EFFECTS OF DIFFERENT TRAINING MODALITIES ON AEROBIC AND ANAEROBIC CAPACITY OF SOCCER PLAYERS

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ABSTRACT

The purpose of present study was to investigate the effect of different training modalities on aerobic and anaerobic capacity of male soccer players. Sixty male football players between the age of 16 – 20 year of age from Jabalpur, Chinndwara and Tikamgarh (M.P.) those who regularly participate in training and inter district competitions, were selected for the present study. Random group design was used to evaluate the effect of different training modalities. The selected subjects (N=60) were randomly divided into three groups with subjects in each group out of which experimental group-I underwent the plyometeric training. Experimental group II underwent specific training thrice in a week along with two days match practice. Group-III (control group) participated in their regular game for 12 weeks the 80 minutes to 90 minutes training was devoted towards warming up and stretching. The pre and post tests were administered to the subjects at the play grounds and tracks. Before administering the tests the subjects were given proper warming up under the supervision of the research scholar. Aerobic Capacity and Anaerobic Capacity were identified for the present study. Anaerobic capacity: Margeria Kalamen power test. Anaerobic capacity was estimated by using the formula. Power watts = (M x D) x 9.8/t. Aerobic capacity: Estimated using cooper 12 min run/walk test and VO_2 Max was determined by the formula VO_2 Max = 22.351 x distance covered in km – 11.288. Unit of measurement is (ml per kg per min). In order to compare the effectiveness of different training modalities, means, standard deviations and one way Analysis of Co-Variance (ANCOVA) was computed. . In case of significant F-ratios, the Least Significant Difference (L.S.D) Test of Post hoc Comparison was used to find out the specific group differences. The level of significance was set at 0.05 level of confidence. The results of study revealed that the twelve weeks systematic training programme consisting of plyometric exercises had contribute effect on anaerobic capacity of football players. But the plyometric exercises did not have any significant effect for improving the aerobic capacity of football players.

Keywords: Anaerobic capacity, Aerobic capacity, Plyomtric exercises, male soccer players.

1. INTRODUCTION:

Football refers to a number of games that involve, to varying degrees, feints, kicking a ball with the foot to score a goal, in general it is known as just "football" or "soccer". The word football applies to whichever form of football is the most popular in the regional context in which the word appears, including association football, as well as American football, Australian rules football, Canadian football, Gaelic football, rugby league, rugby union, and other related games. These variations of football are known as football codes.

All different forms of football can be identified in history, often as popular peasant games. Contemporary codes of football can be traced back to the codification of these games at English public schools in the eighteenth and nineteenth century. The influence and power of the British Empire allowed these rules of football to spread to areas of British influence outside of the directly controlled Empire, though by the end of the nineteenth century, distinct regional codes were already developing: Gaelic Football, for example, deliberately incorporated the rules of local traditional football games in order to maintain their heritage. In 1888, The Football League was founded in England, becoming the first of many professional football competitions. During the twentieth century, the various codes of football became amongst the most popular team sports in the world.

All Football players require running, but the requirements of their running differ from those of distance runners or sprinters. The form of running perform in football is known as broken-pace or varied pace running. Although in a single game Football players cover a lot of distance, the type of running they do is very different from that done by distance runners. Perhaps, much of Football running is

short-distance sprinting. Football players, however, sprint so many times with different intensity for varied distance throughout a game. This creates a unique and seemingly contradictory demand for both anaerobic and aerobic capacity.

Anaerobic capacity is the ability to perform intense activity with little or no rest, for energy to supply , all reaction occurs in the absence of oxygen this condition ultimately result into onset and accumulation of lactic acid, that is responsible for fatigue while performing short duration activity, Aerobic training is not intense enough to have an effect on energy source to produce lactic acid, so all football players need to train specifically to match the intensity of anaerobic work and the demand that it places on the body. Work-rest interval training at medium to high intensity is the exercise mode that most efficiently taxes this system.

Aerobic capacity is the ability to use oxygen during exercise. Aerobic pathways start in the same way that anaerobic pathways do, but for the reason that the intensity of the exercise is low (producing little or no lactic acid). These exercises are performed at 50 to 80 percent of maximum heart rate for 20 to 40 minutes of uninterrupted exercise. Jogging at a moderate pace is an example of aerobic exercise. During a match or in practice session, the recovery periods between sprinting or continuous movement offer time for the player to use aerobic pathways to return oxygen to the energy system. Of course, soccer is not always played at low intensity. Change of speed and stop-and-go action is often explosive and aggressive. But a good aerobic base is the foundation that leads to speed, speed-endurance, and the ability to change speeds repeatedly and enhanced aerobic base also improve ability to recover quickly from the given load. Although the aerobic energy system has low power output, developing a base early in a program increases the work capacity of the body as a unit, improves the working efficiency of the heart and lungs, and prepares the body for higher intensity work without risk of injury, staleness, or rapid fatigue.

Enhanced aerobic endurance in soccer players improved soccer performance by increasing the distance covered, enhancing work intensity, and increasing the number of sprints and involvements with the ball during a match (Helgerud et.al., 2001).

Soccer specific exercise using ball dribbling or small group play may be performed as aerobic interval training. Heart rate monitoring during soccer specific exercise is a valid indicator of actual exercise intensity (Hoff, 2002).

Performing high intensity 4 min intervals dribbling a soccer ball around a specially designed track together with regular soccer training is effective for improving the VO2max of soccer players, with no negative interference effects on strength, jumping ability, and sprinting performance (McMillan et.al. 2005).

The aerobic system plays a significant role in the maintenance of intensity level during a soccer game, which is characterized by short bursts of activities. Anaerobic performance of repeated brief efforts imposes different physiological stress than a single prolonged activity and, thus, may reflect different physiological capabilities (Meckel et.al. 2009).

Explosive power presented a new dimension of anaerobic power, i.e., how fast maximal energy for power development can be obtained, and its values are high in all sports activities that demand explosiveness and fast maximal energy production. The influence of anaerobic capacity in different sports was observed among elite male athletes. (Popadic et.al. 2009).

Enhanced aerobic endurance in soccer players improved soccer performance by increasing the distance covered, enhancing work intensity, and increasing the number of sprints and involvements with the ball during a match. But no changes were found in maximal vertical jumping height, strength, speed, kicking velocity, kicking precision, or quality of passes after the training period (Helgerud et.al. 2001).

Soccer specific exercise using ball dribbling or small group play may be performed as aerobic interval training. Heart rate monitoring during soccer specific exercise is a valid indicator of actual exercise intensity (Hoff, 2002).

The VO2max of adult players was similar to that of the youth players when expressed in direct proportion to body mass. Conversely, compared with seniors, youth players had higher energy cost of running compared with the youth soccer players, VO2max in the seniors was underestimated and running economy overestimated (Chamari et.al. 2005)

The induced changes in the training program made it more anaerobic in nature and led to a dissociation between aerobic and anaerobic capacity in ice-hockey players. Such a training intervention caused an increase of P max and Wtot. with a parallel decrease in VO2max (Urszula Szmatlan et.al. 2006).

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Tollison (2006) expressed that there were significant improvements in aerobic fitness and match performance in soccer players, especially in response to the first 4 weeks of pre-season training. However, no significant differences between specific and generic aerobic interval training were found in any of the measured variables including soccer specific tests. The results of this study showed that both small-sided games and running are equally effective modes of aerobic interval training in junior soccer players.

The purpose of the study was to assess the Comparative effect of different training modalities on aerobic and anaerobic capacity of football players.

2. METHODOLOGY

Selection of Subject

The subjects for present study were 60 male football players between the age of 16 – 20 year of age from Jabalpur, Chinndwara and Tikamgarh (M.P.) those who regularly participate in training and represented their districts in inter district competitions. All the subjects were randomly assigned to three groups (N=20), out of which two group were experimental and one group served as a control group. For all three groups training was imparted thrice in a week with two days of regular game and control group participated in regular game for five days in a week.

Selection Of Variables

The performance of football players is concerned with capacity to work aerobically and anaerobically. So, based on review of available literature, the current research in the area and the feasibility criteria the Aerobic Capacity and Anaerobic Capacity were identified for the present study.

Criterion Measures

Anaerobic capacity: Margeria Kalamen power test. Anaerobic capacity was estimated by using the formula. Power watts = (M x D) x 9.8/t. Aerobic capacity: Estimated using cooper 12 min run/walk test and VO_2 Max was determined by the formula VO_2 Max = 22.351 x distance covered in km – 11.288. Unit of measurement is (ml per kg per min).

Experimental Design

Random group design was used to evaluate the effect of different training modalities. The selected subjects (N=60) were randomly divided into three groups with subjects in each group out of which experimental group-I underwent the plyometeric training. Experimental group II underwent specific training thrice in a week along with two days match practice. Group-III (control group) participated in their regular game for 12 weeks the 80 minutes to 90 minutes training was devoted towards warming up and stretching. The pre and post tests were administered to the subjects at the play grounds and tracks of DSO Chhindwara, Deptt. Physical Education, R.D.V.V., Jabalpur of before the starting of and DSO Tikamgarh at the end of experiment. Before administering the tests the subjects were given proper warming up under the supervision of the research scholar.

3. RESULTS

Descriptive statistics (mean & standard deviation), were computed for pre test and post test date for all the selected variables and data has been presented in table no. 1 The data obtained on pre-test and post-test on respective skill were analyzed using Analysis of Co-Variance and data have been presented in table 2 to 4 and depicted in figures 1 to 4

Table 1. Descriptive Statistics of Pre and Post Test Scores on Selected Variables of Football Players.

S.N0.	Variable	Test	Mean	SD
1.	Aerobic Capacity	Pre	38.05	7.08
		post	39.5	6.91
2.	Anaerobic Capacity	Pre	8.99	232.36
		post	9.39	275.55

The pre-test and post-test data of the experimental group and the control were analyzed using analysis of co-variance-as the subject of the experimental and control groups were selected at random and were not equated with reference to the parameters examined, therefore the difference between the initial means of the groups at the pre-test level had to be taken on to account during analysis of post-test difference between the means. The final means were adjusted for the difference in initial means and adjusted means were tested for significance of difference.

The obtained data on Aerobic Capacity Cooper 12 min Run/Walk Test for two experimental and one control group were analyzed using analysis of co-variance and data has been presented on table 2.

Table 2. Analysis of Co-Variance for Experimental Group and Control Group on Aerobic Capacity VO2 Max (mg/kg/min)

Means	Plyometric Group	Specific Training Group	Control Group	Source of Variance	Sum of Squares	df	Means Sum of Squares	F
Pre Means	39.19	34.75	40.20	Between Groups	336.23	2	168.11	3.66*
				Within Group	2618.80	57	43.94	
Post Means	40.29	36.20	42.01	Between Groups	356.21			4.13*
				Within Group	2456.96	57	43.10	
Adjusted Means	39.49	38.50	40.52	Between Groups	36.66	2	18.33	0.86**
				Within Group	1187.15	56	21.20	

*** Significant at 0.05 level** **** insignificant at .05 level.**

F 0.05 (2,57) = 3.15

The data on aerobic capacity in table 14 indicated significant pre mean and post mean difference among different groups as the F-ratio of 3.66 and 4.13 were higher than the tabulated F-ratio to be significant (3.15) at 0.5 level with (2,27)df. The data on adjusted final mean scores indicated insignificant difference among groups as the obtained F-ratio (0.56) was much less than the required F value to be significant. The data has been depicted in figures 1 and 2.

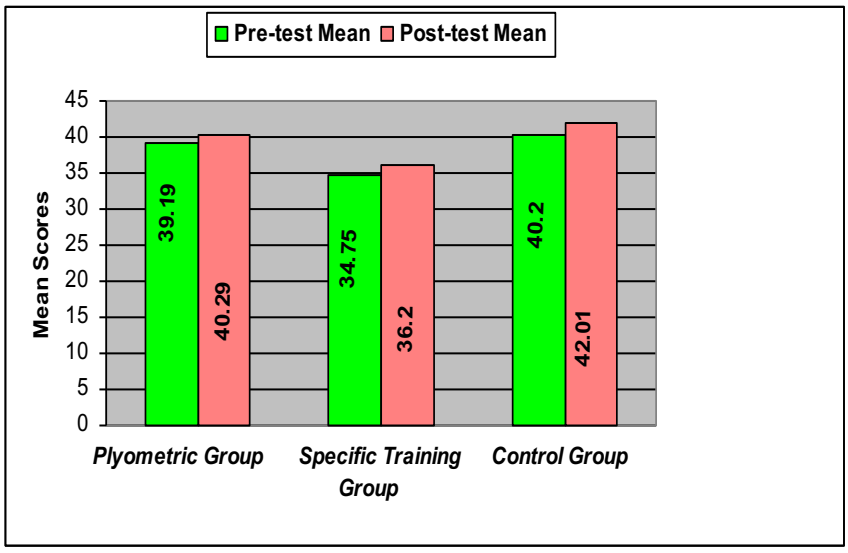

Figure 1:- Pre and Post Test Mean for Experimental Group and Control Group on Aerobic Capacity

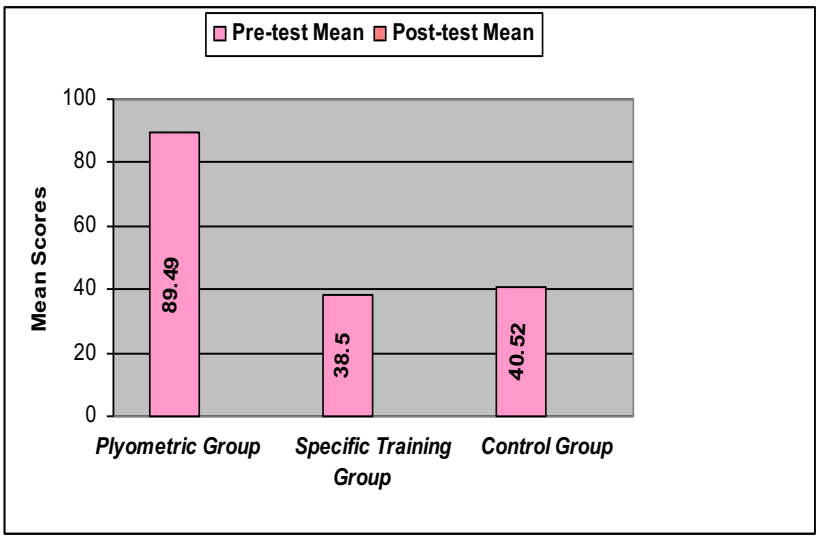

Figure 2: Adjusted Mean for Experimental Group and Control Group on Aerobic Capacity.

The obtained data on Anaerobic Capacity by Margeria Kalamen Anaerobic Power Test for two experimental and one control group were analyzed using Analysis of Co-variance and data has been presented on table 3.

Table 3. Analysis of Co-Variance for Experimental Group and Control Group on Anaerobic Capacity

Means	Plyometric Group	Specific Training Group	Control Group	Source of Variance	Sum of Squares	d.f.	Means Sum of Squares	F
Pre Means	1091.32	784.70	820.27	Between Groups	1124787.85	2	562493.92	15.56*
				Within Group	2060996.52	57	36149.06	
Post Means	1167.87	810.50	839.56	Between Groups	1575663.31	2	787831.66	15.42*
				Within Group	2903674.23	57	50940.78	
Adjusted Means	1070.32	868.29	878.33	Between Groups	334433.60	2	167216.80	3.94*
				Within Group	2374732.44	56	42405.94	

*** Significant at .05 level F .05 (2,57)=3.15**

Data in Table 15 on Anaerobic capacity of experimental and control groups indicated significant difference among the groups on pre means (F=15.56) post mean (F=15.42) and also on final adjusted mean scores (F=3.94) of different groups, as the obtained F-ratios were much higher than the F-value required to be significant at .05 level and data has been depicted in figures 3 and 4.

As the F-ratio of final adjusted means of different groups was statistically significant the least Significant Test of Post-hoc Analysis was computed to find out the significance of difference between adjusted paired means of different groups and the data has been presented in the table 4.

Table 4. Significance of Difference between Adjusted Paired Final Means of Different Experimental and Control Groups on Anaerobic Capacity.

Groups			MD	CD
Plyometric Training Group	Specific Training Group	Control Group		
1070.32	868.29	-	202.03*	-
-	868.29	878.33	10.04	130.240
1070.32	-	878.33	191.99*	-

*** Statistically Significant**

The data on post-hoc analysis in table 16 indicated significant difference in Anaerobic capacity between plyometric group and specific group (202.03) and between plyometric group and control group (191.99) as the mean difference were higher than the critical difference of 130.24 to be significant at 0.05 level. The mean difference between specific training group and control group (10.04) was statistically insignificant.

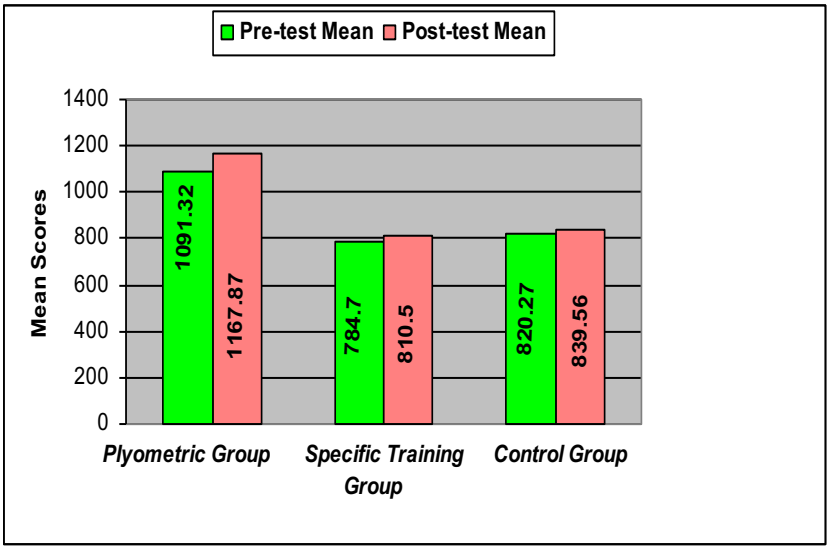

Figure 3:- Pre and Post Test Mean for Experimental Group and Control Group on Anaerobic Capacity.

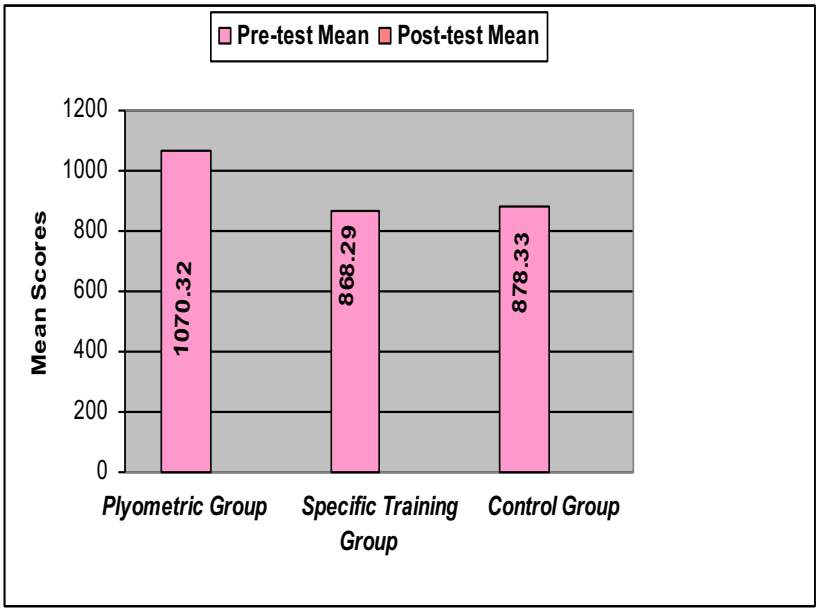

Figure 4: Adjusted Mean for Experimental Group and Control Group on Anaerobic Capacity.

4. DISCUSSION

The purpose of present investigation was to assess the relative contribution of plyometric training and specific competitive exercises programme on aerobic and anaerobic capacity of football players. None of the training modality had significant effect in improving the aerobic capacity of football players. Plyometeric training was more effective than specific competition exercise training in improving the anaerobic capacity of football players.

Finally the different training modalities used in the study did insignificantly improve the short endurance and long endurance performance of football players. The higher mean scores of control group which was playing (Practicing) its regular game may be attributed to the specificity principle having a strong hold with in soccer training and physiological adaptation in soccer.

5. CONCLUSIONS

1.Twelve weeks of planned and systematic training programme consisting of plyometric exercises had contribute effect on anaerobic capacity of football players.

2.The plyometric exercises or football specific competitive exercises used in the study were not significant effective for improving the aerobic capacity of football players.

3.The plyometric exercise did improve the acceleration ability but the improvement is statistically insignificant

6. FUTURE RESEARCH DIRECTIONS

In future, research should focus on plyometric training combined with regular soccer training for significantly improve explosive strength and the improvement can be transferred to soccer performance .Further research on effect of power endurance training, football specific high intermittent high intensity exercise program in football players is needed.

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