International Physiology
Vol. 1 No. 2, July - December 2013

Pulmonary Function Tests in Competitive Cricket Players

Varsha Vijay Akhade*, Muniyappanavar N. S.**

Abstract

Introduction: Increasing evidence suggests that playing competitive cricket produces many health benefits which include endurance, stamina, balance and physical fitness. Even though cricket is one of the oldest organized sports, there are very few studies on the association between playing competitive cricket and pulmonary functions. ***Aims and Objectives***: To study the pulmonary functions in competitive cricket players and to compare the same with matched sedentary control group. ***Materials and Methods***: In this study pulmonary functions such as FVC, FEV_1, FEV_1/FVC, MVV, PEFR parameters were studied in 48 competitive cricket players in the age group of 18- 26 years. These parameters were compared with matched apparently normal healthy sedentary medical students using unpaired t test. ***Results***: In our study significant increase was observed in pulmonary function parameters of competitive cricketers than sedentary controls. Competitive cricketers had higher mean of percentage value of Forced Vital Capacity (FVC) (P=0.0122), Forced expiratory volume in first second (FEV_1) (P=0.0129), Maximum Voluntary Ventilation (MVV) (P=0.0249) and Peak Expiratory Flow Rate (PEFR) (P=0.0119) than controls. However there was no significant difference in FEV_1/FVC ratio (P=0.3404) between the study groups. ***Conclusion***: The current study has shown that, there is significant positive relationship between playing cricket and pulmonary function in healthy young men. The improvement in pulmonary function could be due to increased strength of respiratory muscles.

Keywords: Cricket; FEV1; FVC; PEFR; Pulmonary function.

Introduction

Although cricket has origins in the British Empire, it is followed as a religion in South Asia, probably due to the influence of the former during their rule. The sport is equally popular among all groups of the society, and is not subject to gender or age constraints.

Impaired pulmonary functions are associated with increased mortality and morbidity.[1-3] Physical activity is known to improve physical fitness and to reduce morbidity and mortality from numerous chronic ailments.[4]

Sports encourage healthy lifestyle choices among people belonging to all ages and genders. They exert beneficial effects on bone metabolism, promote cardiovascular and respiratory health and contribute to improvements in motor and cognitive functions. [5-6] Regular physical activity reduces the risk of premature mortality.[7] Substantial evidence exists for the beneficial effects of regular exercise on cardiopulmonary, metabolic and neoplastic disorders.[8-9]

Cricket has been shown, in various studies, to improve stamina and endurance. Most professional cricketers undergo rigorous training periods before they are considered fit to play.[10] The training exercises that form part of the normal conditioning of these individuals help them attain endurance levels comparable to those of players from other, more intense sports.

Author's Affiliations: *Associate Professor, **Assistant Professor, Department of Physiology, Bidar Institute of Medical Sciences, Bidar, Udgir Road, Bidar - 585401, Karnataka, India.

Corresponding Author: Dr. Muniyappanavar N. S., Assistant Professor, Department of Physiology, Bidar Institute of Medical Sciences, Bidar, Udgir Road, Bidar - 585401, Karnataka, India.

E-mail: drmunins@gmail.com

Cricket game has an impression it is a relatively undemanding sport. However, cricket is a physically demanding sport and that one-day cricket is a far consuming format, which requires the players to be athletic.[11]

The study conducted by A.K. Ghosh *et al,* on sportsmen playing different games including cricket showed significant increase in pulmonary functions.[12] There are several studies that have shown significant improvement in pulmonary functions as a result of the effect of exercise.[13-14] However, there are studies which show non -significant change in pulmonary functions in athletes.[15-17] Sedentary life styles could be associated with less efficient pulmonary functions and regular competitive cricket practice could produce a positive effect on the lungs by increasing pulmonary capacity and thereby improving the lung functioning.

Even though cricket is one of the oldest organized sports, there are very few studies on pulmonary functions of cricketers. The present study was therefore designed to study whether playing competitive cricket has any effect on pulmonary function. In this study, we have compared pulmonary functions of healthy cricketers and those with matched sedentary medical students. This is a cross sectional study of competitive cricket players who were playing competitive cricket for different periods of time.

Materials and Methods

This study was conducted in the department of physiology, Dr V M Medical College, Solapur, after obtaining the institutional ethical clearance. The present study included 48 male competitive cricket players, aged between 18-26 years, who were residents of Solapur district and were practicing cricket at Park Stadium and other cricket grounds at Solapur, for about 2-4 hours per day for at least 5 days in a week regularly since 3-6 years. A similar number of age, sex, height and weight matched medical students not directly involved in any kind of sports activity selected as controls. The informed consent was taken after the detailed procedure and purpose of the study was explained.

Those with history of chronic respiratory disorders, cardiovascular disorders, systemic diseases affecting respiratory system, alcoholics and smokers were excluded from the study. A thorough history taking & clinical examination was carried out to rule out the exclusion criteria and the vital data was recorded. Standing Height was measured without foot wear with subjects back in contact with the wall and with both heels together and touching the base of the wall. Weight was recorded with light clothing using a digital weighing machine. Both the height and weight were measured to the nearest 0.1cm and 0.5 kg respectively.

Spirometry was done on both competitive cricket players and control groups with Medspiror a portable, computerized pneumotachometer (Manufactured by Medsystems Pvt. Ltd. Chandigarh). The recordings were carried out at an average temperature of 28 degree C between 9am-11am. All the maneuvers were performed with the subjects in sitting position. Thorough instructions were given to each subject regarding the test and sufficient time was provided for them to practice the maneuvers. A soft nose clip was put over the nose to occlude the nostrils and disposable mouthpieces were used to minimize cross infection. Three readings were taken and maximum reading was selected to print.

The data obtained were expressed as mean and standard deviation and student unpaired t-test was applied for comparison between two groups. A p value less than 0.05 was considered to be statistically significant.

Table 1: Anthropometric Data

Parameters	Cricketers Mean ± SD	Controls Mean ± SD	P value
Age (yr)	20.20 ± 3.20	21.02 ± 2.28	P=0.1515
Height (cm)	168.23 ± 8.49	167.29 ± 5.49	P=0.5211
Weight (kg)	64.35 ± 7.38	65.66 ± 11.36	P=0.5045

Table 2: Pulmonary Function Parameters Cricket Players and Controls

Parameters (Ltrs)	Cricketers Mean ± SD	Controls Mean ± SD	P value
FVC(L)	2.93 ± 0.45	2.62 ± 0.71	P=0.0122
FEV_1(L)	2.71±0.64	2.43±0.42	P=0.0129
FEV_1/FVC	97.34 ± 6.71	98.37 ± 3.23	P=0.3404
PEFR(L)	9.15 ± 0.76	7.58 ± 1.34	P=0.0119
MVV(L)	142.44±23.47	131.23 ±24.71	P=0.0249

Results

The recorded anthropometric data in cricket players and control groups did not show any statistical significance as shown in Table 1. The present study shows that among cricket players and sedentary controls, competitive cricketers have significantly higher values of forced vital capacity (FVC) (P=0.0122), Forced expiratory volume in first second (FEV1) (P=0.0129), and Maximum Voluntary Ventilation (MVV) (P=0.0249) and Peak Expiratory Flow Rate (PEFR) (P=0.0119). There was no significant difference in FEV1/ FVC ratio (P=0.3404) in cricket players and controls as shown in Table 2.

Discussion

Cricket has been an established team sport for hundreds of years and is one of the most popular sports in the world. It originated in England and is now very popular in countries such as India, Pakistan, Sri Lanka, Australia, the West Indies and South Africa. Competitive cricket is essentially a bat and ball sport. It is played by two teams and involves batting, fielding and bowling. There are 11 players a side and a game can last anywhere from several hours to several days. Cricket matches come in three formats: test, one-day and twenty-twenty. The former is usually considered a trial of a player's psychological strength, whereas the latter two usually judge his corporeal strength.

During the span of one match, the bowlers, batsmen, fielders and the wicket-keepers are subjected to tremendous physical and mental stress. For example the bowler in this sport usually bowls from a variable run-up. This run-up may range from a few feet to several meters.

Similarly, the batsman has to judge the pitch of the ball, and then use his muscles to artistically divert it to his location of choice. He then has to crossover to the other side and completes a run. The fielders have to remain vigilant throughout the course of the innings, and once the ball finds their territory, have to run on to gather it and then throw it back. These, along with the boons similar to those associated with other strategic team sports, imply that each cricket game is an intense and involving experience, and every minute spent on the field requires an intricate balance between the mind and the body.

Pulmonary function is governed by genetic, environmental and nutritional factors and confirms that physical training during growth help in developing a greater endurance in Respiratory muscles. Lung size may increase by a strenuous and prolonged

strength training regimen during adolescence.[17]

Our study clearly shows that among competitive cricketers and sedentary controls, cricketers have statistically significant values of forced vital capacity (FVC) (P=0.0122), Forced expiratory volume in first second (FEV1) (P=0.0129), Maximum Voluntary Ventilation (MVV) (P=0.0249) and Peak Expiratory Flow Rate (PEFR) (P=0.0119). There was no significant difference in FEV1/FVC (P=0.3404) between two groups.

In the present study, it is observed that there is significant increase in Forced vital capacity in cricketers than controls. Muscular exercise increases the rate and depth of respiration and so improves FVC, the consumption of O2 and the rate of diffusion.[18] In the Amsterdam Growth and Heart study, physical activity was observed to be positively correlated to changes in FVC between ages 13-27 years over a period of 15 years.[19]

Forced expiratory volume in first second (FEV1) was significantly high in cricketers than controls. Hence, it can be stated here that the physically trained individuals, may have higher ventilatory capacity as well as FEV1. This might have been brought about by the fact that physical training not only improves the strength of skeletal limb and cardiac muscle, but also improves the accessory muscles for inspiration and expiration.[12]

Maximum voluntary ventilation (MVV) which depend both on the patency of airways and strength of respiratory musculature was significantly high in cricketers. MVV improvement might be due to superior expiratory power and overall low resistance to air movement in the lungs. The higher MVV value is advantageous for physical work capacity.[20-21]

The mean expiratory flow rate (PEFR) of cricket players was significantly higher than matched control group. The PEFR is an effort dependent parameter emerging from the large airways within about 100–120 ms of the start of the forced expiration.[22-23] PEFR can be therefore, be an easy test for quick assessment of improvement of an overall pulmonary function of the sportsmen. A continued high physical activity is associated with lower mortality, and delays decline in the pulmonary functions and therefore should be encouraged.[24]

Although there is some standing around, to play cricket the player need to be fit and strong. Cricket involves sprinting between wickets and running to stop balls, as well as bowling and throwing. Hence results from the present study suggest that playing competitive cricket 2-3 hours per day for minimum of 5 days a week for 3-6 years could cause strengthening of respiratory muscles with resultant increase in pulmonary function.

One limitation of our study is that most of our healthy subjects were from mid to upper socioeconomic strata and only male subjects were included in the study. This shortcoming may affect the generalization of the results to other sections of society. Our study was a cross sectional study. A follow up study with larger sample size is needed.

Conclusion

The current study has shown that, there is significant positive relationship between playing cricket and pulmonary function in healthy young men. The improvement in pulmonary function could be due to increased strength of respiratory muscles. So playing cricket can be recommended so as to improve the pulmonary function of an individual.

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