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**Arumugam S**  
Assistant Professor,  
Department of Physical  
Education and Sports,  
Manonmaniam Sundaranar  
University, Abishekapatti,  
Tirunelveli, Tamil Nadu, India

**Sri Suba E**  
M.P.Ed. Student,  
Department of Physical  
Education and Sports,  
Manonmaniam Sundaranar  
University, Abishekapatti,  
Tirunelveli, Tamil Nadu, India

## Training effects of aerobic and anaerobic running on cardio vascular endurance among football players

**Arumugam S and Sri Suba E**

### Abstract

The present study was aimed to find out the training effects of aerobic and anaerobic running on cardio vascular endurance among football players. To attain the purpose of this study, thirty six school girl football players were randomly selected as participants from schools in Tirunelveli District, Tamil Nadu, India. Their age were ranged from 15 to 17 years, who were participated inter school football tournament during the academic year of 2018-2019. The selected participants were randomly divided into three groups such as group 'I' underwent aerobic running (n=12), group 'II' underwent anaerobic running (n=12) and group III act as control (n=12). Group 'I' underwent aerobic running (continuous run) for three alternative days per week and one session per day with the intensity was progressively increased the range from 30% to 40% and volume of work was increased from 30 to 40 minutes for six weeks period. Group 'II' underwent anaerobic running (interval run) for three alternative days per week and one session per day with the intensity was progressively increased the range from 40% to 50% and volume of work was increased from 30 to 40 minutes for six weeks period. Group 'III' was not exposed to any specific training but they were participated in regular activities. The data on selected criterion variable on cardio vascular endurance was measured by 9 mins run/walk test (metres). The collected data were statistically analysed by using Analysis of Covariance (ANCOVA) and when the F ratio of the adjusted post-test mean was found to be significant, Scheffe's post hoc test was employed to find out the paired mean differences and the significant was fixed at 0.05 level of confident. All the data were analysed by used SPSS-22 version statistical package. It was concluded that the aerobic and anaerobic running groups were significantly improved on cardio vascular endurance when compare than control group and also made significant difference among experimental and control groups.

**Keywords:** Aerobic running, anaerobic running, cardio vascular endurance, football players

### Introduction

Physiological requirements of the football game demand high aerobic and anaerobic capacity, muscle strength, speed, power, skills, coordination and flexibility for the improvement of performance and care of injury prevention [1].

The game of Football is that uses both combination of aerobic and anaerobic capacity towards improvement of player's performance. Improving VO<sub>2</sub>max and anaerobic capacity are much needed for every Football Players [2].

Football is team sport that is played in an outdoor field, and training is mainly based on movement implementing the endurance qualities consisting of moderate activity alternating with sprints of intermittent high intensity [3], and is characterized by short duration high speed runs, jumps, heading and ball disputes are besides other activities such as trots, low speed running and walk [4]. The American College of Sports Medicine (ACSM) defines aerobic exercise as any activity that uses large muscle groups, can be maintained continuously and is rhythmic in nature [5].

Aerobic capacity of athletes is an important element of success in sports achievements. Physiologically, it is functional capacity of an organism to increase the level of metabolic process in keeping with the requirement of physical effort being exposed too. Metabolic process in this sense means the transformation of chemical energy into mechanical one [6].

Anaerobic exercise has been defined by the ACSM as intense physical activity of very short duration, fueled by the energy sources within the contracting muscles and independent of the use of inhaled oxygen as an energy source [7].

**Correspondence**  
Assistant Professor,  
Department of Physical  
Education and Sports,  
Manonmaniam Sundaranar  
University, Abishekapatti,  
Tirunelveli, Tamil Nadu, India

Anaerobic training is used to increase strength and power through intense muscular activity. In soccer, anaerobic metabolic pathways are utilized during very short bursts of moderate to intensive effort that can directly determine a match's outcome [8].

Slow running over natural terrain. Interval training is a programme of repeated running with a set of resting full jogging after each repetition. Continuous training is when an athlete's exercise in a steady aerobic way without any pauses or breaks in between [9].

Sports scientists can, through physiological testing of performers, analyze these components and use this information to create individual profiles of participants to include strengths and weaknesses in relation to other squad players and previous tests [10].

Cardio vascular endurance is one of the most significant components of general physical fitness. It may be defined as the ability of heart and lungs to take in and to transport adequate amounts oxygen to the working muscles for activities to be performed over long periods of time [11].

### Purpose of the study

The study was to investigate two different training effects between aerobic running and anaerobic running towards improving on cardio vascular endurance among girl football players.

### Material and methods

The study was conducted in the Department of Physical Education and Sports, Manonmaniam Sundaranar University in February 2019.

The research participants consisted thirty six school girl football players (n=36, age=15 to 17 years), were randomly selected as participants from school in Tirunelveli District, Tamil Nadu, India who were participated inter school football tournament during the academic year of 2018-2019. The selected participants were randomly divided into three groups such as group 'I' underwent aerobic running (n=12), group 'II' underwent anaerobic running (n=12) and group III act as control (n=12). The tests were in the in-season phase of competition and all subjects were clinically tested by healthy and had no history of recent infection, asthma or cardio respiratory disorders.

### Cardio vascular endurance

Cardio vascular endurance refers to an athlete's ability to sustain prolonged exercise for minutes, hours, or even days. Endurance testing is a way to measure the efficiency of an athlete's circulatory system and respiratory system in supplying oxygen to the working muscles and support sustained physical activity.

For collection of data in the variable cardio vascular endurance, need flat oval or running track, marker cones, recording sheets, stop watches. Procedure of the test was explained properly to the subjects. Perform screening of health risks and obtain informed consent. Also prepare forms and record basic information such as age, height, body

weight, gender, test conditions.

### Test procedure: (9 min run/ walk Test)

The nine-minute walk/run test was conducted to assess cardio vascular endurance among girl football players. To conduct the test the following resources needed such as flat oval running track, marker, stop watches etc. Place markers at set intervals around the track to aid in measuring the completed distance. The test requires to run or walk for 9 minutes, and the total distance covered was recorded. Walking may be allowed, though participants should try and push themselves as hard as they can.

**Scoring:** Measure the distance walked in 9 minutes to the nearest meter [12].

### Aerobic running program

Aerobic running (continuous run) for three alternative days per week and one session per day with the intensity was progressively increased the range from 30% to 40% and volume of work was increased from 30 to 40 minutes per session for six weeks period without the rest between the running activity. During the early season the athletes should have one very long run every 3 days and the workouts should progress in duration every 2 weeks by 5 minutes.

### Anaerobic running program

Anaerobic running (interval run) for three alternative days per week and one session per day with the intensity was progressively increased the range from 40% to 50% and volume of work was increased from 30 to 40 minutes per session for six weeks period with active rest between the repetition of running activity. During the early season the athletes should have one session run every 3 days and the workouts should progress in duration every 2 weeks.

The data were collected from experimental groups and control group prior to and immediately after the completion of the training period on selected variable and it was statistically examined by applying analysis of covariance (ANCOVA) for find out the significant differences among experimental and control groups. As all the three groups were selected from the same population and no attempt were made to equate the groups on the selected dependent variable initial differences may exist, and there was a possibility of affecting the post-test mean. For eliminating any possible influence of pre-test means the adjusted post-test means of experimental groups and control group were tested for significance by using ANCOVA. When the F ratio of the adjusted post-test mean was found to be significant, Scheffe's post hoc test was employed to find out the paired mean difference. All the data were analyzed using SPSS statistical package. The level of confidence was fixed at 0.05 level of significance as the number of subjects was limited and also as the selected variable might fluctuate due to various extraneous factors.

### Results and discussion

**Table 1:** Analysis of covariance for the selected variable among experimental groups & control group (meters)

Test	Aerobic Running Group	Anaerobic Running Group	Control Group	Source of variance	Sum of square	DF	Mean square	'F' ratio
Pre Test Mean	1113.32	1110.79	1087.45	B.M	309.54	2	154.77	1.73
SD (±)	102.11	121.45	143.14	W.G	2952.18	33	89.46	
Post Test Mean	1382.74	1326.85	1135.87	B.M	1994.58	2	997.29	9.57*
SD (±)	94.03	110.87	132.09	W.G	3438.93	33	104.21	

Adjusted Post Test Mean	1389.45	1328.06	1136.83	B.M	4890.72	2	2445.36	13.30*
				W.G	5883.84	32	183.87	

\*significant at 0.05 level of confidence. The table values required for significance at 0.05 level of confidence for 3 & 33 and 3 & 32 are 3.28 and 3.29.

The table 1 shows that the pre-test mean value on cardio vascular endurance of school girl football players aerobic running, anaerobic running and control groups are 1113.32, 1110.79 and 1087.45 respectively. The obtained 'F' ratio 1.73 for pre-test scores was less than the table value 3.28 for DF 1 and 33 required for significance at 0.05 level of confidence on cardio vascular endurance.

The post-test mean values on cardio vascular endurance of school girl football player's aerobic running, anaerobic running and control groups are 1382.74, 1326.85 and 1135.87 respectively. The obtained 'F' ratio 9.57 for post-test scores

was greater than the table value 3.28 for DF 1 and 33 required for significance at 0.05 level of confidence on cardio vascular endurance.

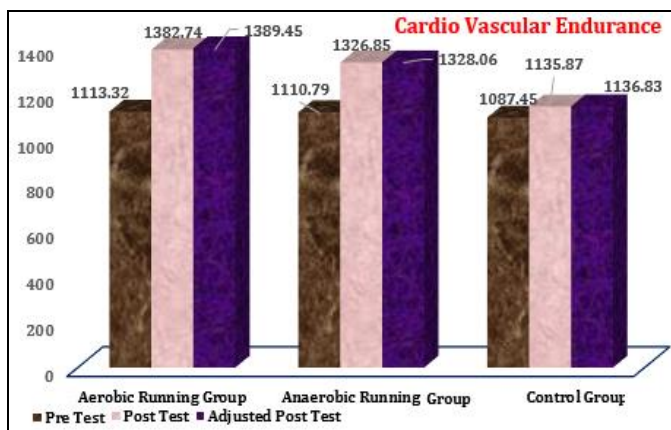
The adjusted post-test means of school girl football player's aerobic running, anaerobic running and control groups are 1389.45, 1328.06 and 1136.83 respectively. The obtained 'F' ratio of 13.30 for adjusted post-test means was greater than the table value of 3.29 for DF 1 and 32 required for significance at 0.05 level of confidence on cardio vascular endurance.

**Table 2:** The Scheffe's test for differences between the adjusted post-test paired means

Variable	Aerobic Running Group	Anaerobic Running Group	Control Group	Mean Difference	CI
Cardiovascular Endurance	1382.74	1326.85	--	55.89*	14.20
	1382.74	--	1135.87	246.87*	
	--	1326.85	1135.87	190.98*	

\*Significant at 0.05 level of confidence

The table 2 shows that the mean difference values between aerobic running group & anaerobic running group, aerobic running group & control group and anaerobic running group & control group which is greater than the confidence interval value 14.20 at 0.05 level of confidence. The results of the study showed that there was significant differences between aerobic running group & anaerobic running group, aerobic running group & control group and anaerobic running group & control group of school girl football players on cardio vascular endurance



**Fig 1:** Mean value of aerobic running group, anaerobic running group and control group on cardio vascular endurance among school girl football players

**Discussion on findings**

The result of study indicates that there were significant differences on cardio vascular endurance between aerobic running, anaerobic running and control groups on school girl football players. Aerobic endurance group significantly improved than anaerobic running and control groups. Anaerobic running group had significantly improved than control group. The following studies are supported to the result of this investigation Hoff, J., & Helgerud, J. (2004) [13], Mcmillan, K., Helgerud, J., Macdonald, R., & Hoff, J. (2005) [14], Norris, R., Carroll, D., & Cochrane, R. (1990) [15], Gent, D. N., & Norton, K. (2013) [16], Bendiksen, M., Williams, C.

A., Hornstrup, T., Clausen, H., Kloppenborg, J., Shumikhin, D., & Krustrup, P. (2014) [17] and Satheesh Kumar, K., & Arumugam, S. (2018) [18].

**Conclusion**

The following conclusions were drawn from the result of the present study,

1. The present study was exposed that significant differences were found in the mean of cardio vascular endurance between aerobic running, anaerobic running and control groups.
2. There was significant improvement of aerobic endurance group when compared to control group on cardio vascular endurance due to the effect of aerobic running among school girl football players.
3. There was significant improvement anaerobic endurance group when compare than control group on cardio vascular endurance due to the effect of anaerobic running among school girl football players.
4. The aerobic running group had excelled than anaerobic running group.
5. The control group had not shown any significant improvement on cardio vascular endurance.

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