

Comparison of Aerobic Fitness (VO_{2max}) of Cricket Players on Basis of Their Playing Positions

Lokendra Bahadur Kathayat and Ashok Kumar

Abstract

Aims: The purpose of this study was to compare the aerobic fitness (VO_{2max}) of cricket players on basis of their playing positions. **Materials and Methods:** There was one hundred fifty (N=150) trained male cricketers between the ages of 15 and 25 years volunteered for this study. An estimation of VO_{2max} was calculated from the test results, using standard formula (McArdle et al., 1972). **Results:** The mean age, height weight, BMI and VO_{2max} of batsman cricketer was 17.75 ± 2.88 year, 171.00 ± 6.56 cm, 57.00 ± 8.80 kg, 19.42 ± 2.22 kg/m² and 43.93 ± 8.65 ml.kg⁻¹.min⁻¹ respectively. The mean age, height weight, BMI and VO_{2max} of fast-bowler cricketer was 18.06 ± 2.43 year, 172.68 ± 7.50 cm, 59.16 ± 8.99 kg, 19.84 ± 2.99 kg/m² and 41.78 ± 7.55 ml.kg⁻¹.min⁻¹ respectively. The mean age, height weight, BMI and VO_{2max} of spinner cricketer was 17.88 ± 2.93 year, 169.40 ± 8.94 cm, 56.32 ± 10.45 kg, 19.54 ± 2.87 kg/m² and 43.96 ± 9.03 ml.kg⁻¹.min⁻¹ respectively. The mean age, height, weight, BMI and VO_{2max} of batsman/wicketkeeper cricketer was 17.00 ± 2.62 year, 170.70 ± 7.49 cm, 56.80 ± 9.23 kg, 19.41 ± 2.31 kg/m² and 40.05 ± 8.76 ml.kg⁻¹.min⁻¹ respectively. The mean age, height, weight, BMI and VO_{2max} of all-rounder cricketer was 17.26 ± 2.33 year, 171.66 ± 8.09 cm, 57.66 ± 10.49 kg, 19.41 ± 2.74 kg/m² and 40.20 ± 6.08 ml.kg⁻¹.min⁻¹ respectively. The results shows that there was a difference in the mean values of VO_{2max} of cricket players on the basis of their playing position but it was not statistical significant. **Conclusion:** It was concluded that there was no difference of aerobic fitness (VO_{2max}) of cricket players on the basis of their playing position.

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Introduction

Cricket is one of the most popular team sports practiced around the world. During the season, elite male cricket players practice on a daily basis. The players play practice matches which include one or two matches per week, and take part in international tournaments such as ICC Champions Trophy, T20 World cup, Ashes Series, Champions League Twenty20, ICC Cricket World Cup etc. This important schedule of practices and games requires well developed physical, mental and physiological characteristics (Slimani et al., 2016). Aerobic Fitness (VO_{2max}) is one of the most important aspects of physical fitness component in cricket (Da Silva et al., 2008; Nikolaidis, 2011, Noakes and Durandt, 2000). In this context, optimum level aerobic fitness (VO_{2max}) helps cricket players to maintain repetitive high intensity actions within a cricket match, to accelerate the recovery process, and to maintain their physical condition at an optimum level during the entire game and season (Noakes and Durandt, 2000). Physical capacity of a cricketer is an important

element of success in sports achievements. It involves a huge number of different capacities, with aerobic capacity being its major component. Physiological basis of physical capacity of an organism incorporates the functional capacity of the organism to increase the level of metabolic processes in keeping with the requirement of physical effort. The metabolic processes in this sense mean the transformation of chemical energy into mechanical one (Bowers and Fox, 1988). Aerobic fitness denotes a general extent of metabolic processes occurring in the human organism, and stands for a larger portion of the total energetic capacity. VO_2max refers to the intensity of aerobic processes, and actually represents the capacity of the organism to utilize at a certain moment the maximum amount of oxygen (Goran et al. 2010). Maximal oxygen uptake is a measure of aerobic capacity has been determined as the international standard of physical capacity (Fleg et al. 2000, Fletcher et al. 1995). The basic unit for measuring the maximal oxygen uptake is its absolute value expressed in liters or milliliters of oxygen per minute. However, the absolute value of maximal oxygen uptake (VO_2max) is highly affected by body weight, and it is, therefore, more objective and generally accepted to express aerobic capacity in relative units – milliliters per kilogram of body mass per minute. Continuing estimation of cricketer's physical capacity is one of the most important tasks of the physiology of sport. In that way, one can get insight into the momentary physical capability of cricketer's and efficiency of the training process (Ponorac et al. 2005). Determination of aerobic capacity is possible to perform with accuracy by indirect measuring of maximal oxygen uptake in tests (queen's college step test) on maximal physical effort. In the present study an estimation of VO_2max was calculated from the test results, using the formula (VO_2max (ml/kg/min) = $111.33 - (0.42 \times \text{heart rate})$) given by McArdle et al., (1972). There are very few studies that have been conducted on male cricket players of Punjab to observe aerobic fitness ($\text{VO}_{2\text{max}}$) of cricket players on basis of their playing positions.

Materials and Methods

One hundred fifty (N=150) Punjabi male cricketers (from different cricket academies situated at Patiala, Punjab) between the age group of 15 to 25 years voluntarily participated in the study. Anthropometric measurements were recorded according to the standard procedure. An estimation of VO_2max was calculated from the test results, using following formula (VO_2max (ml/kg/min) = $111.33 - (0.42 \times \text{heart rate})$) given by McArdle et al., (1972). The subjects were divided according to their playing positions. Statistical analysis of data was done using SPSS Statistics 20.0 (free trial version) (Chicago, IL, USA). Results are presented as mean \pm standard deviation (SD). Analysis of variance (ANOVA) was also used to evaluate the differences in VO_2 max according to playing positions of the cricketers.

Results

The mean age, height weight and BMI (body mass index) of batsman cricketer was 17.75 ± 2.88 year, 171.00 ± 6.56 cm, 57.00 ± 8.80 kg and 19.42 ± 2.22 kg/m^2 respectively. The mean age, height weight and BMI (body mass index) of fast-bowler cricketer was 18.06 ± 2.43 year, 172.68 ± 7.50 cm, 59.16 ± 8.99 kg and 19.84 ± 2.99 kg/m^2 respectively. The mean age, height weight and BMI (body mass index) of spinner cricketer was 17.88 ± 2.93 year, 169.40 ± 8.94 cm, 56.32 ± 10.45 kg and 19.54 ± 2.87 kg/m^2 respectively. The mean age, height weight and BMI (body mass index) of batsman/wicketkeeper cricketer was 17.00 ± 2.62 year, 170.70 ± 7.49 cm, 56.80 ± 9.23 kg and 19.41 ± 2.31 kg/m^2 respectively. The mean age, height weight and BMI (body mass index) of all-rounder cricketer was 17.26 ± 2.33 year, 171.66 ± 8.09 cm, 57.66 ± 10.49 kg and 19.41 ± 2.74 kg/m^2 respectively (Table1).

Table1. Mean \pm SD of Age, height weight and BMI of Cricket Players on Basis of Their Playing Positions

Player's Playing Experience	N	Age, (year)	Height (cm)	Body weight (kg)	BMI (kg/m ²)
Batsman	55	17.75 \pm 2.88	171.00 \pm 6.56	57.00 \pm 8.80	19.42 \pm 2.22
Fast-bowler	31	18.06 \pm 2.43	172.68 \pm 7.50	59.16 \pm 8.99	19.84 \pm 2.99
Spinner	25	17.88 \pm 2.93	169.40 \pm 8.94	56.32 \pm 10.45	19.54 \pm 2.87
Batsman/Wicketkeeper	10	17.00 \pm 2.62	170.70 \pm 7.49	56.80 \pm 9.23	19.41 \pm 2.31
All-rounder	29	17.26 \pm 2.33	171.66 \pm 8.09	57.66 \pm 10.49	19.41 \pm 2.74
Total	150	17.77 \pm 2.66	171.19 \pm 7.52	57.45 \pm 9.42	19.54 \pm 2.58

The mean VO_{2max} (aerobic fitness) of batsman, fast bowler, spinner, batsman/wicketkeeper and all-rounder cricket players was 43.93 \pm 8.65 (ml.kg⁻¹.min⁻¹), 41.78 \pm 7.55(ml.kg⁻¹.min⁻¹), 43.96 \pm 9.03 (ml.kg⁻¹.min⁻¹), 40.05 \pm 6.08 (ml.kg⁻¹.min⁻¹) and 40.20 \pm 6.08 (ml.kg⁻¹.min⁻¹) respectively. The maximum mean value of VO_{2max} was 43.96 \pm 9.03 (ml.kg⁻¹.min⁻¹) of spinner and minimum was 40.05 \pm 6.08 (ml.kg⁻¹.min⁻¹) of batsman/wicketkeeper (Table 2).

Table 2. Comparison of Aerobic Fitness (VO_{2max}) of Cricket Players on the basis of their Playing Positions

Variable(s)	Player's Playing Position	N	Mean \pm Std. Deviation
VO ₂ max.(ml.kg ⁻¹ .min ⁻¹)	Batsman	55	43.93 \pm 8.65
	Fast-bowler	31	41.78 \pm 7.55
	Spinner	25	43.96 \pm 9.03
	Batsman/Wicketkeeper	10	40.05 \pm 8.76
	All-rounder	29	40.20 \pm 6.08
	Total	150	42.51 \pm 8.12

The variance in the mean VO_{2max} of cricket players on the basis of their playing positions was statistical analyzed with the help of ANOVA. The results of ANOVA showed that there was no statistical significant difference in the variance of VO_{2max} (aerobic fitness) among batsman, fast bowler, spinner, batsman/wicketkeeper and all-rounder (Table 3).

Table 3. Analysis of Variance (ANOVA) of Aerobic Fitness (VO_{2max}) of Cricket Players on the basis of their Playing Positions

Variable(s)		Sum of Squares	df	Mean Square	F	Sig.
VO ₂ max.(ml.kg ⁻¹ .min ⁻¹)	Between Groups	394.354	4	98.588	1.513	.202
	Within Groups	9450.438	145	65.175		
	Total	9844.791	149			

Discussion

Aerobic capacity is an integral indicator of functional capacities of all systems involved in supply, transportation and energetic oxygen transformation (cardio-pulmonary capacity, functional muscle capacity to produce ATP in the presence of oxygen (Ponorac et al. 2005). Functional impairment of any link in the chain can, to some extent, influence the decrease in the level of cricketer's physical

capacity (Wilmore & Costill 1999). An insufficient aerobic capacity precludes the maintenance of high level of aerobic exercise, and there with the maximal performance, especially in the last 15 minutes of a match (Živanić 2003). In the present study VO_{2max} (aerobic fitness) of cricket players on the basis of their playing positions was 43.93 ± 8.65 ($ml \cdot kg^{-1} \cdot min^{-1}$) (batsman), 41.78 ± 7.55 ($ml \cdot kg^{-1} \cdot min^{-1}$) fast bowler, 43.96 ± 9.03 ($ml \cdot kg^{-1} \cdot min^{-1}$) spinner, 40.05 ± 6.08 ($ml \cdot kg^{-1} \cdot min^{-1}$) batsman/wicketkeeper and 40.20 ± 6.08 ($ml \cdot kg^{-1} \cdot min^{-1}$) (all-rounder). It was found that VO_{2max} of batsman of the present study was in average range when compared with the VO_{2max} norms reported by Robert (2012). The results of VO_{2max} of the present study also showed an average VO_{2max} when compared with the values of VO_{2max} reported by Vaccaro et al., (1979). In the literature, various researchers reported the different values of maximum oxygen uptake (VO_{2max}) for team sports such as 50.1 ml/kg/min (Riezebos et al., 1983) ; 49.6 ml/kg/min (Dal Monte et al., 1987) ; 51.1 ml/kg/min (Joussellin et al., 1990) ; 51.3 ml/kg/min (Smith & Thomas 1991) ; 48 and 47 ml/kg/min (Hakkinen 1993) ; 50.36 ml/kg/min (Franco 1998) ; 46.6 ml/kg/min (Fernández-Río et al., 2000) ; 56.7 ml/kg/min (Tsunawake et al., 2003) ; 46.54 ml/kg/min (Koley & Singh 2010). Thus with the help of a maximal oxygen uptake (VO_{2max}) one can get insight into the momentary physical capability of cricketer's and efficiency of their training process (Ponorac et al. 2005).

Conclusion

It was concluded that there was no difference of aerobic fitness (VO_{2max}) of cricket players on the basis of their playing position.

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