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Review Article

Effect of Concurrent Neuromuscular Training and Football Game Practice on Agility

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Abstract

The purpose of study was to find out the effect of concurrent neuromuscular training and football game practice on agility. To achieve the purpose of the study, forty five school boys who actively participate the physical activity from Alagappa Physical Fitness Academy, Karaikudi, Tamil Nadu, were selected as subject at random. Their age group range between 11 to 12 years. The study was formulated as pre and post-test 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, NMTaFGP) underwent neuromuscular training after football game practice and group 3 served as a control group (n=15, CG). The agility was selected as criterion variable. It was measured by 4x10 meters shuttle run test. The selected two treatment groups were performed five days in a week for the period of six weeks, as per the stipulated training program. The nature of agility 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, for observed the significant adjusted post-test mean difference of three groups. The Scheffe's post hoc test was used to find out pair-wise comparisons between groups. To test the hypothesis 0.05 level of significant was fixed. The study proved that both treatment groups have statistically produced significant effect of agility.

Keywords: Concurrent neuromuscular training (NMT), Football game practice (FGP), Agility, Seconds, 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 KRAEMER, 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., Buraczewski 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 agility.

Experimental Approach to the Problem

The study was formulated as pre and post-test 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 a control group (n=15, CG). The selected two treatment groups were performed five days in a week for the period of six weeks, as per the stipulated training program. The group 1 has performed neuromuscular training before football game training in the form of circuit training. After completion of the neuromuscular training, the subjects were allowed to take seven minutes rest before the football game practice. The group 2 has performed football game practice followed by neuromuscular training. Exercise involved: Vertical jump, Push-ups, High knee action, Biceps Curl, Butkick, Wands pull down, Burpee and Sit ups.

7 minutes rest before the football practice

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
Football 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

Results Analysis

The Results of Analysis of Covariance on Agility 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**	15.59	15.53	15.45	B	0.15	2	0.08	0.4
	S.D.	0.55	0.48	0.33	W	9.08	42	0.22	
Post test	**Mean**	13.63	14.17	15.45	B	26.31	2	13.16	54.8*
	S.D.	0.59	0.51	0.33	W	10.08	42	0.24	
Adjusted Post test	**Mean**	13.61	14.17	15.47	B	27.13	2	13.56	60.5*
					W	9.18	41	0.224	

*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 AGILITY

The pre-test mean and standard deviation on agility scores G1, G2 and G3 were 15.59+0.55, 15.53+0.48 and 15.45+0.33 respectively. The obtained pre-test F value of 0.4 was lesser than the required table F value 3.22. Hence the pre-test means value of neuromuscular training before football game practice, neuromuscular training after football game practice and control group on agility 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 was successful. The post-test mean and standard deviation on agility of G1, G2 and G3 were 13.63+0.59, 14.17+0.51 and 15.45+0.33 respectively. The obtained post-test F value of 54.8 was higher than the required table F value of 3.22. Hence the post-test means value of neuromuscular training before football game practice, and neuromuscular training after football game practice on agility 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 post-test means on agility scores of G1, G2 and G3 were 13.61, 14.17 and 15.47 respectively. The obtained adjusted post-test F value of 60.5 was higher than the required table F value of 3.226. Hence the adjusted post-test means value of neuromuscular training before football game practice and neuromuscular training after football game practice on agility 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 agility 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 2.

Table- 2: The Results of Scheffe's Post Hoc Test Mean Differences on Agility among Three Groups (Scores in Seconds)

Ex-1 NMT_bFGP	Ex-2 NMT_aFGP	Gr-3 CG	Mean Differences	Confidence Interval Value
13.61	14.17	-----	0.56*	0.07
13.61	-----	15.47	1.86*	
-----	14.17	15.47	1.3*	

* Significant at .05 level of confidence.

Result of Scheffe's Post Hoc Test on Agility

Table 2 shows the paired mean differences of neuromuscular training before football game practice, neuromuscular training after football game practice and control group on agility. 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 0.56 was higher than the confidential interval value of 0.07. Hence the first comparison was significant. The results of this comparison clearly proved that both training have produced different effect on agility. Second comparison: Group 1and Group 3: The pair wise mean difference of group 1 and group 3 values 1.86 was higher than the confidential interval value of 0.07. 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 agility, than the control group. Third comparison: Group 2 and Group 3: The pair wise mean difference of group 2 and group 3 values 1.3 was higher than the confidential value of 0.07. 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 agility than the control group. The adjusted post-test mean deference of experimental and control group value graphically represented in the figure.

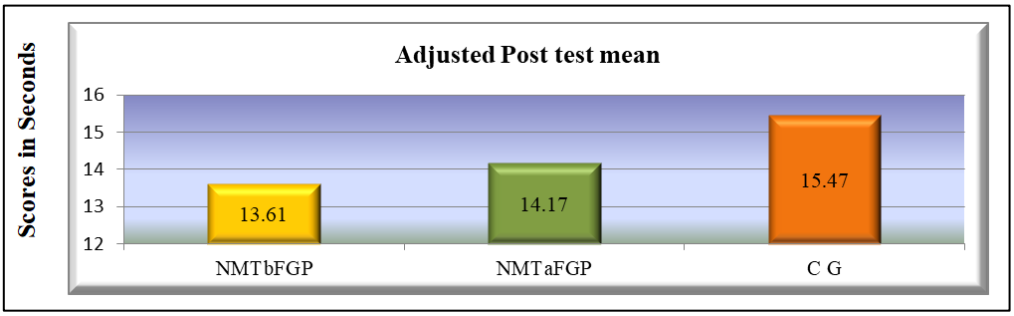

Figure: The Adjusted Post Test Mean Values of Experimental and Control Groups on Agility

DISCUSSION OF AGILITY

Neuromuscular 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 improper form and strengthen muscles to help prevent injury and subsequently increases athletic performance. Neuromuscular training involves strength and conditioning activities, resistance exercises, and dynamic stability work, with a strong focus on core, plyometrics and agility, and proper jump landing technique and is typically conducted 2-3 times per week for 6 weeks. The present study showed that both training strategies result in different in agility. Furthermore, neuromuscular training before football game practice induced better improvement in agility in school students. Further the neuromuscular training after football game practice also show the best performance in agility than the control group.

After analyzing the statistical end results the researcher found that the selected training groups have significantly improved agility from the base line to post interventions. The pre to post intervention was present as follows. The neuromuscular training before football game practice (NMT_bFGP) group from pre (15.59+0.55), to post (13.63+0.59) and neuromuscular training after football game practice (NMT_aFGP) group from pre (15.53+0.48) to post (14.17+0.51) has significantly changed the pre to post results. The

present study demonstrates an increase in agility performance of 12.57% and 8.75% for neuromuscular training before football game practice and neuromuscular training after football game practice group respectively. The result of this study prove that the agility 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 (NMT_bFGP) would produce better improvement than the other training namely neuromuscular training after football game practice (NMT_aFGP) group. Further the neuromuscular training after football game practice (NMT_aFGP) group also produces better improvement on agility than the control group. The control group did not show any significant changes on agility. In the intervention group, however, we found significant differences between pre- and post-test results in all motor skills investigated in this study. Kumar Jagadish, 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, Rowe BH. 2005). Chappell and Limpisvasti (2008) those 6 weeks (NTP) resulted in significant improvement in vertical jump height in female collegiate athletes. S Malar, D Maniazhagu (2019) found that the neuromuscular drills combined with asana practices and asana practices combined with neuromuscular 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, Sukumar Sha (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 biomechanics 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 jump 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 improved speed in school boys. Umesh Muktamath, D Maniazhagu, Vinuta Muktamatha, Basavaraj Ganiger (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 Tamilarasia, 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.

CONCLUSIONS

The present study demonstrated the effect of the concurrent neuro muscular training and football game practice on agility of school students. A 6-week training period, including neuro muscular training before the football game practice and neuromuscular training after the football game practice five times a week was effective in changing agility performances. Furthermore, neuro muscular training before the

football game practice also showed a considerable increase in agility performances from a practical point of view, a neuro muscular training before the football game practice strategy might help to improve the performance of agility. From a coach's point of view, time-efficient, more effective and more enjoyable training strategies are preferable to improve participants' agility qualities.

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