AGILITY*

## INTRODUCTION

Neuromuscular training plays a crucial role in improving physical fitness, coordination, and athletic performance (Bompa and Haff, 2009). It involves exercises that enhance communication between the nervous system and muscles, thereby improving movement efficiency and reducing injury risk (Behm and Sale, 1993). Neuromuscular training programs, which include exercises to improve motor control, stability, and proprioception, have been shown to enhance athletic performance parameters relevant to soccer (Hewett et al., 2005). These programs typically combine plyometrics, resistance training, dynamic stability drills, and change-of-direction exercises to improve sprint speed, agility, and jumping ability (Markovic and Mikulic, 2010). This integrated approach optimizes the neuromuscular system's ability to generate force and control movement, thereby improving on-field performance (Young et al., 2001). Considering the intermittent nature of soccer, which requires repeated high-intensity efforts, neuromuscular function and recovery are essential factors in training design (Stolen et al., 2005). Therefore, understanding the effect of moderate intensity neuromuscular training on performance variables such as speed and agility is important for developing effective training strategies (Impellizzeri et al., 2006).

Soccer, a globally recognised sport, demands a comprehensive athletic profile, particularly at the university level, where competition is more intense (FIFA). In addition to aerobic endurance, successful performance requires sprinting ability, rapid direction changes, explosive power, and effective tackling skills (Reilly et al., 2000). These physical attributes are essential for both offensive and defensive performance and help distinguish elite players (Bangsbo, 1994). Speed, defined as the ability to move quickly over a short distance, is critical for actions such as counterattacks and ball chasing (Little and Williams, 2005). Agility, the ability to change direction rapidly while maintaining balance and control, is equally important for dribbling, defensive play, and reacting to game situations (Sheppard and Young, 2006). Thus, improving speed and agility through structured training interventions is essential for enhancing performance and reducing injury risk in soccer players.

This study specifically aims to evaluate the effects of a moderate-intensity neuromuscular training regimen on the speed and agility performance of university soccer players, thereby contributing to the refinement of athletic preparation protocols.

## OBJECTIVES OF THE STUDY

The study is designed with the following specific objectives:

1. To determine the effect of moderate intensity neuromuscular training on speed among university soccer players.
2. To assess the effect of moderate intensity neuromuscular training on agility among university soccer players.

## METHODOLOGY

### Research Design

The study adopted a randomized pre-test and post-test experimental design with one experimental group and one control group. This design was chosen to determine the effect of moderate intensity neuromuscular training on selected motor fitness variables among university soccer players.

### Participants

A total of 30 male university soccer players, aged between 18–24 years, were selected from Manipur University soccer players. The subjects were physically active and had prior experience in competitive soccer. The participants were randomly assigned into two groups: Moderate Intensity Training Group (MITG) – 15 subjects, Control Group (CG) – 15 subjects. All participants were medically fit and voluntarily agreed to participate in the study. The study included one independent variable, namely moderate intensity neuromuscular training, and two dependent variables, namely speed and agility. The selected variables were assessed using standardized criterion measures, where speed was measured through the 50-meter sprint test recorded in seconds, and agility was measured using the side step test, also recorded in seconds.

**Table: 8-Week Moderate Intensity Neuromuscular Training Schedule**

Week	Frequency (Days/Week)	Warm-up (10–15 min)	Main Training (25–30 min)	Cool-down (10–15 min)	Intensity
Week 1	3 Days	Dynamic stretching, light jogging	Basic plyometrics (jump squats), balance drills, ladder drills (low intensity)	Static stretching	60%
Week 2	3 Days	Dynamic stretching, mobility drills	Plyometrics (bounding), balance exercises, ladder drills, COD drills (basic)	Static stretching	60–65%
Week 3	3 Days	Dynamic warm-up, light aerobic work	Plyometrics, single-leg balance, ladder drills (moderate speed), COD drills	Static stretching	65%
Week 4	3 Days	Dynamic stretching, jogging	Advanced plyometrics, stability drills, ladder drills, directional changes	Static stretching	65–70%
Week 5	3 Days	Dynamic mobility exercises	Plyometrics (increased reps), balance & stability, ladder drills (faster), COD drills	Static stretching	70%
Week 6	3 Days	Dynamic warm-up, agility prep	Explosive plyometrics, advanced balance drills, ladder drills (high speed), COD drills	Static stretching	70–75%
Week 7	3 Days	Dynamic stretching, activation drills	High-intensity plyometrics (moderate volume), complex ladder drills, rapid COD drills	Static stretching	75%
Week 8	3 Days	Dynamic warm-up, mobility	Integrated drills (plyometric + agility combination), advanced COD drills	Static stretching	75%

Note: Each training session lasted between 45 and 60 minutes and included exercises such as change of direction (COD) drills as a key component of neuromuscular training. The intensity of the program was maintained at a moderate level, ranging from 60% to 75% of maximum effort, to ensure effectiveness while minimizing fatigue and injury risk. Adequate recovery was provided by allowing proper rest intervals of 30 to 60 seconds between sets.

## Procedure

The procedure of the study involved conducting pre-tests for all participants to assess their baseline levels of speed and agility. Following this, the experimental group underwent an 8-week moderate intensity neuromuscular training program, while the control group continued with their regular routine activities. Upon completion of the training period, post-tests were administered using the same procedures and instruments as employed during the pre-test. All testing sessions were conducted under similar environmental conditions to ensure consistency and reliability of the results.

### Test administration

**Speed:** The 50m dash test was conducted to measure the speed of the subjects, where each participant started behind a line and ran 50 meters on a track, with the time recorded using a stopwatch to the nearest one-tenth of a second from the start signal to the finish line.

**Agility:** Agility was assessed using the side step test, in which subjects stood on a centre line between two parallel lines placed 1 meter apart and moved side-to-side as quickly as possible for 10 seconds, touching each line alternately, the total number of times the centre line was crossed was counted as the score, with higher counts indicating better agility, and the best of two trials was recorded.

### Statistical Analysis

The collected data were analysed using appropriate statistical techniques. Descriptive statistics, including mean and standard deviation, were used to summarize the data. Analysis of Covariance (ANCOVA) was employed to determine the significance of differences between groups by adjusting for pre-test scores.

### Ethical Considerations

Informed consent was obtained from all participants prior to the commencement of the study, and they were clearly informed about the purpose and procedures involved. The confidentiality of the collected data was strictly maintained throughout the research process. All necessary precautions were taken to ensure that no harm or injury occurred to the participants during both the training and testing phases of the study.

## ANALYSIS OF DATA

## Speed

The analysis of covariance on the speed of the pre and post test scores of the moderate intensity neuromuscular training and control group has been analysed and presented in Table I.

TABLE II:

**ANALYSIS OF COVARIANCE OF PRE AND POST TEST OF SPEED FOR THE MODERATE INTENSITY NEUROMUSCULAR TRAINING AND CONTROL GROUP**

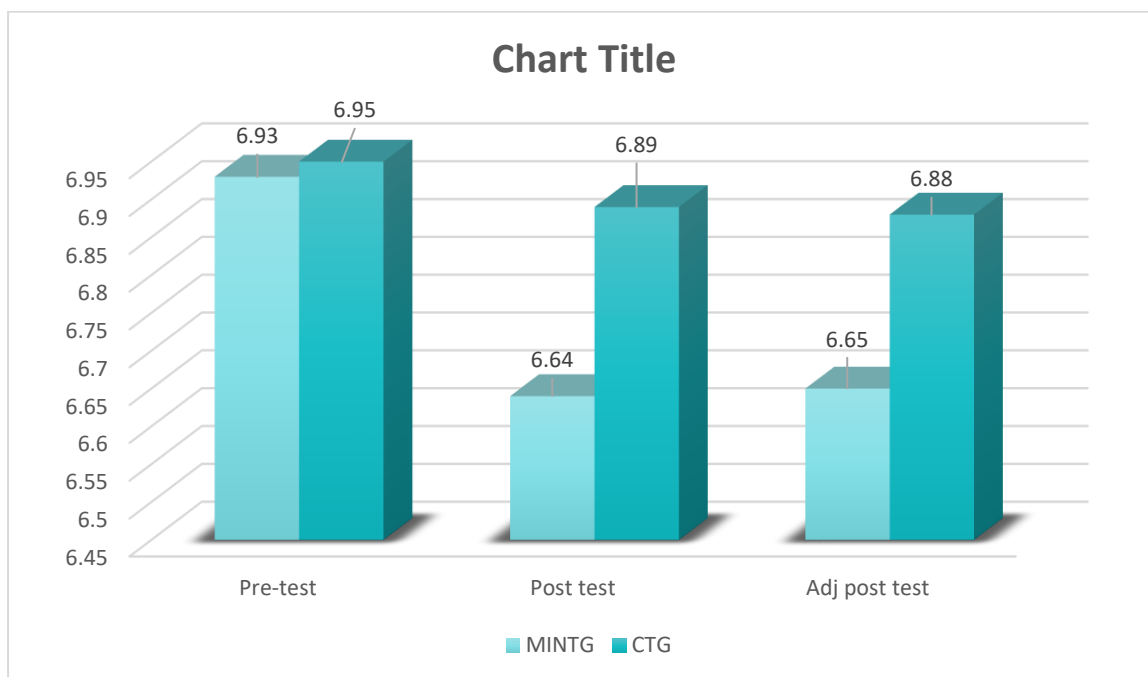
Test	MINTG	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
<b>Pre Test</b>							
Mean	6.93	6.95	Between	0.001	1	0.001	0.38
S.D.	0.17	0.15	within	0.79	28	16.59	
<b>Post Test</b>							
Mean	6.64	6.89	Between	0.45	1	0.45	12.23*
S.D.	0.13	0.23	Within	1.03	28	0.03	
<b>Adjusted Post Test</b>							
Mean	6.65	6.88	Between	0.42	1	0.42	14.44*
			Within	0.79	27	0.03	

\* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 1 and 28 and 1 and 27 are 4.20 and 4.21 respectively).

The analysis of covariance in Table II shows that before training, the moderate intensity neuromuscular training group (MINTG) and the control group had nearly identical pre-test mean scores (6.93 vs. 6.95), with an obtained F-ratio of 0.38, which is far below the critical value of 4.20. This indicates no significant difference at baseline. After training, the post-test mean of the MINTG dropped to 6.64 compared to 6.89 for the control group, reflecting faster speed performance. The obtained F-ratio here was 12.23\*, which is well above the critical value of 4.20, showing a statistically significant improvement. When adjusted post-test means were calculated to account for pre-test differences (6.65 vs. 6.88), the F-ratio rose to 14.44\*, again exceeding the critical value of 4.21. This confirms that the improvement in speed was not due to chance or initial differences but was a genuine effect of the moderate intensity neuromuscular training. In summary, while both groups started at the same level, the training group showed a significant and reliable improvement in speed compared to the control group.

**Figure 1:** Shows the pre-test, post-test, and adjusted post-test mean scores of the moderate intensity neuromuscular training group and the control group on the speed test.



### Agility

The analysis of covariance on the agility of the pre and post test scores of the moderate intensity neuromuscular training and control group has been analysed and presented in Table II.

**TABLE II:**

### ANALYSIS OF COVARIANCE OF PRE AND POST TEST OF AGILITY FOR THE MODERATE INTENSITY NEUROMUSCULAR TRAINING AND CONTROL GROUP

Test	MINTG	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
<b>Pre Test</b>							
Mean	11.66	11.86	Between	0.30	1	0.30	0.49
S.D.	0.81	0.74	within	17.06	28	0.61	
<b>Post Test</b>							
Mean	10.93	11.66	Between	4.03	1	4.03	5.57*
S.D.	0.79	0.89	Within	0.72	28	0.72	
<b>Adjusted Post Test</b>							
Mean	10.96	11.63	Between	3.24	1	3.24	4.81*
			Within	18.15	27	0.67	

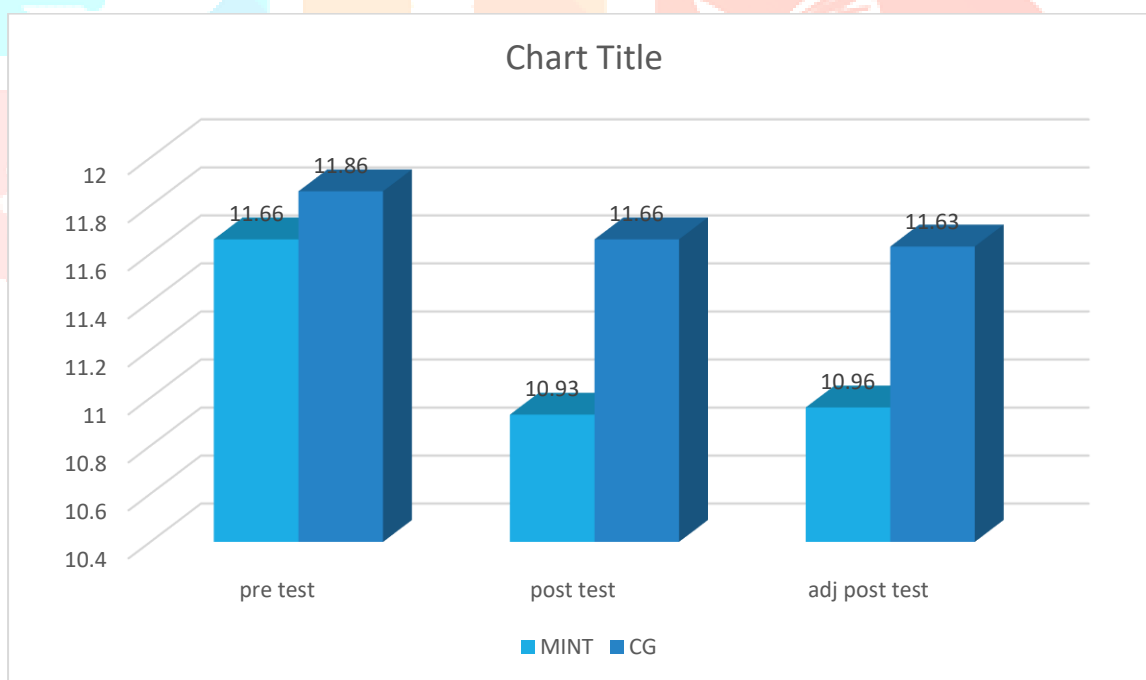
\* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 1 and 28 and 1 and 27 are 4.20 and 4.21, respectively).

The analysis of covariance presented in Table II for agility indicates that at the pre-test stage, the moderate intensity neuromuscular training group (MINTG) had a mean of 11.66, while the control group recorded a mean of 11.86. The obtained F-ratio was 0.49, which is lower than the required table value of 4.20, indicating that the difference between the groups was not statistically significant. This confirms that both groups were similar in agility at the baseline. In the post-test, the mean score of the MINTG decreased to 10.93, whereas the control group showed a mean of 11.66. The obtained F-ratio was 5.57, which is higher than the critical value of 4.20, indicating a statistically significant difference between the groups. This suggests that the training group demonstrated better improvement in agility compared to the control group. For the adjusted post-test means, the MINTG recorded a mean of 10.96, while the control group had a mean of 11.63. The obtained F-ratio was 4.81, which exceeds the required table value of 4.21, showing that the difference remained statistically significant even after adjusting for pre-test differences.

Although both groups started at a similar level of agility, the moderate intensity neuromuscular training program led to a significant improvement in agility compared to the control group.

**Figure 2:** Shows the pre-test, post-test, and adjusted post-test mean scores of the moderate intensity neuromuscular training group and the control group on the agility test.



## DISCUSSION AND FINDINGS OF THE STUDY

The results of the present study demonstrate that participants in the moderate intensity neuromuscular training group (MINTG) showed significant improvements in both speed and agility from pre-test to post-test, while the control group did not. The pre-test results indicated no significant differences between groups, confirming that both started at a similar baseline. The post-test and adjusted post-test analyses revealed that the MINTG achieved faster sprint times and better agility scores, with F-

ratios well above the critical values at the 0.05 level of confidence. This suggests that the training program was effective in enhancing neuromuscular coordination, reaction time, and movement efficiency.

The findings of the study showed that the MINTG significantly reduced sprint times compared to the control group, indicating improved acceleration and running efficiency, while also demonstrating superior agility performance, with adjusted post-test means confirming that these improvements were not influenced by baseline differences. Both speed and agility gains were statistically significant, as the obtained F-ratios for speed (12.23 and 14.44) and agility (5.57 and 4.81) exceeded the critical value at the 0.05 level. These results are consistent with previous research on SAQ and neuromuscular training, which has reported improvements in sprint performance, change-of-direction ability, and reaction time. Studies such as those by Min Sun et al. (2025) and trials listed on ClinicalTrials.gov support that moderate intensity and structured training interventions effectively enhance speed, agility, and overall athletic performance.

## CONCLUSION

The study confirms that moderate intensity neuromuscular training significantly improves speed and agility compared to a control group. These findings are supported by previous research, which consistently demonstrates that structured SAQ and neuromuscular training programs enhance athletic performance across multiple domains. This evidence justifies the inclusion of such training protocols in sports conditioning programs aimed at improving functional movement and competitive performance.

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