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EFFECT OF CONCURRENT NEUROMUSCULAR TRAINING AND FOOTBALL GAME PRACTICE ON SPEED

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Abstract

The purpose of study was to find out the effect of concurrent neuromuscular training and football game practice on speed. To achieve this purpose of the study, forty five school boys' students from Alagappa Physical Fitness Academy, Karaikudi, Tamil Nadu during the year 2021-2022 were randomly selected as subjects. The age of the subjects ranged between 11 and 12 years. The study was formulated as pre and posttest random group design, in which forty five subjects were divided into three equal groups. The experimental group-1 (n=15, NMT_bFGP) underwent neuromuscular training before football game practice, the experimental group-2 (n=15, NMT_aFGP) underwent neuromuscular training after football game practice and group 3 served as control group (n=15, CG) did not undergo any specific training. In this study, two training programme were adopted as independent variable, i.e., neuromuscular training before football game practice and neuromuscular training after football game practice. The speed was selected as dependent variable and it tested by 50 meters run; the performance was recorded in seconds. The selected two treatment group's namely neuromuscular training before football game practice and neuromuscular training after football game practice were performed five days in a week for the period of six weeks, as per the stipulated training program. The speed was tested before and after the training period. The collected pre and post data was critically analyzed with apt statistical tool of one-way analysis of co-variance (ANCOVA), for observed the significant adjusted post-test mean difference of three groups with respect to speed. The Scheffe's post hoc test was used to find out pair-wise comparisons between groups with speed. To test the hypothesis 0.05 level of significant was fixed in this study.

Keywords: 1).Neuromuscular training, 2).Football game practice, 3).Speed, 4).Concurrent Training, 5).ANCOVA

Introduction:

Marked evidence shows that neuromuscular training programs are effective for improving measures of performance. The benefits of a program designed for performance enhancement often include increased power, agility, and speed (Kraemer, W.J., N.D. Duncan, and J.S. Volek 1998, Kraemer, W.J et al., 2003). Comprehensive neuromuscular training programs designed for young women may significantly increase power, strength, and neuromuscular control and decrease gender differences in these measures (Kraemer, W.J et al., 2003 and KRA EM ER, W.J., et al., 2001) Football is one of the most widely played sports in the world. It is a sport characterized by short sprints, rapid acceleration or deceleration, turning, jumping, kicking, and tackling (Arnason A, Sigurdsson S.B., Gudmundsson A, Holme I., Engebretsen L., and Bahr, R 2004). Football is classified as a high intensity intermittent team sport (Stolen T., Chamari K., Castagna C., Wisloff U 2002), It is a contact sport and challenges physical fitness by requiring a variety of skills at different intensities. Players are divided into different position such as goalkeepers, defenders, midfielders, and attackers. It was noted that goalkeepers have lower level of development of coordination motor abilities than players occupying positions in the field. The role and importance of coordination motor abilities in Football should be directed at the realization of technical and tactical actions in varied conditions and in constantly changing situations and in tasks of all team formations (Cicirko L., Bu raczewski T., 2007). Running is the predominant activity involved in playing Football while explosive type activities such as sprints, jumps and kicks are an important performance factor which requires maximal strength and power of the neuromuscular system,(Marques MC, Pereira A, Reis IG, Tillaar RV, 2003). The purpose of this study was to examine the effects concurrent neuromuscular training and football game practice on Speed.

Methods and tools:

The experimental group-1 (n=15, NMTbFGP) underwent neuromuscular training before football game practice, the experimental group-2 (n=15, NMTaFGP) underwent neuromuscular training after football game practice and group 3 served as control group (n=15, CG) did not undergo any specific training

Administration of training programmes:

Neuromuscular training before football game practice (NMTbFGP)
Neuromuscular training (Circuit training)
At first the subjects has performed circuit training for neuromuscular training. They performed following exercises in circuit manner. After completion of the neuromuscular training, the subjects were allowed to take seven minutes rest before the football game practice.
Exercises involved

Vertical jump	Push-ups	High knee action	Biceps curl
Back kick	Wands pull-down	Burpee	Sit-ups

Training variables	1-2 weeks	3-4 weeks	5-6 weeks
Total number of station	8 stations	8 stations	8 stations
Duration of each exercises	Ten seconds	Fifteen seconds	Twenty seconds
Rest in between Exercises	----	----	----
Number of circuit	3	3	3
Rest in between the circuit	3 min	3 min	3 min
Duration of one circuit	1 min. 20 sec	2 minutes	2 min 40 sec

Football Game Practice (FGP)

Game	Activity	1-2 Weeks	3-4 Weeks	5-6 weeks
Footbal game practice	Warm Up	15 minutes	15 minutes	15 minutes
	Game Practice	10 minutes	15 minutes	20 minutes
	Warm Down	15 minutes	15 minutes	15 minutes
	Total duration	40 minutes	45 minutes	50 minutes

For football game practice the subjects has initiated with warming up for 15 minutes followed 10miutes,15 minutes and 20 minutes football game practices for the week of 1 and 2, 3 and 4,and 5 and 6 respectively .Further they allowed to go for cooling down process for the period of 15 minutes.

Neuromuscular training after football game practice (NMT_aFGP)

Football Game Practice (FGP): At first the subjects has performed football game practice as per the training programme were given below.After completion of the football game practice, the subjects were allowed to take seven minutes rest before the neuromuscular training.

Football Game Practice (FGP)

Game	Activity	1-2 Weeks	3-4 Weeks	5-6 weeks
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Neuromuscular training (Circuit training)

At first the subjects has performed circuit training for neuromuscular training. They performed following exercises in circuit manner. After completion of the neuromuscular training, the subjects were allowed to take seven minutes rest before the football game practice.

Exercises involved

Vertical jump Push-ups High knee action Biceps curl

Back kick Wands pull-down Burpee Sit-ups

Training variables	1-2 weeks	3-4 weeks	5-6 weeks
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Results:

TABLE - I

THE RESULTS OF ANALYSIS OF COVARIANCE ON SPEED OF DIFFERENT GROUPS (Scores in Seconds)

Test Conditions		Ex-1 NMT_b FGP	Ex-2 NMT_a FGP	Gr-3 CG	SV	SS	Df	MS	'F' ratio
Pre test	Mean	7.44	7.47	7.41	B	0.028	2	0.014	0.238
	S.D.	0.22	0.20	0.28	W	2.43	42	0.058	
Post test	Mean	5.87	6.44	7.50	B	20.50	2	10.25	113.4*
	S.D.	0.43	0.18	0.21	W	3.79	42	0.090	
Adjusted Post test	Mean	5.87	6.45	7.50	B	20.38	2	10.19	110.1*
					W	3.79	41	0.093	

* Significant at .05 level of confidence. The required table value for test the significance was 3.22 and 3.226 with the df of 2 and 42, 2 and 41.

RESULTS OF SPEED

The pretest mean and standard deviation on speed scores G1, G2 and G3 were 7.44±0.22, 7.47±0.20 and 7.41±0.28 respectively. The obtained pretest F value of 0.238was lesser than the required table F value 3.22. Hence the pretest means value of neuromuscular training before football game practice, neuromuscular training after football game practice and control group on speed before start of the respective treatments were found to be insignificant at 0.05 level of confidence for the degrees of freedom 2 and 42. Thus this analysis confirmed that the random assignment of subjects into three groups were successful. The posttest mean and standard deviation on speed of G1, G2 and G3 were 5.87±0.43, 6.44±0.18 and 7.50±0.21 respectively. The obtained posttest F value of 113.4 was higher than the required table F value of 3.22. Hence the posttest means value of neuromuscular training before football game practice, and neuromuscular training after football game practice on speed were found to be significant at 0.05 level of confidence for the degrees of freedom 2 and 42. The results proved that the selected two training interventions neuromuscular training before football game practice and neuromuscular training after football game practice was produced significant improvement rather than the control group of the sample populations. The adjusted posttest means on speed scores of G1, G2 and G3 were 5.87, 6.45 and 7.50 respectively. The obtained adjusted posttest F value of 110.1 was higher than the required table F value of 3.226. Hence the adjusted posttest means value of neuromuscular training before football game practice and neuromuscular training after football game practice on speed were found to be significant at 0.05 level of confidence for the degrees of freedom 2and 41. The results confirm that the selected two training interventions namely neuromuscular training before football game practice and neuromuscular training after football game practice on speed were produced significant difference among the groups.

In order to find out the superiority effects among the treatment and control groups the Scheffe's post hoc test were administered. The outcomes of the same are presented in the table I.

TABLE - I
THE RESULTS OF SCHEFFE'S POST HOC TEST MEAN DIFFERENCES ON SPEED AMONG THREE GROUPS
(Scores in Seconds)

Ex-1 NMT_bFGP	Ex-2 NMT_aFGP	Gr-3 CG	Mean Differences	Confidence Interval Value
5.87	6.45	-----	0.57*	0.04
5.87	-----	7.50	1.63*	
-----	6.45	7.50	1.05*	

* Significant at .05 level of confidence.

Result of Scheffe's Post Hoc test on speed

Table I shows the paired mean differences of neuromuscular training before football game practice, neuromuscular training after football game practice and control group on speed. The pair wise comparisons results as follows. First comparison: Group 1 and Group 2: The pair wise mean difference of group1 and group 2 values 0.57 was higher than the confidential interval value of 0.04. Hence the first comparison was significant. The results of this comparison clearly proved that both training have produced different effect on speed. Second comparison: Group 1 and Group 3: The pair wise mean difference of group 1 and group 3 values 1.63 was higher than the confidential interval value of 0.04. Hence the second comparison was significant. The results of this comparison clearly proved that neuromuscular training before football game practice has produced significant improvements on speed, than the control group. Third comparison: Group 2 and Group 3: The pair wise mean difference of group 2 and group 3 values 1.05 was higher than the confidential value of 0.04. Hence the third comparison was significant. The results of this comparison clearly proved that neuromuscular training after football game practice group has produced significant improvements on speed than the control group.

The adjusted posttest mean deference of experimental and control group value graphically represented in the figure 1.

FIGURE 1
THE ADJUSTED POST TEST MEAN VALUES OF EXPERIMENTAL AND CONTROL GROUPS ON SPEED

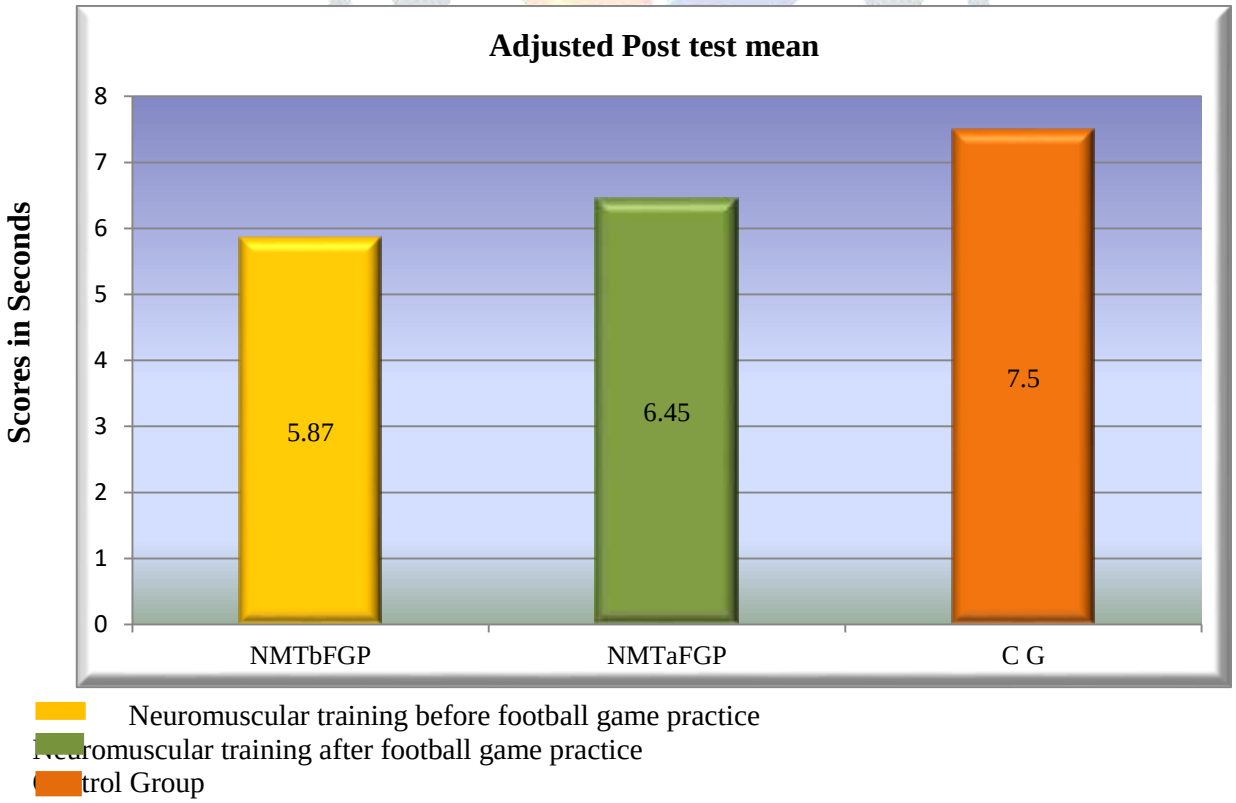
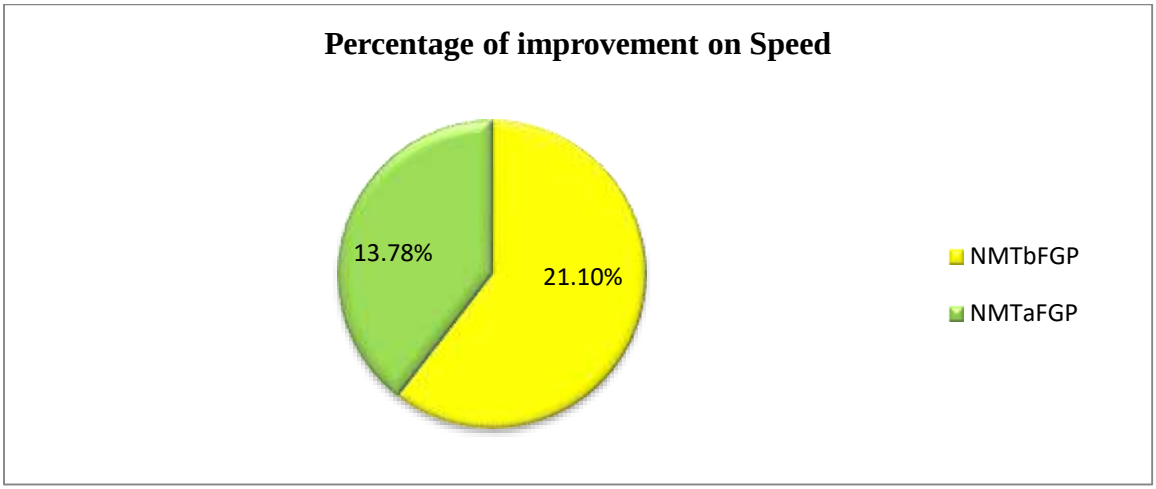


FIGURE-2

PERCENTAGE OF IMPROVEMENT OF EXPERIMENTAL GROUPS ON SPEED



After analyzing the statistical end results the researcher found that the selected training groups have significantly improved speed from the base line to post interventions. The pre to post intervention was present as follows. The neuromuscular training before football game practice (NMTbFGP) group from pre (7.44+0.22), to post (5.87+0.43) and neuromuscular training after football game practice (NMTaFGP) group from pre (7.47+0.20) to post (6.44+0.18) has significantly changed the pre to post results. The present study demonstrates an increase in speed performance of 21.10% and 13.78% for neuromuscular training before football game practice and neuromuscular training after football game practice group respectively. The result of this study prove that the speed increased significantly over the six weeks training period for neuromuscular training before football game practice and neuromuscular training after football game practice when comparing control group . However, neuromuscular training before football game practice (NMTbFGP) would produce better improvement than the other training namely neuromuscular training after football game practice (NMTaFGP) group. Further the neuromuscular training after football game practice (NMTaFGP) group also produces better improvement on speed than the control group. The control group did not show any significant changes on speed. Neuro muscular training is a supplemental training program that focuses on developing appropriate athletic and body movements to improve sport performance and prevent injuries. Muscle imbalances, improper movement mechanics, and poor conditioning are all factors that contribute to injury in sport. Neuromuscular training conducted by a qualified health-professional seeks to correct imp roper form and strengthen muscles to help prevent injury and subsequently increases athletic performance. Dr. Maniazhagu (2015) found that the interval training on treading (INT-TR) and interval training on spinning produced significantly different improvements on cardio respiratory endurance of college untrained women. D Maniazhagu, S Malar, M Manogari (2019) found that the circuit training and battle rope training improves the performance of speed. Studies have reported that neuromuscular training is likely to enhance athletic performance (Wojtys EM, Huston LJ, Taylor PD, 1996 and Emery CA, Cassidy JD, Klassen TP, Rosychuk RJ, Ro we BH. 2005). Chappell and Limpisvasti (2008) those 6 weeks (NTP) resulted in significant imp rovement in vertical ju mp height in female co lleg iate athletes. S Malar & D Maniazhagu (2019) found that the neuromuscular drills combined with asana practices and asana practices combined with neuro muscular drills produced greater improvement on dependent variable. Sridhar, Maniazhagu, Revathi (2011) found that the maximal exercise improve the hematological variables in middle and long distance runner. Maniazhagu, Robert C. Alexander, SukumarSha (2011) found that the aerobic training and circuit training produced improvement on muscular strength and muscular endurance. Myer et al., (2005) studied the effect of a neuromuscular training program on measures of athletic performance and lower-extremity movement bio mechanics in female athletes, especially female basketball players, and found significant improvement in measures of athletic performance. Recently, recreational soccer has emerged as a feasible and efficacious strategy for increasing health-related fitness in adult populations.(Milanovic Z, Pantelic S, Sporis G, Mohr M, Krustrup P, 2015 and Krustrup P, Nielsen JJ, Krustrup BR, Christensen JF, Pedersen H, Randers MB ,2009)When we exposed untrained adolescents to short-term soccer-based training, there was a marked positive between-group effect on postural balance, but an unclear effect on 10 m sprint, 20-m sprint, CMJ, SLJ, flexibility, and Yo –Yo IRT performance when compared with controls . The between-group effect on balance was highly significant despite poor reliability of the test .For sprint and ju mp performance, the within-group analyses showed improvements similar or slightly lower than data reported in RCT studies for young adults and untrained adults (Krustrup P, Christensen JF, Randers MB, Pedersen H, Sundstrup E, Jakobsen MD, et al., 2010 and Milanovic Z, Pantelic S, Sporis G, Mohr M, Krustrup P ,2015) that included more participants and longer training periods (12-40 weeks) than the present study. Hence, the lack of between-group differences in most of the physical tests may be linked to sample size and to the short training period. The only study in which the effects of recreational soccer in adolescents were investigated showed that obese adolescents improve their health markers (VO2max, body composition, blood pressure) after a 12 week recreational soccer program.12 It has been reported that the positive effects of recreational soccer can be explained by the high exercise intensity achieved during training. S. Leo Stanly, Maniazhagu Dharuman (2020) revealed that the after the 12 weeks training interventions all the experimental groups improved the

capacity of cardio respiratory endurance in selected subjects. The best improvement was noticed in combined practice of tai chi, Pilates and yoga group. Hemambara Reddy, D Maniazhagu (2015) exposed the low intensity of aquatic plyometric training, low intensity of land plyometric training imp roved speed in school boys. Umesh Muktamath, D Maniazhagu, Vinuta Muktamatha, Basavaraj Gan iger (2010) found that the plyometric training and circuit training have produced improvement on speed leg explosive power and anaerobic power of male college students . Hammami A, Kasmi S, Chamari K, Farinatti P, Fgiri T, Chamari K, et al., 2017) In the present study, the mean HR was 84.6% of HRpeak, a value that is comparable to that obtained in adult participants, where HR generally exceeded 80% of HRmax,(Krustrup P, Nielsen JJ, Krustrup BR, Christensen JF, Pedersen H, Randers MB ,2009).In addition to the high exercise intensity, recreational soccer represents an odd-impact physical activity that involves intense actions and movements in different directions. K Tamilarasan, D Maniazhagu (2014) found that the combination of assisted and resisted sprint training produced greater improvement on anaerobic power. D Maniazhagu (2019) revealed that the low and moderate intensities of aquatic plyometric training combined with yogic practices on anaerobic capacity of junior athletes. Dejan A. Milenkovic (2011), his study revealed a strong correlation between motor speed and situational-motor speed in football, with sprinting (200m) and foot taping tests showing the highest predictive value. These findings highlight speed as a crucial motor ability influencing technical performance in football. Thomas Haugen et.al. (2013), Their study suggests that adopting progressive sprint training models, similar to strength training principles and elite athletics practices, may provide soccer players with more time-efficient performance gains. Traditional guidelines may therefore need adaptation to better match the sport-specific demands of football. Álvaro Novillo et al. (2024) they reported that during the defensive phase, goalkeepers mainly move parallel to the ball, while forwards run more directly toward its position. Notably, these movement dynamics change considerably in the attacking phase, underscoring tactical role-specific adjustments. Hao Wang & Xiaofeng Shi (2021) they highlighted that player speed is crucial for both individual quality and team success in football. They suggest targeted training programs to improve adaptability, physical preparation, and overall team performance.

Conclusion

The present study demonstrated that, the effect of the concurrent neuromuscular training and football game practice on speed of school students. A 6-week training period, including neuromuscular training before the football game practice and neuromuscular training after the football game practice five times a week was effective in changing Speed performances. The nature of the speed was increased by 21.10% and 13.78% for neuromuscular training before football game practice and neuromuscular training after football game practice group respectively. It was enhanced in neuromuscular training before football game practice than neuromuscular training after football game practice group. No significant improvements were noticed on control participants on speed.

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