Effect of Circuit And Interval Trainings On Vo$_2$max Among Male Inter-Collegiate Cricket Players

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Abstract

The purpose of the study was to find the out the effect of circuit and interval trainings on Vo$_2$ max among male inter-collegiate cricket players. To achieve the purpose, forty five (45) male cricket players were selected from Govt. degree college kulgam (UT) Jammu and Kashmir. The age of the subjects ranged from 18 to 23 years. The selected subjects were divided into three equal groups namely circuit training group, interval training group and control group of 15 subjects each. Group I underwent the circuit training group (CTG), Group II underwent the interval training group (ITG) and Group III control group (CG) who did not participate any specific training programme apart from their regular routines. Vo$_2$ max were selected as criterion variable and was tested with coopers 12 mint. /run walk test. The collected data from three groups prior to and post experimentation, paired’ test was applied to examine the changes within the groups. To find out the significant difference between the groups, Analysis of covariance (ANCOVA) was applied. When the ‘F’ ratio of adjusted post-test mean was found to be significant, Scheffe’s post hoc test was employed to find out the paired mean differences. In all cases, 0.05 levels were fixed as level of confidence. The results of the study showed that the two experimental groups namely circuit training group and interval training group achieved significant improvement on vo$_2$ max among male inter-collegiate cricket players.

Keywords: circuit training, interval training and Vo$_2$ max.

Introduction

Vo$_2$ max (maximal oxygen uptake) is the point at which oxygen consumption plateaus and is the best predictor of determine cardio respiratory endurance or aerobic fitness. There are several field tests (12-minute running test, Léger shuttle run test) available to Vo$_2$ max in athletes which are inexpensive and easy to administer, recently, the yo-yo, intermittent recovery test was
developed which was found to be more accurate, inspired by Léger multistage fitness test to inspect a person’s ability to repeatedly perform intermittent exertion with a high aerobic component towards the end of the test (Costill DL 1994). The factors affecting $\text{VO}_2\text{max}$ are often divided into supply and demand factors. Supply is the transport of oxygen from lungs to the mitochondria (including lung diffusion, stroke volume, blood volume, and capillary density of the skeletal muscle) while demand is the rate at which the mitochondria can reduce oxygen in the process of oxidative phosphorylation (Bassett DR Jr 2000). $\text{VO}_2\text{max}$ is the maximal oxygen uptake or the maximum volume of oxygen that can be utilized in one minute during maximal or exhaustive exercise. It is measured as milliliters of oxygen used in one minute during per kilogram of body weight (ml/kg/m). $\text{VO}_2\text{max}$ or maximal oxygen uptake is one factor that can determine an athlete’s capacity to perform sustained exercise and is linked to aerobic endurance. A high $\text{VO}_2\text{max}$ may indicate an athlete’s potential for excellent aerobic endurance (Farrell, et. al., 1979). One can think of $\text{VO}_2\text{max}$ as an athlete’s aerobic potential and the lactate threshold as the marker for how much of that potential they are tapping into during an endurance event. This threshold can improve and increase numerically with appropriate training. In theory, an individual could exercise at any intensity up to their $\text{VO}_2\text{max}$ indefinitely. However, this is not the case even amongst elite athletes (Tauseef Nabiet, et al. 2015). All types of prolonged physical activity depends upon cardio-respiratory endurance of the performers, therefore a large number of cardiovascular fitness test have been based on varying duration of run-walk test. Majority of these test have been based on the pulse rate response after a fixed distance running or more frequently on measuring the time taken to run-walk a fixed distance or by measuring distance covered in a given time. While the test based upon pulse rate response or calculation of $\text{VO}_2\text{max}$ form the run-walk test (Kansal Devinder 2008).

Sport training is very important to improve the $\text{VO}_2\text{max}$. The given training is to increase the $\text{VO}_2\text{max}$ will impact to the respiration system and cardiovascular system. The system will adapt, so the performance will increase. Adaptation occurs at the lung that is at the tidal volume value, inspiration and expiration value average, and pulmonary ventilation value for the oxygen exchange, also will occur the heart size and plasma volume increase at the cardiac output, so the oxygen stroke volume also will increase (Sakthielavan 2009). Cardio respiratory fitness, typically determined by maximal oxygen update ($\text{VO}_2\text{max}$), is a fundamental measurement for the exercise physiologist. $\text{VO}_2\text{max}$ refers to the highest rate all which oxygen can be taken up and
consumed by the body during intense exercise (D.R.J.R Bassett 2000). To increase Vo2 max training program should be done carefully, systematically, orderly and constantly increasing, following the principles and methods of accurate exercise in order to achieve the expected objectives (Ramos JS et al;2015). The greater the Vo2 max a person has, the better physical fitness will be, where the quality of the biometric components will also be better (Sylta Ø, Tønnessen et al; 2016). One of the main factors for the determination of Vo2 max is cardiac output, which corresponds to the volume of blood ejected by the heart in one minute. This value can be increased by as much as six times in the case of high-intensity exercise in well-trained athletes (Klasnja A et al; 2015).

Circuit training is a type of body conditioning that involves endurance training, resistance training, high intensity aerobics, and exercise performed in a circuit, similar to high-intensity interval training. It targets strength building and muscular endurance (Macllannis, Martin 2017). Interval training is a kind of training that involves a series of high-intensity workouts interspersed with rest or relief periods. The high-intensity periods are typically at or close to anaerobic exercise, while the recovery periods involve activity of lower intensity (Comynes, Tom 2018).

Methodology

Subjects and variables

To achieve the purpose of this study, forty five (45) male cricket players were selected at random as subjects from Govt. degree college kulgam (UT) Jammu and Kashmir and there age ranged between 18 to 23 years. The selected subjects were medically examined by a qualified physician and certified that they were medically and physically fit enough to undergo the training programme. The selected subjects were randomly assigned into three equal groups of 15 subjects each. Group I underwent circuit training, group II underwent interval training and group III acted as control. Vo2 max was measured by coopers 12 mint. /run walk test.
Training Protocol

The training programmes were scheduled for one session a day, each session lasted between 45 minutes to an hour, approximately excluding warming up and relaxation in morning session. During the training period, the experimental groups underwent their respective training programme three days per week (alternate days) for twelve weeks in addition to their regular programme of the course of study as per their curriculum. The training sessions were held every other day, so that the body could rest. The players trained every Monday-Wednesday & Friday.

Experimental Design and Statistical technique

The experimental design in this study was random group design involving 45 subjects, who were divided at random into three groups of fifteen each. All the three groups were selected from the same population. No effort was made to equate the groups prior to the commencement of the experimental treatment. In order to nullify the initial differences the data collected from three groups prior to and post experimentation on selected dependent variable were statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). Since three groups were involved, whenever they obtained ‘F’ ratio for adjusted post test means was found to be significant, the Scheffe’s test was applied as post hoc test to determine the paired mean differences. In all cases level of confidence was fixed at 0.05 for significance.

Analysis of Vo2 Max

The descriptive analysis showing mean, percentage of improvement and ‘t’ ratio of the collected data on Vo2max among experimental and control groups are presented in table I.

Table – I

Descriptive Analysis of the Data on Vo2 max

<table>
<thead>
<tr>
<th>Variable</th>
<th>Groups</th>
<th>Pre-Test Mean</th>
<th>Post-Test Mean</th>
<th>MD</th>
<th>%</th>
<th>‘t’ ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vo2 max</td>
<td>CTG</td>
<td>44.67</td>
<td>45.79</td>
<td>1.12</td>
<td>2.50</td>
<td>9.97</td>
</tr>
<tr>
<td></td>
<td>ITG</td>
<td>44.64</td>
<td>46.81</td>
<td>2.17</td>
<td>4.86</td>
<td>17.16</td>
</tr>
<tr>
<td></td>
<td>CG</td>
<td>44.35</td>
<td>44.91</td>
<td>0.56</td>
<td>1.26</td>
<td>3.39</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level for the df of 1 and 14 is 2.15
It is clear from the table - I, that there were significant differences between pre-test and post-test data on Vo₂ max of circuit training group, interval training group and control group because obtained ‘t’ ratio of 9.97, 17.16 and 3.39 are greater than the required table value of 2.15 at 0.05 level of significance for the df of 1 and 14.

The results of the study also produced 2.50% of changes in Vo₂max due to circuit training, 4.86% of changes due to interval training and 1.26% of changes in control group.

The percentage of changes on Vo₂ max of circuit training group, interval training group and control group are given in the figure I.

**Figure - I**

*Pie Diagram Showing the Percentage of Changes on Vo2 max*

The data collected from the three groups on Vo₂max was statistically analyzed by ANCOVA and the results are presented in the table II.
Table - II

Analysis of Covariance on Vo$_2$ Max of Experimental and Control Groups

<table>
<thead>
<tr>
<th>Test</th>
<th>CTG</th>
<th>ITG</th>
<th>CG</th>
<th>SoV</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre test Mean SD (±)</td>
<td>44.67</td>
<td>44.64</td>
<td>44.35</td>
<td>BG</td>
<td>0.90</td>
<td>2</td>
<td>0.45</td>
<td>0.59</td>
</tr>
<tr>
<td>Post-test Mean SD (±)</td>
<td>45.79</td>
<td>46.81</td>
<td>44.91</td>
<td>BG</td>
<td>27.11</td>
<td>2</td>
<td>13.55</td>
<td>15.28*</td>
</tr>
<tr>
<td>Adjusted Post-test Mean</td>
<td>44.70</td>
<td>43.89</td>
<td>45.07</td>
<td>BG</td>
<td>6.52</td>
<td>2</td>
<td>3.26</td>
<td>13.85*</td>
</tr>
</tbody>
</table>

*Significant, Table value, 2 to 42 & 2 to 41 is 3.23

Table–III shows that pre-test mean values on Vo$_2$ max of circuit training group, interval training group and control group are 44.67, 44.64 and 44.35 respectively. The obtained ‘F’ ratio of 0.59 pre-test score was lesser than the required table value of 3.23 for df 2 and 42 for significance at 0.05 level of confidence on Vo$_2$ max. The post-test mean values on Vo$_2$ max of circuit training group, interval training group and control group are 45.79, 46.81 and 44.91 respectively. The obtained ‘F’ ratio value of 15.28 for post-test score was greater than the required table value of 3.23 for the df of 2 and 42 for significance at 0.05 level of confidence on Vo$_2$ max.

The adjusted post-test means of circuit training group, interval training group and control group are 44.70, 43.89 and 45.07 respectively. The obtained ‘F’ ratio value of 13.85 for adjusted post-test score was greater than the required table value of 3.23 for df 2 and 41 for the significance at 0.05 level of confidence on Vo$_2$ max. It was concluded that differences subsist among the adjusted post-test means of circuit training group, interval training group and control group on Vo$_2$ max. The ‘F’ value in the adjusted post-test means was found significant, hence the Scheffe’s test was applied to assess the paired mean difference and the results are presented in table - III.
Table - III

Scheffé’s Test for the Differences between Paired Means on Vo$_2$ Max

<table>
<thead>
<tr>
<th></th>
<th>ITG</th>
<th>CG</th>
<th>MD</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTG</td>
<td>44.70</td>
<td>43.89</td>
<td>0.81*</td>
<td>0.44</td>
</tr>
<tr>
<td></td>
<td>44.70</td>
<td>45.07</td>
<td>0.37</td>
<td></td>
</tr>
<tr>
<td></td>
<td>43.89</td>
<td>45.07</td>
<td>1.18*</td>
<td></td>
</tr>
</tbody>
</table>

From table - III shows that the adjusted post test mean differences on Vo$_2$ max between circuit and interval training groups; circuit training and control groups; and interval training and control groups are 0.81 and 1.18 for Vo$_2$ max respectively.

From the above table, it was imperative that both the experimental groups differed significantly from control group on Vo$_2$ max. Significant differences were found between circuit training group and interval training group in improving Vo$_2$ max of inter-collegiate male cricket players. Therefore, twelve weeks of interval training showed greater improvement than circuit training on inter-collegiate male cricket players. The finding of the study implies that both the groups improved but interval training was significantly better in improving inter-collegiate male cricket players than other groups confined to this study. The changes in inter-collegiate male cricket players are presented in figure II.
Discussion on Findings

The analysis of covariance indicated that the experimental group – 1 (circuit training) and experimental group - 2 (Interval training) were significantly improved the Vo2max. It may be due to the nature of varied regimens of circuit and interval training which have influenced to increase the physiological level and function of various, organs and systems. Further, findings of the study showed that control group did not improve the Vo2 max. However, the experimental group – 2 had more effect on the improvement of Vo2 max greater than experimental -1. The findings of the study are in conformity with the findings of the earlier studies;

Singh & Patel (2014) conducted a comparative study on maximum oxygen consumption of different game players. They found significant difference in Vo2 max of different games and sports groups. Yunus & Wahjuni (2019) investigated the difference of continuous and interval training toward maximum Vo2max increases. The results showed that the continuous training influences significantly toward the Vo2max increase and also the interval training influence significantly toward the Vo2max increase. Krishnanet al., 2020 examined the effect of Continuous Training and Interval training on Resting pulse rate, Vital capacity and Vo2 Max among university college men students. The result of the study showed that there was
Significantly improvement found in resting pulse rate, Vital capacity and Vo$_2$ Max among the experimental group when compared with control group. Vivekananda et al., (2010) stated that high intensity interval training is an effective endurance training tool in non-athletic school going male population and provides better improvement in Vo$_2$ max than slow continuous training.

**Conclusion**

The two experimental groups namely circuit training group and interval training group achieved significant improvement on Vo$_2$ max among male inter-collegiate cricket players. The circuit training group shows an improvement of 2.50 % and interval training group shows an improvement of 4.64% due to 12 weeks of circuit and interval training programme.

**References**


