A Study of Hand Dimensions and Hand Grip Strength between Adolescent Basketball and Volleyball Players

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Abstract: The purpose of this study was to compare the hand dimensions and grip strength between adolescent basketball and volleyball players. The present study was conducted on a sample of sixty (N=60) subjects, which includes thirty each, basketball players (N₁ = 30) and volleyball players (N₂ = 30) of age group 15-18 years were selected from different schools affiliated to Punjab School Education Board, Punjab, India. The purposive sampling technique was used to select the subjects. All the participants were informed about aim and methodology of the study and they volunteered to participate in this study. All the participants were assessed for height, weight, hand length, hand span and hand grip strength. The height of the subjects was measured with anthropometric rod to the nearest 0.5 cm. The weight of subjects was measured by using portable weighing machine to the nearest 0.5 kg. The hand dimensions were measured for each subject by standard tools and techniques. The hand grip dynamometer with adjustable grip was used to measure right & left hand grip strength in kg. The independent samples t-test was applied to assess the differences of hand dimensions and grip strength between basketball and volleyball players. Results indicated that basketball players had significantly greater values in left hand length (p<0.05), left hand span (p<0.05), right hand grip strength (p<0.05) and left hand grip strength (p<0.05) as compared to volleyball players. Keywords: Hand dimensions, grip strength, basketball, volleyball, players.

I. INTRODUCTION
Volleyball and basketball are among the world’s popular sports, played practically in every nation at varying levels of competence (Gaurav et al., 2010). These sports require excellent upper extremity power and hand grip strength. In order to evaluate the physical characteristics of the hand, the grip strength was chosen as one of the indicators of hand functions (Koley et al., 2010). The strength of a hand grip is the result of forceful flexion of all finger joints, thumbs, and wrists with the maximum voluntary force that the subject is able to exert under normal biokinetic conditions (Richards et al., 1996; Bohannon, 1997; Barut et al., 2008), which uses several muscles in the hand and the forearm (Bassey & Harrie, 1993). Hand grip strength plays an important role to predict the performance in various sports activities especially in baseball (Hughes et al., 2004), tennis (Lucki & Nicolay, 2007) and in cricket (Koley & Yadav 2009). Also, volleyball requires a sustained level of hand grip strength to maximize control and performance (Blackwel et al., 1999). Grip strength is often used as an indicator of overall physical strength (Massey-Westrop et al., 2004; Foo, 2007), hand and forearm muscles performances (Nwuga, 1975). Handgrip strength access the muscular strength of an individual (Foo, 2007). Hand length has the significant effect on the grip strength (Koley et al., 2010). Handgrip strength is important for catching and throwing the ball in different team sports (Fallahi & Jadidian, 2011). Hand dimensions are the most important hand anthropometric variables in relation to handgrip strength (Visnapuu & Jurimae, 2007). Basketball and volleyball are sports branches that required mainly the use of hand. The action of overhead passing, throwing, shooting, spiking and blocking places significant demands on the hand. The hand morphology and functional properties play an important role in performance (Faraji et al., 2014). However, the hand anthropometric study of the basketball and volleyball players remains largely unreported. Therefore, the purpose of this study was to compare the hand dimensions and grip strength between junior basketball and volleyball players.

II. MATERIALS AND METHODS
Subjects: A sample of sixty (N=60) subjects, which includes thirty each, basketball players (N₁ = 30) and volleyball players (N₂ = 30) of age group 15-18 years were selected from different schools affiliated to Punjab School Education Board, Punjab, India. The purposive sampling technique was used to select the subjects. All
the participants were informed about aim and methodology of the study and they volunteered to participate in this study.

**Methodology**: The age of the subjects were obtained from the records of their respective schools. All measurements, viz. height (cm), weight (kg), hand length (cm) and hand span (cm) were measured for each subject by standard tools and techniques suggested by Sodhi, (1991).

**Body Mass Index (BMI)**: BMI was calculated by the formula of; Body Mass Index = Weight/Height².

**Grip Strength Test**: A calibrated hand dynamometer with adjustable grip was used. The best result was the score recorded in kilograms (Singh, 2014).

**Statistical Analyses**: Values are presented as mean values and SD. Independent samples t tests were used to test if population means estimated by two independent samples differed significantly. Data was analyzed using SPSS Version 16.0. The level of significance was set at 0.05.

### III. RESULTS

**Table 1. Demographic Characteristics of Basketball and Volleyball Players.**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Basketball Players (N₁ = 30)</th>
<th>Volleyball Players (N₂ = 30)</th>
<th>Mean Difference</th>
<th>SEDM</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (cm)</td>
<td>177.17 (4.42)</td>
<td>173.20 (3.65)</td>
<td>3.97</td>
<td>1.05</td>
<td>3.790*</td>
</tr>
<tr>
<td>Weight(kg)</td>
<td>72.00 (5.05)</td>
<td>71.40 (5.96)</td>
<td>0.60</td>
<td>1.43</td>
<td>0.421</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>22.65 (1.52)</td>
<td>24.03 (1.90)</td>
<td>1.38</td>
<td>0.44</td>
<td>3.091*</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level

Table 1 depicts the demographic characteristics of basketball and volleyball players. The mean height of basketball players was 177.17 cm and volleyball players were 173.20 cm. The mean weight of basketball players was 72.00 kg and volleyball players were 71.40 kg. The mean value of body mass index of basketball players was 22.65 and volleyball players were 24.03.

**Table 2. Comparison of Hand Dimensions and Grip Strength between Basketball and Volleyball Players.**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Basketball Players (N₁ = 30)</th>
<th>Volleyball Players (N₂ = 30)</th>
<th>Mean Difference</th>
<th>SEDM</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right hand length (cm)</td>
<td>20.18 (0.41)</td>
<td>20.03 (0.36)</td>
<td>0.15</td>
<td>0.10</td>
<td>1.520</td>
</tr>
<tr>
<td>Left hand length (cm)</td>
<td>20.10 (0.37)</td>
<td>19.90 (0.37)</td>
<td>0.20</td>
<td>0.10</td>
<td>2.068*</td>
</tr>
<tr>
<td>Right hand span (cm)</td>
<td>20.69 (0.45)</td>
<td>20.60 (0.37)</td>
<td>0.09</td>
<td>0.11</td>
<td>0.874</td>
</tr>
<tr>
<td>Left hand span (cm)</td>
<td>20.67 (0.41)</td>
<td>20.45 (0.38)</td>
<td>0.22</td>
<td>0.10</td>
<td>2.196*</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level

Table 2 presents the comparison of hand dimensions between basketball and volleyball players. Results indicated that basketball players had significantly greater values in left hand length (p<0.05) and left hand span (p<0.05) than the volleyball players. Basketball players had more values in right hand length and right hand span as compared to the volleyball players but no significant difference were observed between basketball and volleyball players.

**Table 3. Comparison of Hand Grip Strength between Basketball and Volleyball Players.**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Basketball Players (N₁ = 30)</th>
<th>Volleyball Players (N₂ = 30)</th>
<th>Mean Difference</th>
<th>SEDM</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right hand grip strength (kg)</td>
<td>30.95 (0.39)</td>
<td>29.94 (0.39)</td>
<td>0.99</td>
<td>0.10</td>
<td>9.926*</td>
</tr>
<tr>
<td>Left hand grip strength (kg)</td>
<td>29.86 (0.48)</td>
<td>28.86 (0.48)</td>
<td>1.00</td>
<td>0.12</td>
<td>8.074*</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level

Table 3 depicts the comparison of hand grip strength between basketball and volleyball players. Results indicated that basketball players had significantly greater values in right hand grip strength (p<0.05) and left hand grip strength (p<0.05) as compared to volleyball players.

### IV. DISCUSSION

In the present study the hand dimensions and hand grip strength of basketball and volleyball players have been evaluated and compared with each other. The study indicates the existence of differences between basketball and volleyball players with regard to hand dimensions and hand grip strength. The demographic characteristics of basketball and volleyball Players show that basketball players were taller and heavier as compared to the volleyball players. Similar findings were found in the study on Indian male players (Gaurav et al., 2010) which reported that the height of basketball players was greater when compared to volleyball players. On the other...
hand basketball players had more right hand length, left hand length, right hand span and left hand span as compared to volleyball players. Koley et al. (2010) stated that hand length has the significant effect on the grip strength. Passing, dribbling and shooting are the fundamentals of basketball, which requires adequate strength of the upper extremity (Koley et al., 2010). It is indicated that hand dimensions may influence handgrip strength and players have biomechanical advantages (Fallahi & Jadidian, 2011). The findings of the present study indicated that basketball players had significantly greater values in right hand grip strength and left hand grip strength as compared to volleyball players. It is suggested that handgrip strength is important in basketball as various movements rely on the continuous use of wrist and digits flexor muscles when catching, holding, shooting and throwing the ball (Chahal & Kumar, 2014). Fallahi and Jadidian (2011) observed that handgrip strength and some of the hand dimensions may be different in athletes who have handgrip movements with an opponent in comparison to non-athletes. Barut et al.(2008) found that in basketball and volleyball players’ hand dimensions have the significant relationship with the grip strength. In our study superior values of right and left hand dimensions right and left hand grip strength were observed as compare to the previous studies conducted earlier (Barut et al.,2008; Chahal & Kumar, 2014).

V. CONCLUSIONS

There were significant differences in all of the hand dimensions (hand length and hand span) and hand grip strength between the basketball players and volleyball players. On average, basketball players were taller and had more weight than volleyball players. It is concluded from this study that basketball players had longer right and left hand length, right and left hand span and also more value in right and left hand grip strength as compared to volleyball players. More data would be helpful on the above studied variables along with physiological variables to assess relationship among them and with performance in volleyball and basketball.

REFERENCES