

Effect of HIIT and Set Training Programmes on Aerobic Capacity of Football Players

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Abstract: *The aim of the study was to find out the effect of HIIT and SET training programmes on aerobic capacity of football players. For the purpose of study seventy five male district level football players, aged between 18-25 years, were randomly selected from Birbhum, WB. Among them twenty five were randomly selected for high intensity interval training (HIIT) group, twenty five were randomly selected for speed endurance training (SET) group and twenty five were selected as active control group (AC). Aerobic capacity was considered as the variable for the study. The pre test data from all the three different groups were collected before start of the experiment. Then the HIIT and SET programme were applied to the respective groups (HIIT and SET) for three alternate days per week for 8 weeks Programme were applied to the experimental group. For determining the effect of the HIIT training and SET training, descriptive statistics, ANCOVA and LSD post-hoc test were used for the analysis of the data. On the basis of the result it is concluded that the both the high intensity interval training and speed endurance training programmes improve aerobic capacity of the football players.*

Key Words: *HIIT training, SET training, aerobic capacity, Football Player.*

1. INTRODUCTION:

Every country is now trying to show their Excellency in every field. In this regard Sports performance is a prestigious issue in the world. Every developed and developing country is trying to achieve highest performance level in sports at anyhow. Track and Field, Football, cricket, Basketball, Tennis, Badminton etc are the games which are generally played throughout the world. Day by day performance in these games and sports are getting tougher and improvement is also going on simultaneously. For that research played a major role. Research is going on in every aspect like development of means and methods of training, development of new technologies, development of new training equipments etc which directly or indirectly help to achieve the highest level of sports performance of the sports person or a team according to his or her optimum capacity. Many new training means and methods are introduced by many sports scientists day by day. Football is a ball game played on a larger and rectangular grass or simulated turf field with eleven players on both side, with a goal at each of the ends. The aim of the game is to score by man covering the ball into the opponent goal. In general play, the goalkeeper is the only person allowed to apply their hands or arms to drive the ball; the rest of the team members usually use their feet to kick the ball into location, occasionally using their torso or head to seize a ball in mid air. The team that scores the most goals by the end of the match will be the winner of the game. If the score is tied at the end of the game, either a draw is declared or the game will be played into extra time and/ or a penalty shootout, depending on the format of the competition. It is one of the most fashionable sports in the world and is played by men and women, children and adults with different levels of capability. Football performance depends upon a variety of important factors such as technical/biomechanical, tactical, mental and physiological areas. A football players run fats to get the ball or score, dodge defenders to score or pass, jump for heading or receiving the ball etc they do throughout the game for 90 minutes or even more. As the game is played for long time (ninety minutes or more) the aerobic capacity plays a major role in giving best performance throughout the game time. Beside the aerobic capacity a football player needs other important physical fitness components like speed, agility, explosive strength, coordination, and kinaesthetic ability etc to exhibit the best performance.

At present India is also trying to achieve the best performance in the SAF games, Asian Championship etc tournaments by developing their performance. Currently Indian Football team got 101 position (14th June 2019) from 173 position (March 2015) in FIFA World ranking. Indian football team got excellent achievement in all the areas which directly or indirectly help to enhance the sports performance. Area like physical fitness, psychological fitness, technical and tactical aspects etc were developed now a days in Indian football team but to achieve the highest level of performance in the world best football teams like Brazil, Argentina, France, Spain, Germany, England, Uruguay etc Indian team management including the government of India has to think about the development of football performance by developing various sports schemes, preventing corruption in the sports field etc. Various training means and methods have developed to enhance sports performance. Continuous method, Repetition method, Interval method, Circuit training method etc have has been invented for the development of sports performance. High Intensity trainings like

high intensity interval training (HIIT), speed endurance training (SET) etc are now a day's very burning training methods for enhancing the performance in sports field. These are the training methods which are performed in high intensity that ultimately enhance the performance of the sports person.

2. AIM OF THE STUDY:

The aim of the study was to find out the effect of HIIT and SET training programmes on aerobic capacity of football players.

3. REVIEW OF RELATED LITERATURE:

Sökmen, B et. al. (2018) Worked on the effects of sprint interval training with active recovery vs. endurance training on aerobic and anaerobic power, muscular strength, and sprint ability. The study compared sprint interval training with active recovery (SITAR) to moderate-intensity endurance training (ET) in aerobic and anaerobic power, muscular strength, and sprint time results. Forty-two recreationally active adults were randomly assigned to a SITAR or ET group. Both groups trained 3× per week for 10 weeks at 75% of VO₂max for 30 minutes weeks 1-4, with duration increasing to 35 minutes weeks 5-7 and 40 minutes weeks 8-10. While ET ran on a 400-m track without rest for the full training session, SITAR sprinted until the 200-m mark and recovered with fast walking or light jogging the second 200 m to the finish line in 3× original sprint time. Maximal oxygen consumption (VO₂max), anaerobic treadmill run to exhaustion at 12.5 km·h at 20% incline, isokinetic leg extension and flexion strength at 60 and 300°·s, and 50 m sprint time were determined before and after training. Results showed a significant improvement ($p \leq 0.05$) in absolute and relative VO₂max, anaerobic treadmill run, and sprint time in both groups. Only SITAR showed significant improvements in isokinetic leg extension and flexion at 300°·s and decreases in body mass ($p \leq 0.05$). SITAR also showed significantly greater improvement ($p \leq 0.05$) over ET in anaerobic treadmill run and 50 m sprint time. These data suggest that SITAR is a time-efficient strategy to induce rapid adaptations in VO₂max comparable to ET with added improvements in anaerobic power, isokinetic strength, and sprint time not observed with ET.

Sperlich B et. al. (2018) worked on a study to evaluate the effects of 5 Weeks' High-Intensity Interval Training vs. Volume Training in 14-Year-Old Soccer Players. High-intensity interval training (HIIT) in junior and adult soccer has been shown to improve oxygen uptake (VO₂) and enhance soccer performance. The main purpose of this study was to examine the short term effects of a 5-week HIIT vs. high-volume training (HVT) program in 14-year-old soccer players regarding the effects on VO₂max and 1,000-m time and on sprinting and jumping performance. In a 5-week period, 19 male soccer players with a mean (SD) age of 13.5 ± 0.4 years performed HIIT at close to ~90% of maximal heart rate. The HVT intensity was set at 60-75% of maximal heart rate. VO₂max increased significantly (7.0%) from pre to post in HIIT but not after HVT. To decreased significantly after HIIT (~10 vs. ~5 seconds in HVT). Sprint performance increased significantly in both groups from pre to post testing without any changes in jumping performance.

Arazi H et. al. (2017) did a study to compare the effects of two types of high-intensity interval training (HIIT) programs on aerobic and anaerobic capacity of female soccer players. Regional-level female athletes were randomly divided into heart rate-based HIIT ($n = 8$; age 23.4 ± 1.1 year) and speed-based HIIT groups ($n = 8$; age 23.4 ± 1.3 year). Athletes trained three days per week for six weeks. Before and after training, each athlete's performance was assessed directly through the Hoff test, 30-15 Intermittent Fitness Test (VIPT), and repeated-sprint ability test (RAST); maximal oxygen consumption (VO₂max), power and fatigue were estimated indirectly. Both experimental groups improved power, fatigue index and VO₂max after training ($p < 0.05$). It was noteworthy that the speed-based group had greater gains in minimal power (effect size (ES): 3.99 vs. 0.75), average power (ES: 2.23 vs. 0.33), and fatigue index (ES: 2.53 vs. 0.17) compared to heart rate-based group ($p < 0.05$). In conclusion, both heart rate-based and speed-based HIIT induced meaningful improvements in power, VO₂max, and fatigue index in female soccer players, although the speed-based HIIT group achieved greater gains in power and fatigue index compared to the heart rate-based group.

4. METHODS

4.1. Selection of the Subject: For the purpose of study seventy five male district level football players, aged between 18-25 years, were randomly selected from Birbhum, WB. Among them twenty five were randomly selected for high intensity interval training (HIIT) group, twenty five were randomly selected for speed endurance training (SET) group and twenty five were selected as active control group (AC).

4.2. Variable-Test and Criterion Measure: Aerobic capacity was considered as the variable for the study. It was tested by using queens college step test. The data was recorded in ml/kg/min.

4.3. Design of the Study: Simple randomized group design method was used for the study. The pre test data from all the three different groups were collected before start of the experiment. Then the HIIT and SET programme were applied to the respective groups (HIIT group and SET group) for three alternate days per week for eight weeks Programme were applied to the experimental group three alternate days per week for 8 weeks. The active control group was not given

any treatment during those 8 weeks rather they engaged themselves in regular normal practice. There after the post test data from all the three groups were collected.

4.4. Statistical Analyses:

For determining the effect of the HIIT training and SET training, descriptive statistics, ANCOVA and LSD post-hoc test were used for the analysis of the data.

5. RESULT:

The findings pertaining to the study are presented in table-1, 2 and 3 and Graph-1.

The statistical analysis of data of the three groups i.e. High intensity interval training group (HIIT), Speed Endurance Training group (SET), and the active control group (AC) on aerobic capacity of football player for pre and post test have been presented in table No 1 to 2. The illustrations are also graphically represented in Figure 1.

Table 1: Descriptive Statistics of Aerobic Capacity of the Selected Three Groups

Treatment Group	Groups	Minimum Value (ml/kg/min)	Maximum Value (ml/kg/min)	Mean (ml/kg/min)	Std. Error	Std. Deviation
HIIT	Pre-Test	40.77	52.53	46.48	0.71	3.56
	Post-Test	45.81	62.61	52.80	1.05	5.24
SET	Pre-Test	37.41	55.89	44.26	0.86	4.31
	Post-Test	44.13	65.97	52.26	1.05	5.24
AC	Pre-Test	37.41	57.57	48.23	1.02	5.09
	Post-Test	42.45	62.61	52.19	1.16	5.78

Table 1 describes the mean (M), standard deviation (SD), Maximum value (Max.) and Minimum Value (Min.) scores of subjects on VO_{2max}. In the pre test phase, the mean of HIIT group, SET group and AC group were 46.48 ml/kg/min, 44.26 ml/kg/min and 48.23 ml/kg/min respectively. The post test mean of HIIT group, SET group and AC group were 52.80 ml/kg/min, 52.26 ml/kg/min and 52.19 ml/kg/min respectively. The standard deviation for pre-test phase of HIIT group, SET group and AC group were 3.56, 4.31 and 5.09 respectively. The post test standard deviation for HIIT group, SET group and AC group were 5.24, 5.24 and 5.78. The maximum value for HIIT group in pre test phase was 52.53 ml/kg/min whereas the minimum value was 40.77 ml/kg/min. For the SET group the maximum value in pre test was 55.89 ml/kg/min where as the minimum value was 37.41 ml/kg/min. The maximum value for AC group in pre test phase was 57.57 ml/kg/min where as the minimum value was 37.41 ml/kg/min. In the post test phase for HIIT group the maximum value was 62.61 ml/kg/min and the minimum value was 45.81 ml/kg/min, for SET group the maximum value was 65.97 ml/kg/min and the minimum value was 44.13 ml/kg/min, and for the AC group the maximum value was 62.61 ml/kg/min and the minimum value was 42.45 ml/kg/min.

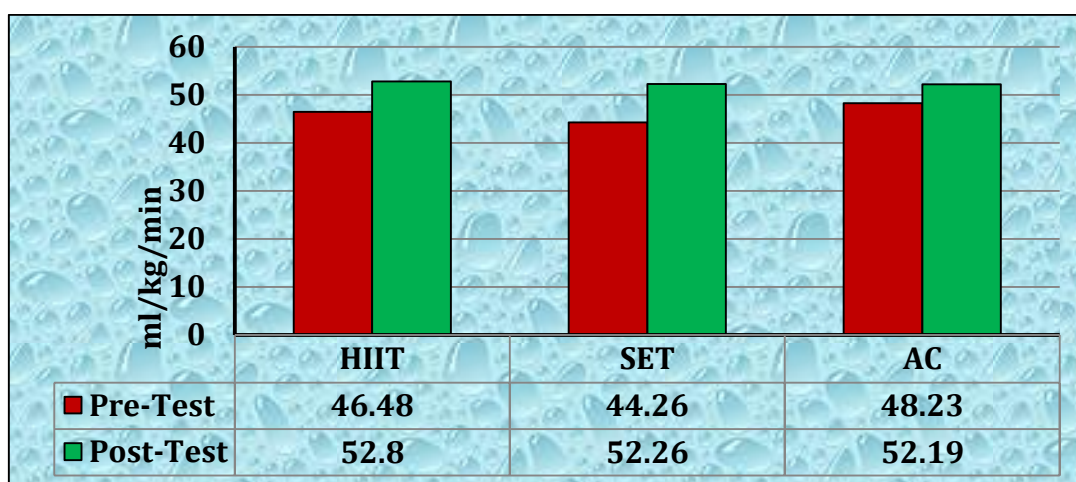


Figure 1: Graphical Representation of Pre-Test & Post-Test Mean for Distinct Treatment Groups on VO_{2max}

Table 1.1: ANCOVA for Distinct Groups on Aerobic Capacity for Pre-Test and Post-Test Data

Source	df	Sum of Squares	Mean Square	F-value
Treatment Group	2	151.224	75.612	5.510*

Error	71	974.396	13.724	
Total	73	1125.620		
Table value of F (2,71) = 3.13 *. Significant at the .05 level				

Table 1.1 reveals the significant improvement on aerobic capacity (F=5.51) among the experimental groups i.e. HIIT Group, SET group and Active Control Group.

HIIT	SET	AC	Mean Difference	Critical Difference
52.66	54.14		1.48	2.089
52.66		50.45	2.21*	
	54.14	50.45	3.69*	
*. The mean difference is significant at the .05 level				

Table 1.2 expresses the pair wise comparison of the selected three groups on aerobic capacity. The mean difference of high intensity interval training group (HIIT) was 2.21 and the mean difference of speed endurance training group (SET) was 3.69 in comparison to the active control group (CD=2.089). This reveals that both the experimental groups were significantly better than the AC group but the mean difference between the experimental groups was 1.48 which was not significant.

6. DISCUSSION:

The result of the study revealed that the eight weeks High Intensity Interval Training (HIIT) and Speed Endurance Training (SET) significantly improve the VO₂max of Football players. The result may be due to the effect of high intensity training programmes both HIIT and SET training programmes for 45-60 minutes per unit for three alternate days for eight weeks. The result of the study is supported by the study of **Arazi H et. al. (2017)** did a study to compare the effects of two types of high-intensity interval training (HIIT) programs on aerobic and anaerobic capacity of female soccer players. Regional-level female athletes were randomly divided into heart rate-based HIIT ($n = 8$; age 23.4 ± 1.1 year) and speed-based HIIT groups ($n = 8$; age 23.4 ± 1.3 year). Athletes trained three days per week for six weeks. Before and after training, each athlete's performance was assessed directly through the Hoff test, 30-15 Intermittent Fitness Test (VIPT), and repeated-sprint ability test (RAST); maximal oxygen consumption (VO₂max), power and fatigue were estimated indirectly. Both experimental groups improved power, fatigue index and VO₂max after training ($p < 0.05$). It was noteworthy that the speed-based group had greater gains in minimal power (effect size (ES): 3.99 vs. 0.75), average power (ES: 2.23 vs. 0.33), and fatigue index (ES: 2.53 vs. 0.17) compared to heart rate-based group ($p < 0.05$). In conclusion, both heart rate-based and speed-based HIIT induced meaningful improvements in power, aerobic capacity and fatigue index in female soccer players, although the speed-based HIIT group achieved greater gains in power and fatigue index compared to the heart rate-based group.

7. CONCLUSION:

On the basis of the result it is concluded that the both the high intensity interval training and speed endurance training programmes improve aerobic capacity of the football players.

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