IOSR Journal of Sports and Physical Education (IOSR-JSPE)
e-ISSN: 2347-6737, p-ISSN: 2347-6745, Volume 8, Issue 6, (Nov. – Dec. 2021), PP 01-04
www.iosrjournals.org

Comparison of Cardiovascular Endurance Among Players from Different Sports

Dr. Manoj Kumar Jadiya MPT, PhD*[1], Dr. Manoj Kumar Mathur, MPT[2] ,
Dr. Anuja Chaudhary MPT, PhD*[3].

1. *Assistant professor, Maharaj Vinayak Global University, Jaipur Rajasthan.*
2. *Assistant professor, Maharaj Vinayak Global University, Jaipur Rajasthan.*
3. *Assistant professor, Maharaj Vinayak Global University, Jaipur Rajasthan.*

Abstract:
Background and Introduction: *The sports like football kabaddi and running are endurance sports. The performance of the players depends upon their cardiovascular endurance. Which involves the circulatory and respiratory systems and their function in sustaining total physical activity over long period of time. It refers to the ability of the circulatory system to provide oxygen to body cells to support the oxidative energy schemes of the body and to remove waste products of metabolism. The main objective of cardiovascular endurance training is to improve the circulation to the working muscles. Assessment of cv endurance is possible to perform with direct measuring of maximum oxygen uptake in laboratory tests on maximal physical effect. This study measures and compares the cardiovascular endurance in football players, kabaddi players and runners.* ***Methodology:*** *This cross sectional and comparative study included sample of 90 male players (18 to 25 years, interstate level players) in which 30 players from each game namely, football, kabaddi and runners were taken by random sampling method. The participants underwent Harvard step test and their fitness index was calculated. The data was collected and analysed by one-way ANOVA and post hoc bonferroni.* ***Results:*** *The results of the one-way ANOVA gives the f value 4.56 which is more than F table showing significant values with p<- .05. Post hoc bonferroni also gives significant mean difference at 0.05 level. There were significant mean differences between football and kabaddi players (20.06) and non-significance between kabaddi and runners (-10.57) and football and runners (9.49).* ***Conclusion:*** *This study concluded that football players exhibit highest level of cardiovascular endurance followed by runners and kabaddi players exhibit lowest level of cardiovascular endurance. The level of cardiovascular endurance depends on kind of sports.*

Keywords: *cardiovascular endurance, Harward step test, Football, Kabaddi, Runner.*

Date of Submission: 04-12-2021 Date of Acceptance: 18-12-2021

I. Introduction

Cardiovascular endurance involves the circulatory and respiratory systems and their function in sustaining total physical activity over long period of time. This physical activity can be brisk walking, running, swimming, climbing, hiking, aerobics or bicycling.

Cardiovascular endurance refers to the ability of the circulatory system to provide oxygen to body cells to support the oxidative energy schemes of the body and to remove waste products of metabolism. In human body when many muscles work for long period of time, these factors limit the amount of work which can be accomplished. Therefore, the primary objective of cardiovascular endurance training is to improve the circulation to the working muscles (1).

A physically fit heart beats at a lower rate and pumps more blood per week at rest. Regular endurance exercise results in increased capacity to use oxygen, leading to ability for more physical work. Assessing the cardiorespiratory fitness encompasses testing the ability of the respiratory, cardiovascular and skeletal muscle tissue to take in, deliver, and utilize oxygen while performing prolong exercise of moderate to high intensity (2). Physiologically two factors probable interact as aerobic fitness improves firstly Increased vagal tone slows the heart, allowing more time for ventricular filling and Secondary Enlarged ventricular volume and a more powerful myocardium eject a larger volume of blood with systole (3).

There are various tests to measure cardiovascular endurance. Assessment of cardiovascular endurance is possible to perform with direct measuring of maximal oxygen uptake in laboratory tests on maximal physical efforts or indirectly estimated by various sub maximal lab and field tests. Maximal aerobic fitness can be determined by continuous to exhaustion, intermittent tests, and walking/running tests. Sub maximal tests includes cycle tests and step tests.

Physical capacity of athlete is an important element of success in sports achievements. It involves a huge number of different capacities, with cardiovascular endurance being its major component. New regulations and tough competition requires an extraordinary cardiovascular endurance of each athlete on the field (4). Moreover, the sports like football, kabaddi, and running are endurance sports. The performance of the players of these sports depends upon their cardiovascular endurance. So, assessment of cardiovascular endurance is important because it motivates players to further increase their cardiovascular endurance and also for design their training programme. The study was attempt to measure and compare the cardiovascular endurance among players of football, kabaddi, and runners.

II. Methodology:

The study was descriptive, cross sectional and comparative in nature in which 90 male players, from Football, Kabaddi, and Runners (30 players from each) were included. The average age, weight and height were 21.26 ± 1.93, 68.6 ± 7.24 and 1.73 ± 0.04 respectively. The Runners Football players, kabaddi players were selected from Maharaj Vinayak Global University Jaipur. Table1 represents demographic characteristics of the players according to their sports.

Table 1: Demographic characteristics of the players according to sports

Game	Football	Kabaddi	Runners
	Mean ± SD	Mean ± SD	Mean ± SD
Age (Years)	21.06 ± 1.74	21.30 ± 1.82	21.43 ± 2.23
Weight (Kg)	64.10 ± 6.55	74.83 ± 10.31	66.80 ± 4.96
Height (Meter)	1.72 ± 0.04	1.74 ± 0.04	1.73 ± 0.04

After selecting the subjects based on selection criteria, the procedure of the test was explained and inform consent was taken. 5 minutes self-selected warm up session was given to all the participants before commencement of the cardiovascular assessment, which was tested using Harvard step test.

Height of the Harvard step was kept 20 inch as per recommendations. Metronome was set to 120 beats per minute. On the first beat, player was instructed to place one foot on the bench, and on the second sound both feet were fully placed on the bench with the body erect straightening the legs and back. With the third and fourth sound he was asked to step down. The player was instructed to repeat the stepping up and down exercise in the above manner for 5 minutes or until exhaustion at the pace of 30 steps per minute. After player stops, his exercise duration in seconds was noted and the player was asked to stop and sit down. Exactly one minute after the exercise the researcher starts counting the pulse rate and records the same for the duration from 1- 1.5, 2- 2.5, 3- 3.5 minutes. Fitness index was calculated by using the formula:

Fitness index = [duration of exercise in second x 100] / [2 x (sum of three pulse counts after exercise)] (5). Distribution of players on the basis of cardiovascular endurance was done using Borg Scale.

III. Result

The data was analysed with the help of SPSS (version: 20) software. Initially, one-way ANOVA was used to find the comparison of cardiovascular endurance among football players, kabaddi players and runners. Further analysis was done using, post hoc-bonferroni test to find the difference in cardiovascular endurance between these sports. Significant level was set at ≤ 0.05.

The data from Borg scale revealed that maximum number of players had poor fitness condition as shown in Table 2. Maximum number of players following in excellent category of CV endurance were runners followed by football and kabaddi players. Whereas maximum kabaddi players have poor category followed by runners and football players.

Table 2: Distribution of players on the basis of cardiovascular endurance

CV endurance	Football	Kabaddi	Runners	Total
	No.(%)	No.(%)	No.(%)	No.(%)
Excellent	4(13.3%)	2(6.6%)	5(16.6%)	11(12.2%)
Good	7(23.3%)	2(6.6%)	5(16.6%)	14(15.5%)
High Average	7(23.3%)	5(6.6%)	2(6.6%)	14(15.5%)
Low Average	3(10%)	4(6.6%)	2(6.6%)	9(10%)
Poor	9(30%)	17(56.6%)	16(53.3%)	42(46.6%)

The results of the one-way ANOVA give the f value 4.46 which is more tabulated value, showing significant values at the level of p≤ .05 (Table 3). Post hoc bonferroni also gives significant mean difference at 0.05 level. There were significant mean differences between football and kabaddi players (20.06) and non-significance difference between kabaddi players and runners (-10.57) and football players and runners (9.49) (Table 4).

Table 3: One-way ANOVA analysis.

	Sum of squares	Degree of freedom	Mean square	F	Sig.
Between groups	6045.89	2	3022.94	4.460	0.013
Within groups	57669.92	87	662.87		
Total	63715.82	89			

Table 4: Post hoc analysis- Bonferroni

Comparison	Mean difference	Standard error	Significance	95% confidence interval	
				Lower bound	Upper bound
Football vs. kabaddi, runners	20.06 9.49	6.64 6.64	0.010 .471	3.84 -6.73	36.29 25.72
Kabaddi vs football, runners	-20.06 -10.57	6.64 6.64	0.010 .346	-36.29 -26.80	-3.84 5065
Runners vs. football, kabaddi	9.49 10.57	6.64 6.64	.471 .346	-25.72 -5.65	6.73 26.80

IV. Discussion:

Determination of cardiovascular endurance is of special importance as it plays key role in professional sports. Various researches were conducted in the past to assess cardiovascular endurance in athletic as well as non-athletic population. There are many methods to assess cardiovascular endurance Taware et al., (6) used bicycle ergometer where as Castagana et al., used yo-yo intermittent test to assess cardiovascular endurance (7). Current study is conducted using Harvard step test to assess the cardiovascular endurance in players of these three sports. There are many studies which have used Harvard step test in non-athletic population, Amitabh et al., (8) conducted a study to evaluate effect of acclimatization to hot desert and high altitude on physical fitness and body composition of healthy individuals using Harvard step test, in which healthy non athletic individuals in temperate plains had highest mean (97.4) followed by individual in hot desert 92.4 and high altitude (83.8). Shivappa conducted a study on physical fitness index with modified Harvard step test in medical students (9). Gahlawat and Parveen conducted a study to compare physical fitness in rural and urban male collegiate students, in this study, cardiovascular endurance was measured using Harvard step test. Rural students had more mean value of cardiovascular endurance (78.50) as compared to urban students (71.25). similarly, Harvard step test has also been used in studies done in players. Patil et al., (2012) assessed physical fitness index in swimmers and non-swimmers using Harvard step test. Physical fitness index on swimmers was more (100.8) than non-swimmers (10).

Rockwin compared cardiovascular endurance between football and volleyball players and found that football players had higher mean values of VO2 max comparison with volleyball players (11). Similarly, Attri compared cardiovascular endurance between football and hockey player, found that among groups of football and hockey players shows in significant at 0.05 level of confidence but mean value of cardiac efficiency is higher (81.91) in football players then in hockey player (78) (1). Football as representative of sports games, requires an intermittent performance with intertwining the aerobic and anaerobic exercises. The player is thus required to have an efficient energetic system which would support all 90 minute maintain full strength (11).

Thus it can be concluded that Harvard step test is widely used in various research studies. However, level of cardiovascular endurance is highly different from one study to another. One major difficulty with comparing these studies the lack of uniformity in study population, data collection techniques and study designs.

To sum up the results of present study, football players have higher level of cv endurance in comparison with runners and kabaddi players but in comparison to other studies the level of cardiovascular endurance is lower in all the players. Therefore, there is a need to bring awareness about importance of cardiovascular fitness in players and coaches. Role of physical therapist is also important in designing their training strategies to improve their cardiovascular fitness.

V. Conclusion

The study concluded that Harvard step test can be used to assess cardiovascular endurance and the level of cardiovascular endurance depends upon kind of sport. football players exhibit highest level of cardiovascular endurance followed by runners and kabaddi players that exhibit lowest level of cardiovascular endurance. Maximum number of player had poor fitness condition. 61.1%of players follow cardiovascular

exercise. There is need to improve the cardiovascular endurance of the players of all sports. Therefore, appropriate training programs should be designed by the coaches and physical therapists.

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