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Jaspreet Singh
Assistant Professor, Department
of Physiotherapy, RIMT
University, Mandi Gobindgarh,
Punjab, India

Tarh Moni
BPT Student, Department of
Physiotherapy, RIMT
University, Mandi Gobindgarh,
Punjab, India

Jagmeet Kaur
Assistant Professor, Department
of Physiotherapy, RIMT
University, Mandi Gobindgarh,
Punjab, India

Gurbinder Kaur
Assistant Professor, Department
of Physiotherapy, RIMT
University, Mandi Gobindgarh,
Punjab, India

Corresponding Author:
Jaspreet Singh
Assistant Professor, Department
of Physiotherapy, RIMT
University, Mandi Gobindgarh,
Punjab, India

Evaluation of cardiovascular endurance ability among football players and non-football players: A comparative study

Jaspreet Singh, Tarh Moni, Jagmeet Kaur and Gurbinder Kaur

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Abstract

The aim of the study was to explore the cardiovascular endurance ability among football players and non-football players. Total of 60 male students (30 football players and 30 non-football players) between the age group of 18 to 25 are included in the present study. Harvard step test was used as an outcome measure to assess cardiovascular fitness. According to cardiovascular endurance mean and standard deviation scores of football players was 91.74 ± 15.46 and mean and standard deviation scores among non-football players was 86.19 ± 7.79 . According to fitness index scores, it was found that there is more excellent fitness index score among football players (33.33 %) as compared to non-football players (6.66 %). Thus, the present study concludes that there is better cardiovascular endurance ability among football players as compared to non-football players.

Keywords: Cardiovascular endurance, football, Harvard step test, fitness index

1. Introduction

One of the most popular outdoor field sports played in the world is Football ^[1]. Football (soccer) is one of the most complex sports in which players need technical, tactical, and physical skills to achieve a successful performance and eventually win the game ^[2]. Football training is mainly based on endurance ability and movement implementation consisting of moderate activity alternating with sprints of intermittent high intensity ^[3]. Football players need to have well-developed physical fitness which requires high levels of endurance, speed, strength and coordination skills ^[4]. The energy used by football players is mainly produced by aerobic metabolism. So, it is important for players to have well-developed aerobic fitness. Adequate levels of aerobic fitness allows players to maintain repetitive high-intensity actions within a football game which further helps to accelerate the recovery process and to maintain physical condition at an optimum level during the entire game and season ^[5]. VO_2 max refers to highest rate of oxygen consumption attainable during maximal/ exhaustive exercise ^[6]. Anaerobic threshold can be defined as the highest exercise intensity at which the production and clearance of lactate is about the same ^[7]. Both VO_2 max and anaerobic threshold levels can be assessed indirectly through field tests but the most accurate measure is based on laboratory testing on a treadmill.

Maximal rate of oxygen uptake is one of the most commonly measured parameter which is frequently used to indicate the cardio-respiratory fitness of an individual ^[8]. Cardio respiratory fitness is the ability of the body's circulatory and respiratory system which helps in supplying fuel and oxygen during sustained physical activity. The Harvard step test is a method which is used to access cardio respiratory fitness and was developed by Brouha *et al.*, in the Harvard fatigue laboratory ^[9]. Another parameter that helps in measuring cardio respiratory fitness is mean arterial pressure ^[10]. A sub-optimal level of cardio-respiratory fitness is a risk factor for coronary heart disease and other different types of chronic diseases among adults such as colorectal cancer, type II diabetes, depression, and is associated with all-cause mortality ^[11]. According to the World Health Organization, moderate and vigorous physical exercise is recommended to improve health status of any individual ^[12]. Being overweight causes high blood pressure which is another risk factor for inactivity ^[13]. Any person with a high level of physical fitness is less likely to get sick and is more likely to achieve his personal and

professional goals [14].

2. Methodology

2.1 Selection of samples

Population of study included football players and non-football players between the age group of 18 to 25 years. The participants were selected from various departments of RIMT University. Total of 60 male students (30 football players and 30 non-football players) are included in the present study.

2.2 Selection of variable

The Harvard Step test of 20-inch (50.8 cm) high was used to measure cardiovascular endurance ability among subjects.

2.3 Procedure for Data Collection

After a brief explanation, the subjects performed the Harvard step test by stepping up and down on the platform at the rate of 30 steps per minute (per 2 seconds) for 5 minutes or until tired. When subjects were no longer able to maintain a 15-second stepping rate, they were said to be exhausted. Following the completion of the test, the subject instantly sits down, and the total number of heart rates was counted from 1 to 1½ minutes after finishing, and from 2 to 2½ after completion, and then from 3 to 3½ minutes after completion.

Pulse rates of subject were counted by feeling their heart rate on the wrist.

2.4 Scoring

The following equation was used to calculate the fitness index score among subjects.

$$\text{Fitness Index} = (100 \times \text{test duration in seconds}) \div (2 \times \text{sum of heartbeats in the recovery periods}).$$

2.5 Statistical Procedures

The data was collected and entered into Microsoft Excel. After that descriptive statistics was used to explain the subject characteristics. To interpret and statistically analyze the data, the mean and standard deviation was used.

3. Results

Cardiovascular Endurance	Football Players (N=30)	Non-Football Players (N=30)
Mean ± Standard deviation	91.74 ± 15.46	86.19 ± 7.79

Table 1. Shows that there is better cardiovascular endurance value among football players (91.74) as compared non-football players (86.19).

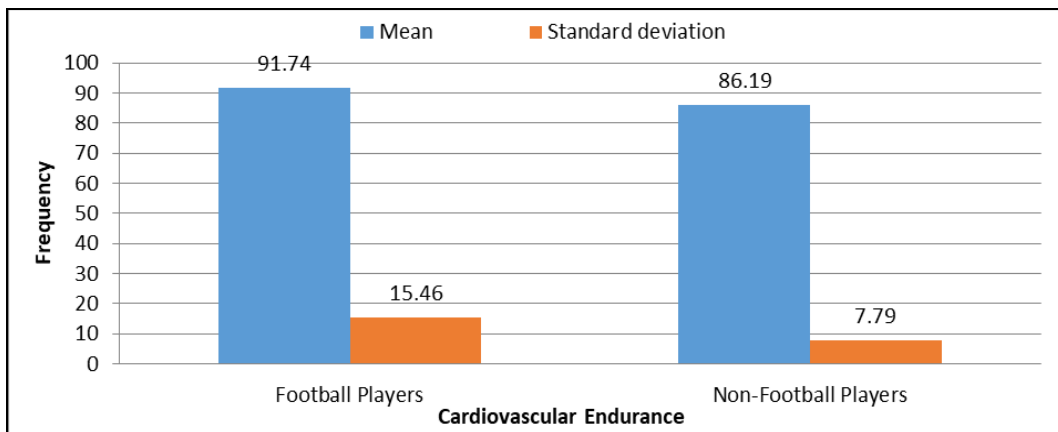


Fig 1: Distribution of subjects according to cardiovascular endurance among football players and non-football players

Table 2: Shows that there is more excellent fitness index score among football players (33.33 %) as compared to non-football players (6.66 %)

Fitness Index	Football Players (N=30)	Non-Football Players (N=30)
> 96 (Excellent)	(10) 33.33 %	(2) 6.66 %
83-96 (Good)	(9) 30%	(17) 56.66 %
68-82 (Average)	(11) 36.66 %	(11) 36.66 %
54-67 (Low Average)	0 %	0 %
< 54 (Poor)	0 %	0 %

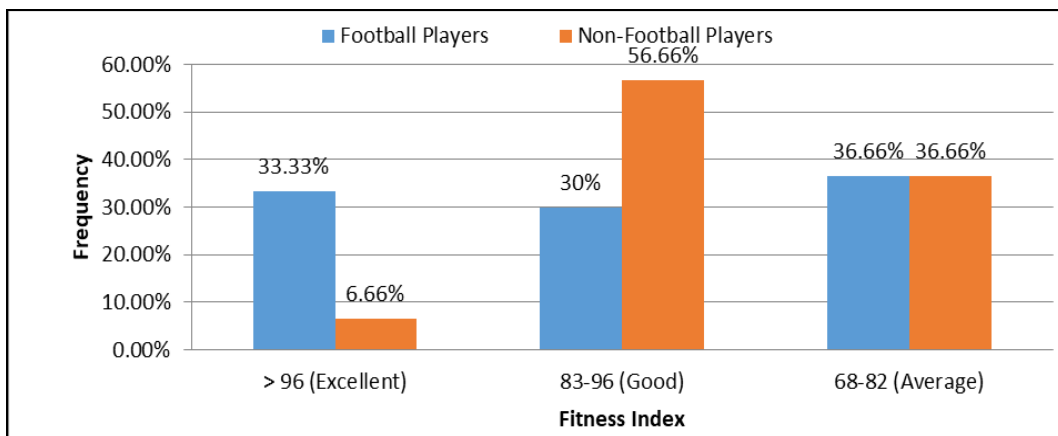


Fig 2: Distribution of subjects according to Fitness Index among football players and non-football players

4. Discussion

Total 30 football players with mean age group of 21.93 ± 1.83 and 30 non-football players with mean age group of 20.23 ± 1.94 were included in the study. According to height of subjects, the mean height of football players was 5 feet. 61 inches ± 0.27 and mean height of non-football players was 5 feet. 67 inches ± 0.18 . According to weight of subjects, the mean weight of football players was $63.26 \text{ kg} \pm 8.96$ and mean weight of non-football players was $67.96 \text{ kg} \pm 8.33$. According to BMI of subjects, it was observed that non-football players (26.66 %) are more overweight as compared to football players (20 %). According to total years of football practice by football players, it was found that most of the football players (40 %) were playing football from last 4-6 years. According to total hours of football practice per week, it was observed that (43.33 %) players spent 5-8 hours, (36.66 %) players spent 9-12 hours, (16.66 %) players spent 13-16 hours and only (3.33 %) players spent 17-20 hours per week while playing football. Dharmesh and Vishwas conducted a study in 2015 of physical fitness index using modified Harvard step test in relation with body mass index in physiotherapy students. This cross-sectional study was done on 105 physiotherapy students and physical fitness index was measured using modified Harvard step test. This study further concluded that physical fitness of Physiotherapy students in Ahmadabad Physiotherapy College is not satisfactory and overweight students are having less physical fitness in comparison to normal BMI students ^[15].

Poor level of cardio-respiratory fitness further leads to poor performance and frequent fatigue among athletes during competitions ^[16]. Cardiovascular endurance ability among football players and non-football players was measured by help of Harvard step test. According to cardiovascular endurance mean and standard deviation scores of football players was 91.74 ± 15.46 and mean and standard deviation scores among non-football players was 86.19 ± 7.79 . Further, it was concluded that there is better cardiovascular endurance value among football players (91.74) as compared to non-football players (86.19). According to fitness index scores, it was found that there is more excellent fitness index score among football players (33.33 %) as compared to non-football players (6.66 %).

5. Conclusion

Following conclusions are drawn from the findings of the current study.

1. This study concludes that there is better cardiovascular endurance value among football players (91.74) as compared to non-football players (86.19).
2. Further it was found that there is more excellent fitness index score among football players (33.33 %) as compared to non-football players (6.66 %).

Thus, the present study concludes that there is better cardiovascular endurance ability among football players as compared to non-football players. According to the World Health Organization, moderate and vigorous physical exercise is recommended to improve the health status of any individual. Obesity causes high blood pressure which is another risk factor for inactivity. However, regular exercise can help prevent hypertension and lower blood pressure and physical fitness can be obtained by doing physical activity. A person with a high level of physical fitness is less likely to get sick and is more likely to achieve his personal and professional goals.

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