Aerobic and Anaerobic Capacity of Track and Field Athletes: A Comparative Study

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INTRODUCTION

Aerobic capacity is the ability to mobilize energy for continuous performance of specific movement for prolonged time i.e. capacity for prolonged physiological functioning under continuous supply of required oxygen under conditions of required oxygen completely available. The glucose molecule is completely broken down to CO2 and H20, and energy is made available as needed.

Anaerobic capacity is the ability to mobilize energy during activities of intensive nature i.e. executing intensive work with explosive action in short duration of time, such as, kicking the football faster and for explosive take off in jumps, maximum rate for about two to three minutes under water swimming.

The physiological systems of the body interact to accomplish a variety of tasks. There inter dependence can be linked to a symphony orchestra whose different musical instrument represent various organ systems and whose conductor represents the higher Brain center.

The capacity for prolonged physiological functioning demanding cardiovascular endurance depend upon Aerobic capacity i.e. energy metabolism under continuous supply of oxygen to the organism. Intensive burst of activities i.e. executing high load of work with explosive action and of short duration of time, such as kicking the football faster and far, explosive take off in jumps, throwing an implement etc. depend upon Anaerobic capacity i.e. efficiency in energy production in the absence of oxygen supply, though the oxygen would be taken up later during the recovery period after the cessation of activity.

Both Aerobic and Anaerobic capacities play an important role in influencing the performance in various games and sports. In activities which involve working with maximal intensity for shorter period of time, such as, Sprinting, Weight lifting, kicking of Football fast, explosive jumping etc. Where anaerobic capacity play an important role in games and sports where a sportsman has to resist fatigue relatively for longer period without effecting skill proficiency, for example, long distance running, swimming, cycling, rowing and even some team sports such as football and hockey, Aerobic capacity of individual plays an important role.

The human body obtains energy from two sources, Anaerobic and Aerobic metabolism of foodstuffs. Anaerobic metabolism deals with the break down of carbohydrates to lactic acid with a release of small quantity of energy in the form of Adenosine Triphosphate (ATP) and heat. Since these processes do not require oxygen; the term Anaerobic (without oxygen) applies. Aerobic metabolism includes processes that releases large amount of energy in the form of A.T.P, when any or all the three foodstuffs are burnt with the aid of oxygen, hence the term is Aerobic. The ability of an individual to perform well in given activity depends of many variables the most significant of which is the magnitude of one’s energy supply and the type of energy needed.
Three energy systems have been identified. The first two are Anaerobic and third is Aerobic: 1) Adenosine Triphosphate -Phosphocreatine (ATP-PC) system; 2) lactic acid system; and 3) oxygen system. The determination of predominant energy source is based on the duration of the activity and whether the activity is continuous or intermittent, because energy sources as the listed above are sequential, that is, we utilize the ATP-PC system first, the lactic acid system next and last the oxygen system.

Objective: The purpose of this study was to compare the Aerobic and Anaerobic capacity of track and field athletes.

1. The study was confined to 18-25 years male athletes of Inter-collegiate level.
2. The study was further confined to the Sprinters, Jumpers and Throwers of Track and Field.

The study was done on subjects who were systematically getting training in their respective events. Even though all factor was common for all the subjects. The possible additional effects of their events practice to an experimental variable cannot be ruled out.

From the scholars own understanding of the problem and referring to the literature it was hypothesized that Aerobic and Anaerobic capacities have significant difference between Sprinters, Jumpers and Throwers.

METHODOLOGY

The subjects for this study were athletes of sprints, jumps and throwing events randomly selected from Inter-collegiate Athletic Competition. A total number of 30 male athletes, 10 each from sprints, jump and throws were selected. The age of the subject range from 18-25 years. The selected variables were aerobic capacity and anaerobic capacity. Aerobic capacity was measured by 12-minute cooper run and walk test. The scoring will be in meters and nearest to25 meters. Anaerobic capacity was measured by 50-meter dash. The score was that time elapsed in the nearest 1/10th of a second. To compare Aerobic and Anaerobic capacity of Sprinters, Jumpers and Throwers. The analysis of variance was used at .05 level of significance.

RESULTS

Table-1

<table>
<thead>
<tr>
<th>Source of treatments</th>
<th>df</th>
<th>Sum of squares</th>
<th>Mean squares</th>
<th>F ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>2</td>
<td>242666.7</td>
<td>121333.35</td>
<td>1.6684</td>
</tr>
<tr>
<td>Within group</td>
<td>27</td>
<td>1963504</td>
<td>72722.37</td>
<td></td>
</tr>
</tbody>
</table>

Significant at 0.05 level, F 0.05 (2, 27) = 3.54

It appears from the table-1 that Aerobic capacity comparison between Sprinters, Jumpers and Throwers. Which was not significant as ‘f’ ratio was found to be 1.6684 is less than the tabulated ‘f’ value 3.54
Table-2

<table>
<thead>
<tr>
<th>Source of treatments</th>
<th>df</th>
<th>Sum of squares</th>
<th>Mean squares</th>
<th>F ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>2</td>
<td>2.78</td>
<td>1.39</td>
<td>8.072*</td>
</tr>
<tr>
<td>Within group</td>
<td>27</td>
<td>4.65</td>
<td>0.1722</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level F.05 (2,27) = 3.54

The table-2 Indicates Anaerobic Comparison between Sprinters, Jumpers and Throwers, which is significant as calculated f-ratio 8.072 was greater than tabulated ‘F’ value 3.54

Table-3

<table>
<thead>
<tr>
<th>Mean of different groups</th>
<th>Mean difference</th>
<th>Critical difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sprinters</td>
<td>6.82sec.</td>
<td>7.14sec.</td>
</tr>
<tr>
<td>Jumppers</td>
<td>7.14sec.</td>
<td>8.11sec.</td>
</tr>
<tr>
<td>Throwers</td>
<td>8.11sec.</td>
<td>8.11sec.</td>
</tr>
</tbody>
</table>

Above table-3 indicates that there were no significant difference between sprinters and jumpers as mean difference 0.32 is less than critical difference 0.62. However there were mean difference between sprinters and throwers is 1.29 and Jumpers and Throwers as mean difference 0.97 is higher than critical difference 0.62. Sprinters have highest anaerobic capacity among all.

DISCUSSIONS

Aerobic capacity

The statistical findings of the present study revealed that there were no significant differences in Sprinters, Jumpers and Throwers in relation to Aerobic capacity. This can be attributed to the quantum of aerobic training done in preparatory phase. The aerobic training helps in improvement of oxygen supply to the muscles. It increases blood volume and raises the level of oxygen carrying hemoglobin in red blood cells. The improved delivery and use of oxygen results, increased energy production and so, the trained athletes of sprints, jumps and throws showed insignificant difference in relation to aerobic capacity. Also the increased lung volume of the sprinters, jumps and throwers enhanced movement of oxygen from lungs to blood and aerobic training done by the groups’ results in increased myoglobin content and oxidation of carbohydrates so; there is no significant difference among them. The Sprinters, Jumpers and Throwers undergo almost similar type of aerobic training and endurance workout during base creation phase.
so they all possess almost same amount of aerobic capacity.

**Anaerobic capacity**

The statistical findings revealed that there were significant differences among Sprinters, Jumpers and Throwers in relation to anaerobic capacity. By the help of post-hoc test it was found that there was a significant difference in anaerobic capacity of sprinters and throwers, jumpers and thrower. There was no difference between sprinters and jumpers as they possess almost similar anaerobic capacity. This difference can be attributed to the nature of the activity done by these groups. The sprinters and jumpers continuously perform the activity with high explosiveness for pretty longer period of time then throwers. The nature of the test 50m-dash was also favorable to sprinters and jumpers as they go for sprinting activities during their workout. Throwers normally don’t run so much during their skill performance. In general any activities from metabolic support point of view are classified as Aerobic and Anaerobic muscular activity. All the three groups come under anaerobic type of muscular activity. This might be the reason for statistical insignificant difference of the three experimental groups as far as their aerobic potentiality is concerned. But in case of experimental subjects used in the study though they are anaerobic based sprinters and jumpers require both speed endurance and explosive strength in specific, whereas the throwers requires strength. For which out of the various metabolic support first two groups are using both A.T.P/ CP system as well as partly lactic acid system. Whereas the throwers who are using their maximum strength and power in a quickest possible time are basically requiring high potentiality of utilizing of A.T.P/ CP only

**CONCLUSIONS**

1) In relation to aerobic capacity no significant difference was found between sprinters, jumpers and throwers.

2) There was significant difference among sprinters, jumpers and throwers in relation to anaerobic capacity.

**REFERENCES**


Colemen A, et al “aerobic and anaerobic responses of male college freshmen during season of basketball”, journal of sports medicine and physical fitness (June 1974)


Schriber Mary, “Anaerobic Capacity as a function of Somatotype and participation in Varsity Athletics”, Research Quarterly: 34(June 1993)
