Description of Aerobic and Anaerobic Capacity of Male Student Volleyball Players

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ABSTRACT Physiological capacity of athletes is an important element of success in sports achievements. Volleyball is a sport with high anaerobic and aerobic demands in lower body as it needs power jumps and quick returns with legs that may continue over 20 minutes in the game. Therefore, the aim of this study was to describe the elite male student volleyball players' physiological characteristics (aerobic and anaerobic power) in three different positions (spiker, libero and passer). 31 men students of volleyball teams in Islamic Azad university tournament 2013 participated randomly in current study. Aerobic and anaerobic capacities were evaluated by conconi and ergojump-15s tests respectively. Data were analyzed using descriptive statistics, mean and standard deviation was used for classification based on three positions of spiker, libero and passer. The results of this study help the coaches to set appropriate training program for improve the physiological abilities of male volleyball players.

KEYWORDS Aerobic Capacity, Anaerobic Capacity, Men Students, Volleyball.

INTRODUCTION Physiological capacity of athletes is an important element of success in sports achievements. Aerobic and anaerobic capacities are significant indicators related to physiological abilities affect motor functions which causes success in sport competitions. Many sports such as volleyball can be described as interval sports, with the demands at high levels requiring intermittent bouts of high-intensity play interspersed with periods of submaximal effort, utilizing both aerobic and anaerobic energy systems. A special physiological ability is needed to perform volleyball's skills (Kalinski, Norkowski, Kerner & Tkaczuk, 2002). Volleyball players need to improve their aerobic and anaerobic systems because of the quick return and power jump in the game that may continue for more than 20 minutes (Viltasalo et al., 1987; Hakkinen, 1993). Therefore, ideal physiologic abilities can be determinant factors for success in this sport. According to this point, It has been suggested that success in many sport games appears to include high anaerobic capacity, not aerobic power alone (Al-Hazzaa, Almuzini, Al-Refaee, Sulaiman, Dafterdar, Al-Ghamedi, Al-Khuraiji, 2001; Hoffman, Maresh, 2000; Smith, Roberts, Watson, 1992). The assessment of physiological work capacity is a major consideration in preparing athletes for high-level competition (Bulbulian, Jeong, Murphy, 2001; Kirkendall, 2000). Reporting volleyball player's physiologic factors can present standards for coaches to choose the best player and the best training programs according to different player's position. Current information regarding physiological profiles is necessary to provide a quantifiable basis for the development and maintenance of conditioning and training programs. Hence, this research describes the elite volleyball player student's physiological features in three different positions (spiker, libero and
passer). Knowing these subjects helps coaches to organize accurately the better specific volleyball's exercise programs and control the athletes' training and their performance and then, reinforce the programs.

**MATERIALS AND METHODS**

The population in this study contains all men volleyball player students of 4th district of Islamic Azad university tournament in 2012. During this study 31 players randomly selected including 6 passers (19.3%), 4 liberos (12.9%) and 22 spickers (70.9%) with 24.52±2.69 year old age and 8.39±3.14 years sport’s experience and they filled the personal information Questionnaire with complete contentment.

**Measurements**

Aerobic capacity: Conconi test used for aerobic capacity measurement in this study (Conconi et al., 1982; Conconi et al., 1996). Participants should do the warm up stage on treadmill with 4 km per hour speed for 5 minutes after that the test begins with 6 km per hour speed for start then 0.5 km/hour addition of speed for each 200 meter pass. During the test heart beat should be measure and record constantly each 5 sec with Polar. When participants' heartbeat showed break, the information such as heartbeat and equivalent anaerobic threshold rate will be record in the device. And when the diagram arrives to the plateau stage, the heartbeat speed will record as equivalent aerobic threshold (Villamil, Martinez, Valle, 2011; Nikouie et al., 2007). In this study the unit of participants' Vo2max is measured in ml/kg min⁻¹.

Anaerobic capacity: using the Ergojump-15s the anaerobic capacity was measured in this study. For this purpose the participants should jump with his both feet on the force plate with his maximum power in 15 seconds. The force plate will show a number which equals to the anaerobic capacity of the participants in Watt for each kg of the body weight.

**Position:** Position means the area each player, plays his role in it. In this study there are three positions as Spiker, Libero, and Passer.

Data analyzed using descriptive statistic methods of average and standard deviation for summarization and classification of physiologic features information among passers, liberos and spikers. All data analyzed using Excel software.

**RESULTS**

Table 1 shows the personal information of participants divided by different positions.

<table>
<thead>
<tr>
<th>Features (unit of measurement)</th>
<th>Spiker (N=22)</th>
<th>Libero (N=4)</th>
<th>Passer (N=6)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (cm)</td>
<td>193.95±5.37</td>
<td>177.50±7.60</td>
<td>188.00±3.34</td>
<td>182.15±12.11</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>88.28±7.49</td>
<td>74.50±9.54</td>
<td>84.83±6.52</td>
<td>75.56±13.41</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>23.44±1.51</td>
<td>23.56±1.48</td>
<td>24.00±1.73</td>
<td>22.57±1.81</td>
</tr>
</tbody>
</table>

Data reported as Mean±SD.

According to table 1 Spikers have the most height (193.95±5.37) and weight (88.28±7.49) and Liberos have the lowest height (177.50±7.60) and weight (74.50±9.54). Table 2 shows student elite volleyball players’ physiologic features information.
Table 2. Data related to physiological abilities of participants.

<table>
<thead>
<tr>
<th>Features (unite of measurement)</th>
<th>Spiker (N=22)</th>
<th>Libero (N=4)</th>
<th>Passer (N=6)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic capacity (ml/kg min⁻¹)</td>
<td>39.38±7.71</td>
<td>39.88±6.65</td>
<td>41.13±3.32</td>
<td>40.72±4.12</td>
</tr>
<tr>
<td>Anaerobic capacity (watt/kg)</td>
<td>47.00±14.30</td>
<td>42.66±6.43</td>
<td>39.25±8.09</td>
<td>43.96±9.95</td>
</tr>
</tbody>
</table>

Data reported as Mean±SD.

The results of anaerobic capacity for spikers, liberos and passers were 47.00±14.30 ml/kg min⁻¹, 42.66±6.43 ml/kg min⁻¹ and 39.25±8.09 ml/kg min⁻¹ respectively. The result for aerobic capacity shows spikers 39.38±7.71 watt/kg, passers 41.13±3.32 watt/kg and liberos 39.88±6.65 watt/kg.

**DISCUSSION AND CONCLUSION**

The results showed that the anaerobic capacity of Iran's national students men volleyball team was 43.96±9.95 watt/kg. The anaerobic capacity of spikers (47.00±14.30 watt/kg) was more than liberos and passers (42.66±6.43 watt/kg and 39.25±8.09 watt/kg respectively). It seems spikers because of jumping more than passers and liberos during the game have higher anaerobic capacity.

The research results indicated that \( \text{Vo}_{2\text{max}} \) in passers (42.25±9.45 ml/kg min⁻¹) was more than liberos (39.88±6.65 ml/kg min⁻¹) and spikers (39.38±7.71 ml/kg min⁻¹) for aerobic capacity. These results are consonant with (Duncan, Woodfield, al-Nakeeb, 2006, England)'s results. The aerobic capacity of Iran's national students men volleyball team was 40.72±4.12 ml/kg min⁻¹ and 69.73±3.82 ml/kg min⁻¹ for Indian elite male volleyball players (18-25 years old) and 50.6±1.4 ml/kg min⁻¹ for Australian elite male volleyball players (Gabbett & Georgieff, 2007). In some studies elite volleyball player's \( \text{Vo}_{2\text{max}} \) was reported 45.2 ml/kg min⁻¹ or more, and some other studies calculated 44.2 and 41 ml/kg min⁻¹ or more. For example \( \text{Vo}_{2\text{max}} \) for elite Canadian and American volleyball players reported 56.7 ml/kg min⁻¹ and 48.8 ml/kg min⁻¹ respectively (Gabbett, 2007). However genetic, continental, cultural and economic conditions can have different influences on physiologic factors of the body (Wilmore & Costill, 1999). The coaches' philosophy is effective too, because some coaches pay more attention on speed and reactions in modern volleyball and this distracted them from focusing on aerobic preparation. However according to \( \text{Vo}_{2\text{max}} \) of volleyball players all positions are in favorable condition in this study.

**REFERENCES**


