



P-ISSN: 2394-1685
E-ISSN: 2394-1693
Impact Factor (RJIIF): 5.38
IJPESH 2022; 9(6): 185-187
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www.kheljournal.com
Received: 06-09-2022
Accepted: 11-10-2022

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A comparative study on peak oxygen consumption among long distance runners, hockey and judo players

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Abstract

Aerobic capacity has been accepted as the major component of physical capacity in athletes. VO₂ max is the highest rate of oxygen consumption attainable during maximal exercise. The purpose of the study was to compare the peak VO₂ among long distance runners, hockey and judo players. To achieve the purpose of the study 20 long Distance Runners, 20 hockey and 20 judo players were selected as subjects. The relative peak VO₂ was selected as variable. The CPET unit was used to assess the relative peak VO₂ of the selected subjects by breath-to-breath analysis. In the result showed the significant difference found between hockey and judo players related to relative peak VO₂. The significant difference found among selected groups. The long-distance runners showed higher peak VO₂ followed by hockey players and judo players. The athletes of different sports demand different VO₂ Max according to the dominant energy system involved in the particular sport.

Keywords: Peak oxygen, long distance runners, hockey and judo players

Introduction

Aerobic capacity has been accepted as the major component of physical capacity in athletes. Maximal oxygen uptake (VO₂ max) has been regarded by majority of authors as the best indicator of aerobic capacity of an organism, and at the same time, the best indicator of an athlete's physical capacity (Rankovic *et al.*, 2010) ^[1]. VO₂ max is the highest rate of oxygen consumption attainable during maximal exercise. Maximal oxygen uptake as a measure of aerobic capacity has been determined as the international standard of physical activity (Bowers, 1988) ^[2]. The basic unit of measuring the maximal oxygen uptake is its absolute value expressed in litres or millilitres per minutes. However, the absolute value is highly affected by body weight; so, it is often expressed as ml/kg/min.

Objective of the study

The purpose of the study was to examine and compare the Relative Peak VO₂ of Long-Distance Runners, Hockey Judo players.

Hypothesis of the study

It was hypothesized that there would be significant difference in Absolute Peak VO₂ (l/min) among Long-Distance Runners, Judo and Hockey Players.

Methodology

To achieve the purpose of the study total 60 university level and national level represented male players were selected, in which 20 from Long Distance Event, 20 from Hockey and 20 from Judo sport. The mean age of the subjects were 22 years. The mean value of height and weight was 171.54 and 64.6 and respectively. The Relative Peak VO₂ was selected as variable for the study. The CPET with treadmill breath-to-breath analysis was done to measure the selected variable. The protocol was fixed individually on the basis of their fitness level with the help of exercise physiology expert. Proper warm up and recovery was also given. The gas calibration and volume calibration were done before testing each subject. The mask was sanitized thoroughly before using by each subject.

Analysis

To analyse the data descriptive statistical techniques i.e., mean, Std. Deviation, minimum, maximum, ANOVA and Post hoc tests were used with the help of SPSS version 20.

Table 1: Mean, SD, Minimum and Maximum values of Relative Peak Vo_2 (ml/kg/min) of Long-Distance Runners, Judo and Hockey Players

Name of the Groups	N	Mean	Std. Deviation	Minimum	Maximum
Long Distance Runners	20	63.53	2.57	58.70	69.60
Judo Players	20	49.98	2.55	45.80	57.10
Hockey Players	20	54.57	4.72	42.00	60.70

The table – 1 shows the mean and SD values of Long-Distance Runners, Judo and Hockey players with regard to Relative Peak Vo_2 (ml/kg/min) as 63.53 ± 2.57 , 49.98 ± 2.55 and 54.57 ± 4.72 respectively. Minimum value of Long-Distance Runners, Judo and Hockey players with regard to Relative Peak Vo_2 (ml/kg/min) as 58.70, 45.80 and 42 respectively. Maximum values of Long-Distance Runners, Judo and Hockey players with regard to Relative Peak Vo_2 (ml/kg/min) as 69.60, 57.10 and 60.70 respectively. The graphical representation of mean scores has been depicted in figure – 1.

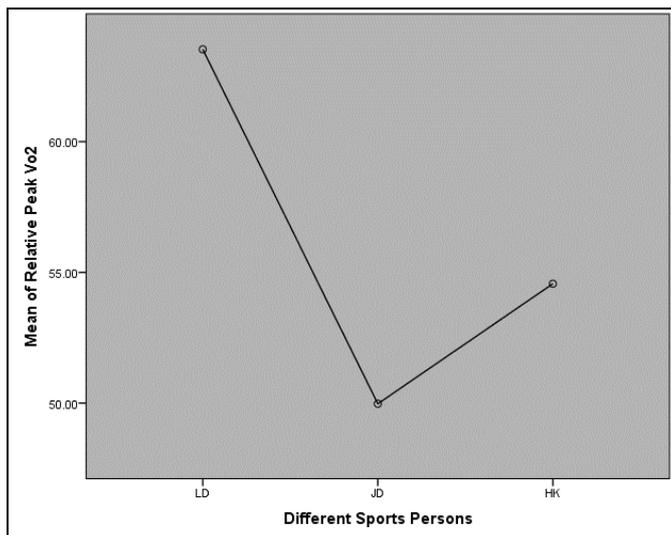


Fig 1: Graphical representation of Mean values of Relative Peak Vo_2 ml/kg/min of Long-Distance Runners, Judo and Hockey Players

Analysis of Variance (ANOVA) results with regard to Relative Peak Vo_2 (ml/kg/min) among Long Distance Runners, Judo and Hockey players have been presented in table – 2

Table 2: Analysis of Variance (ANOVA) of Relative Peak Vo_2 ml/kg/min of Long-Distance Runners, Judo and Hockey Players.

Source of Variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1901.182	2	950.591	80.604	0.00*
Within Groups	672.225	57	11.793		
Total	2573.407	59			

*Significant at 0.05 level

It has been noticed from table – 2 that statistically significant differences ($p < 0.05$) existed among Long Distance Runners, Judo and Hockey players. Since, the obtained 'F' ratio 80.604 (0.00) was found statistically significant. Therefore, Tukey's Post hoc was applied to find out the degree and direction of

differences among selected groups. Result of post hoc test has been presented in table – 3.

Table 3: Post hoc analysis of Relative Peak Vo_2 (ml/kg/min) among Long-Distance Runners, Judo and Hockey Players

Groups (I)	Groups (J)	Mean Difference (I-J)	Std. Error	Sig.
Long Distance Running	Judo	13.56*	1.08598	.000
Judo	Hockey	4.59*	1.08598	.000
Hockey	Long Distance Running	8.97*	1.08598	.000

*Significant at 0.05 level

Table 3 showed the mean value of Long-Distance Runners was 63.53 and Judo players was 49.98 with the mean difference of 13.56. The p-value (Sig.) .000 showed ($p < 0.05$) significant differences between both the group on the variable Relative Peak Vo_2 (ml/kg/min). While comparing the mean values the Long-Distance Runners showed higher Relative Peak Vo_2 than Judo players.

The mean value of Judo players 49.98 was and Hockey players was 54.57 with the mean difference 4.59. The p-value (Sig.) .000 showed ($p < 0.05$) significant differences between both the group on the variable Relative Peak Vo_2 (ml/kg/min). While comparing the mean values the Hockey players showed higher Relative Peak Vo_2 than Judo players.

The mean value of Hockey players was 54.57 and Long-Distance Runners was 63.53 with the mean difference 8.97. The p-value (Sig.) .000 showed ($p < 0.05$) significant differences between both the group on the variable Relative Peak Vo_2 (ml/kg/min). While comparing the mean values the Long-Distance Runners showed higher Relative Peak Vo_2 than Hockey players.

Discussion

It has been observed that the maximum Relative Peak Vo_2 (ml/kg/min) was recorded in the Long-distance runners than hockey and Judo players. The lowest Relative Peak Vo_2 (ml/kg/min) were recorded in the Judo players. This might be because of the subject selected from different sports, the nature or characteristics of the selected sports group is different in terms of movement, physical qualities, skills, dimension of playing areas, work intensities, duration of the events, strategies, training methods, dominant energy system involved etc, the long-distance event is an aerobic nature of activity whereas the hockey comes under aerobic and anaerobic as it requires high repetitive intensive activities with short intermittent recovery periods the sustaining for long duration and judo is the anaerobic activity. But judo players required good aerobic power for the faster recovery between the matches. Because the energy requirement is met by anaerobic metabolism during high intensity exercise periods while aerobic metabolism gains importance in order to supply homeostatic conditions at recovery intervals. Improvements in aerobic capacity may not only be important for endurance performance, but also intermittent activities. (Hamilton AL, Nevill ME, Brooks S, *et al.* 1991, Balsom *et al.*, 1994, Glaister, 2005) [4, 5, 6]. Measurement of VO_2max has commonly been used to monitor the training status of athletes and can help to determine the training regime and schedules. The oxygen demand is differed from one sport to another. (Singh and Patel, 2014) [7].

The findings of this study were an agreement with the findings of Singh and Patel (2014) [7], who have conducted a comparative study on maximum oxygen consumption of

different game players. The results showed that the cross-country runners showed highest and judo players had showed lowest VO₂ Max among all different sports.

The findings of this study were also agreement with the findings of Mishra *et al.*, (2015)^[8], Oinam and Singh 2019^[9], Singh and Patel, (2014)^[7], Rankovic *et al.*, (2010)^[11], Degens *et al.*, (2019)^[10], who have found significant difference between different sports with respect to VO₂ Max. Thus, the athletes of different sports demand different VO₂ Max according to the dominant energy system involved in the particular sport.

The Relative Peak VO₂ (ml/kg/min) found significance difference among Long Distance Runners, Judo and Hockey players. Hence, the hypothesis was accepted.

Conclusion

In sports such as basketball, field hockey and soccer, the assessment of physical fitness, including the VO₂ peak measurement gained scientific interest because success in matches may be explained by the higher physical fitness levels of the players (Wisloff *et al.* 1998)^[3]. On the basis of the findings of the study the following conclusions were drawn;

1. Significant difference was observed among Long-Distance Runners, Judo and Hockey Players with respect to Relative Peak VO₂ (ml/kg/min).
2. The Long-Distance Runners showed higher value related to Relative Peak VO₂ (ml/kg/min) followed by Hockey and Judo Players.

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