ANALYSIS OF ANAEROBIC POWER PERFORMANCE IN RESPONSE TO DIFFERENT FREQUENCIES OF AEROBIC INTERVAL TRAINING AMONG FOOTBALL PLAYERS

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Abstract

The intention of this investigation was to analyze the anaerobic power performance in response to different frequencies of aerobic interval training among football players. To achieve this purpose 45 male football players from Altius International Football Academy, Palakkad, Kerala, India, were chosen. The subjects were selected in the age group of 15 to 18 years. The study population was randomly divided into three equal groups of 15 each. Experimental group-I was given the packages of aerobic interval training (3days/week), experimental group-II was given the packages of aerobic interval training (6days/week) and group III was acted as control. They did these 2 trainings for 12 weeks. All the chosen three groups were assessed before and immediately after 12 weeks of training period on anaerobic power by conducting repeated anaerobic sprint test (RAST). The obtained data was analyzed by paired 't' test to know the differences if any between the two testing periods. Additionally, magnitude of variation was also calculated. In addition, ANCOVA was also applied. When the adjusted 'F' was greater, Scheffe's test was applied. Findings revealed that low frequency aerobic interval training (3days/week) leads to 4.08% of improvement in anaerobic power whereas performing high frequency aerobic interval training (6days/week) leads to 9.47% of improvement in anaerobic power of football players.

Key words: *Aerobic Interval Training, Anaerobic power, Football Players*

Introduction

Nowadays, football is a highly demanding game in which the participants aresubjected to numerous actions that require overall strength and power production, speed, agility, balance, stability, flexibility, and the adequate level of endurance **(Bloomfield *et al.*, 2007; Gorostiaga *et al.*, 2004; Krustrup *et al.*, 2005)**, thus making the conditioning of players a complex process. The next step is to investigate methods that produce the integral effects that can be used in the conditioning of football players. But, few studies have investigated the training methods that produce the integral effects on various abilities. Within the context of randomized intermittent, dynamic andskilled movement type sports, to which football undoubtedly belongs, the integrated effects are wanted. The problem is to decide which type of conditioning should be implemented to improve performance of football players.

For a football player, being in top physical condition is important for both performance and injury prevention. Football is characterized as a predominantly aerobic modality being 80-90% of the energy used coming from the oxidative system (**Santos & Soares, 2001)**. However, during football match, the players also realize another physical actions of short duration and high intensity (sprints, jumps, spins), being predominant, in this cases, the anaerobic-glycolytic system. Football players need aerobic endurance to run around the field without becoming winded, but anaerobic fitness plays a more critical role in the development of strength, quickness, speed and power. In a football match, a player performs one sprint every 90 seconds **(Souza, 1999)** and executed 17 sprints of 20 meters per match by each player **(Di Salvo *et al.*, 2007; Di Salvo *et al.*, 2009)**. Anaerobic power is to make the player become faster and more powerful in a short time. Football moves such as sprint during counterattack situations, highlight the anaerobic power. The maximum effort toward the goal or to intercept a move is notorious so that the anaerobic power becomes a very important during decisive moments of the match.

Sports specific aerobic training is very popular, where players use smaller play area and less number of participants duringgames. Each player comes into contact with the ball and deals with common game situation more often. These situations require good technical skills such aspassing, dribbling, feinting, and shooting as well as tactical skills such as runningwithout the ball, unmarking and cooperation with other players. Prestwick improvement of on court fitness and skill is the advantage of sports specific aerobic training that might ensure the players to perform optimally during a game**(Carmeli *et al.*, 2002)**. And also in order to know the outcome of sports specific aerobic trainings with different frequencies to enhance the required performance qualities for football players. Hence, the purpose of the present investigation was to examine the changes on anaerobic power in response to different frequencies of aerobic interval training among football players.

METHODOLOGY

Subjects and Variable

To attain the purpose of the study 45 male football players from Altius International Football Academy, Palakkad, Kerala, India, were selected as subjects. The subjects were selected in the age group of 15 to 18 years. The study population was randomly divided into three equal groups of 15 each. Experimental group-I was given the packages of low frequency aerobic interval training (3days/week), experimental group-II was given the packages of high frequency aerobic

interval training (6days/week) and group III was acted as control. Control group was restricted to participate in any specific training programme. The selected subjects were medically examined by a qualified physician and certified that they were medically and physically fit enough to undergo the training programme. All 3 groups were assessed before and immediately after 12 weeks of training period on cardiorespiratory endurance by conducting anaerobic power by conducting repeated anaerobic sprint test (RAST).

Training Programme

The experimental group-I performed aerobic interval training alternatively three days in a week and the experimental group-II performed the same aerobic interval training six days in a week for twelve weeks. In this present investigation continuous running was given to the subjects as aerobic interval training. To fix the training load for the aerobic interval training group the subjects were examined for their exercise heart rate in response to different work bouts, by performing continuous running of five minutes duration for proposed repetitions and sets, alternating with active recovery based on work-rest ratio. The subject's training zone was computed using Karvonen formula and it was fixed at 65%HRmax to 90%HRmax. The work rest ratio of 1:1 between repetition and 1:3 between sets was given.

Subjects in the low frequency aerobic interval training (LFAIT) group were performed 80 min/day continuous running, 3days/week (240 min/week). Subjects in the high frequency aerobic interval training (HFAIT) group were instructed to perform 40 min/day continuous running, 6days/week (240 min/week). To subjects performed the training distance of 5 minutes continuous running with proposed repetition and sets. Even though the low and high frequency groups performed aerobic interval training three and six days per week respectively, the weekly training volume for both the training groups was equalized to 240 min/week.

Statistical Procedures

The data collected from the experimental and control groups on selected dependent variables was statistically analyzed by paired 't' test to find out the significant differences if any between the pre and post test. Further, percentage of changes was calculated to find out the alterations in selected dependent variables due to the impact of experimental treatment.

Further, the data collected from the three groups prior to and post experimentation on anaerobic power were statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). Since three groups were involved, whenever the

obtained 'F' ratio value was found to be significant for adjusted post test means, the Scheffe's test was applied as post hoc test to determine the paired mean differences, if any. In all the cases the level of confidence was fixed at 0.05 level for significance.

Results

The collected pre and post test Anaerobic Power (AP) data of 3days/week as well as 6days/week aerobic interval training & control groups are analyzed statistically as in Table - I.

Table – I: Paird't' Test Results on Anaerobic Power of Different Frequencies of Aerobic Interval Training & Control group's Football Players

Group	Test	N	Mean	SD	DM	't' - ratio	%
3days/week Aerobic Interval Training	Pre	15	223.60	5.56	9.13	7.47*	4.08
	Post	15	232.73	5.77			
6days/week Aerobic Interval Training	Pre	15	223.13	4.58	21.13	10.49*	9.47
	Post	15	244.26	8.48			
Control	Pre	15	224.00	5.55	0.20	0.10	0.08
	Post	15	224.20	4.90			

*Table value for df 14 is 2.15(*significant)*

The collected pre and post test anaeropbic power (AP) values of two treatment (3days/week & 6days/week aerobic interval training) groups vary obviously as the found 't' values of 3days/week (7.47) as well as 6days/week (10.49) aerobic interval training groups were more than table value (df14=2.15). Performing aerobic interval training 3days/week leads to 4.08% of improvement in anaerobic power (AP) whereas performing aerobic interval training 6days/week leads to 9.47% of improvement in aerobic power (AP) of football players.

The chosen football player's anaerobic power (AP) performance of 3days/week as well as 6days/week aerobic interval training & Control groups were analyzed by ANCOVA statistics, and exhibited in Table – II.

Table – II: ANCOVA Results on Anaerobic Power of Different Frequencies of Aerobic Interval Training & Control group's Football Players

	3days/week Aerobic Interval Training	6days/week Aerobic Interval Training	Control	SoV	SS	df	MS	'F' ratio
Adjusted Mean	232.72	244.45	224.02	B	3138.47	2	1569.23	41.06*
				W	1604.96	41	38.21	

*(Table value for df 2 & 41 is 3.23)*Significant (.05 level)*

The applied ANCOVA calculation established that the adjusted (post test) means (3days/week training group=232.72, 6days/week training group = 244.45 & CG=224.02) of football player's reaction time of all three chosen groups differs from each other, because the resultant adjusted (post test) mean 'F' value (41.06) is better than 3.23 (Table value for *df 2 & 41* =3.23).

As the 3days/week and 6days/week aerobic interval training & Control group's adjusted (post test) means 'F' value (41.06) is significant, Scheffe's statistics was used as in Table - III.

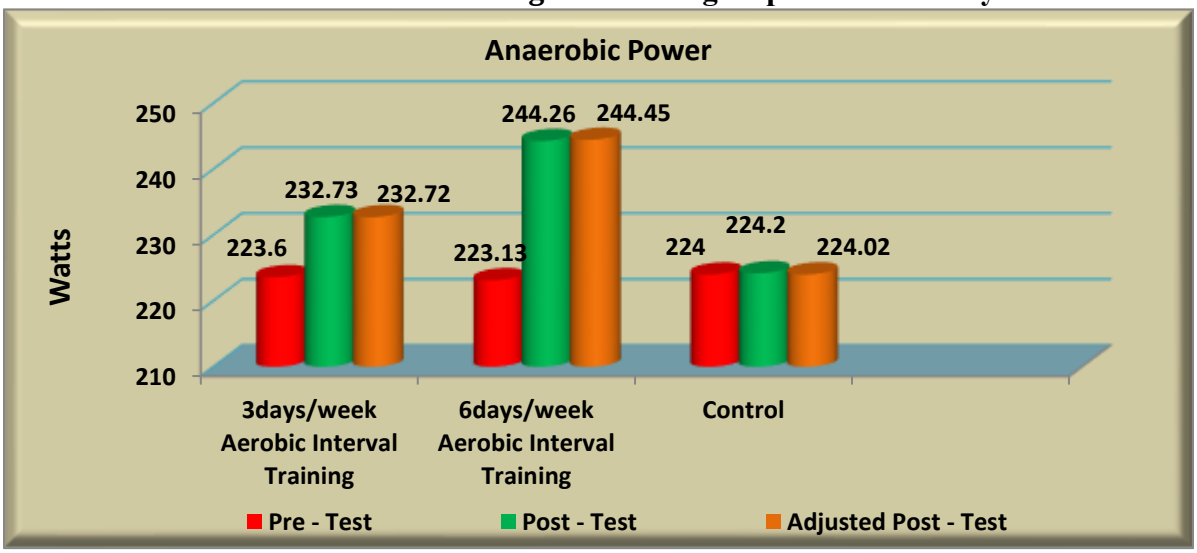
Table – III: Scheffe's Test Conclusion on Anaerobic Power of Different Frequencies of Aerobic Interval Training & Control group's Football Players

Variable	3days/week Aerobic Interval Training	5days/week Aerobic Interval Training	Control	MD	CI
Anaerobic Power	232.72	244.45		11.73*	5.80
	232.72		224.02	8.70*	5.80
		244.45	224.02	20.43*	5.80

**Significant (.05)*

The applied Scheffe's statistics confirmed that due to 3days/week aerobic interval training (8.70), as well as 6days/week aerobic interval training (20.43) the football player's anaerobic power was improved to a great extent. Though, 6days/week aerobic interval training was much better than 3days/week aerobic interval training since the mean difference (11.73) is more than 5.80 (CI value). The anaerobic power (AP) data of 3days/week as well as 6days/week aerobic interval training & Control groups are graphically put on show in Figure - I.

Figure – I: Figure Screening the Anaerobic Power of Different Frequencies of Aerobic Interval Training & Control group's Football Players



Discussion

As a result of different frequencies (3days/week & 6days/week) of aerobic interval training, the anaerobic power of the football players was significantly improved. Moreover 6days/week aerobic interval training was better than 3days/week aerobic interval training in improving the anaerobic power of the football players. This result in agreement with the study of **Barkadehi & Abedimahzoun (2014)** showed that 8-week of highly-intense two session exercises and moderately-intense three-session exercises had almost similar effects in anaerobic power of martial arts sportsmen. Besides, **Clemente & Filipe Manuel (2021)** meta-analyses revealed that significant benefits after the high-intensity interval training (HIIT) in repeated sprint ability ($p = 0.049$) of men soccer players. Furthermore, **Iaia, Rampinini & Bangsbo (2009**) studies on football players have shown the speed-endurance training improved the ability to perform repeated sprints (approximately 2%).

Regular aerobic exercise (Short-term) induces substantial improvement in anaerobic performance **(Sartorio *et al.*, 2003)**. The observation by **Laursen *et al.*, (2005)** that, peripheral adaptation rather than central adaptation are likely responsible for the improved anaerobic capacity witnessed in well-trained endurance athletes following various forms of high-intensity interval training. Besides, **Para *et al.*, (2000)** reported that, high-intensity cycling training in 14 sessions improves enzyme activities of anaerobic and aerobic metabolism however these changes are affected by the distribution of rest periods. In the present study it was concluded that aerobic interval training causes positive effect on anaerobic power of football players. The result of the

present study is supported the fact that systematic exercise is a safe and effective intervention to delay or even reverse the physical and neuro-motor decline. Hence, it is suggested that fitness programme with this kind of activity can help to improve anaerobic power of the football players.

Conclusion

Low frequency aerobic interval training (3days/week) leads to 4.08% of improvement in anaerobic power whereas performing high frequency aerobic interval training (6days/week) leads to 9.47% of improvement in anaerobic power of football players. Though, high frequency aerobic interval training (6days/week) was much better than low frequency (3days/week) aerobic interval training for the development of anaerobic power. Since high frequency training yields more favorable results than low frequency training, this type of training programme is very useful when significant increases in overall fitness are needed.

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