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RESEARCH ARTICLE

JUMPING PERFORMANCE AND HAND GRIP STRENGTH BETWEEN SMASHER AND SETTER U-17 VOLLEYBALL PLAYERS

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Abstract

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The purpose of the study was to compare jumping performance and handgrip strength between smasher and setter players in volleyball. Fifty male U-17 volleyball players (Smashers: $N_1=25$ and Setters: $N_2=25$) selected from different schools of Punjab, India. All the participants were informed about aim and methodology of the study and they volunteered to participate in this study. 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 vertical jump test was used to assess jumping performance and hand grip dynamometer with adjustable grip was used to measure right and left hand grip strength in kg. The independent samples t-test was utilized to assess the differences between smasher and setter players. The results of present study indicated that smasher had significantly greater jumping performance (p<0.05) and right and left hand grip strength (p<0.05) than setter players.

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INTRODUCTION

Volleyball requires a lot of jumping and hand grip strength. The main purpose of volleyball players is achieving greater height on the net (Stec & Smulsky, 2007). Smasher plays in front of the net, performing spike and block (Duncan et al., 2006). Lower limb muscle power, expressed by the numerous jumps performed during the games, which are important both for the attacking and blocking actions (Sheppard et al., 2007; 2008; 2009). The players jump to spike and block in the game, so jumping is a very important physical performance (Zhong & Huang, 1989). Vertical jump is most frequent element during the volleyball game (Harman et al., 1990). Players jump as vertical as they can during various defenses and offence maneuvers (Papageorgiou & Spitzle, 2003). According to Sheppard et al. (2007) jumping acts per set varied according to the players' position and the type of jump they performed: setters performed 11-21 jump sets per set and smasher players performed 1-15 spike jumps and 1-13 block jumps. On the other hand, strength is very important parameter for making technical movements related to volleyball skills. The ability to generate high levels of upper-body muscular strength during spiking and serving is an important attribute of volleyball players (Gabbett et al., 2006). 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). During a volleyball match, players are involved in various skills such as; defensive and offensive jumps and blocks where strength and power are required (Gonzalez-Raveet al., 2011). Therefore, the aim of this study was to examine the jumping performance and hand grip strength of U-17 volleyball players between smasher and setter positions.

MATERIALS & METHODS

Subjects:

A total Fifty male U-17 volleyball players (Smashers: $N_1=25$ and Setters: $N_2=25$) selected from different schools of Punjab, India. All the participants were informed about aim and methodology of the study and they volunteered to participate in this study. The purposive sampling method was used to select the subjects for the present study. The age of each subject was calculated from the date of birth as recorded in his school.

Methodology:

Height measurements were taken by using the standard anthropometric rod to the nearest 0.5 cm. Taken values were recorded in 'cm'. The subject's weight was measured with portable weighing machine to the nearest 0.5 kg. Measurements were recorded in 'kg'. BMI was calculated by the formula of; Body Mass Index = Weight/Height². The vertical jump test (Fleishman, 1964) was used to assess jumping performance of the legs. A calibrated hand dynamometer with adjustable grip was used to assess the hand grip strength. 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.

RESULTS

Table-1. Demographic Characteristics of Smasher and Setters U-17 Volleyball Players.

| Variables | Smas (N ₁ = | shers = 25) | $(N_1 = $ | ters = 25) | Mean | SEDM | t-value | |
|-------------|---------------------------|----------------|-----------|---------------|--------------|------|---------|--|
| | Mean SD | | Mean | SD | D Difference | | | |
| Height (cm) | 176.16 | 4.14 | 171.32 | 3.35 | 4.84 | 1.07 | 4.544* | |
| Weight(kg) | 71.12 | 6.43 | 69.52 | 5.29 | 1.60 | 1.67 | 0.961 | |
| BMI | 22.96 | 1.65 | 23.68 | 1.81 | 0.72 | 0.49 | 1.478 | |

*Significant at 0.05 level

Table-1: depicts the demographic characteristics of smasher and setters U-17 volleyball players. The mean height of smasher players was 176.16 cm and setter players were 171.32 cm. The mean weight of smasher players was 71.12 kg and setter players were 69.52 kg. The mean value of body mass index of smasher players was 22.96 and setter players were 23.68. Results indicated that smasher players have significantly greater values in height (p<0.05) as compared to setter players.

| Table-2. | Comparison | of | Vertical | Jump | and | Hand | Grip | Strength | between | Smasher | and | Setters | U-17 |
|----------|-------------|----|----------|------|-----|------|------|----------|---------|---------|-----|---------|------|
| Volleyba | ll Players. | | | | | | | | | | | | |

| Variables | Smashers (N ₁ = 25) | | Set (N ₁ : | ters = 25) | Mean | SEDM | t-value |
|----------------------------------|--|------|--------------------------|---------------|------------|------|---------|
| | Mean | SD | Mean | SD | Difference | | |
| Vertical Jump Test (cm) | 48.16 | 1.40 | 45.16 | 1.40 | 3.00 | 0.40 | 7.551* |
| Right Hand Grip Strength (kg) | 28.92 | 0.38 | 27.92 | 0.38 | 1.00 | 0.11 | 9.260* |
| Left Hand Grip Strength (kg) | 27.85 | 0.50 | 26.85 | 0.50 | 1.00 | 0.14 | 7.129* |

*Significant at 0.05 level

Table 2 depicts the comparison of vertical jump and hand grip strength between smasher and setters U-17 volleyball players. Results indicated that smasher players have significantly greater values in vertical jump test (p<0.05), right hand grip strength (p<0.05) and left hand grip strength (p<0.05) as compared to setter players.

DISCUSSION & CONCLUSIONS

In volleyball, each playing position requires a varying game skill. In the present study the jumping performance and hand grip strength of U-17 volleyball players have been evaluated in relation to their playing positions (i.e., smasher and setter). This study indicates the existence of differences between smasher and setter players. The overall results show that smasher players were taller and heavier as compared to the setter players. These differences in height and weight could be the result of different technical and tactical demands placed on players in different positions (Duncan et al., 2006). The mean height of the smasher (176.16±4.14 cm) volleyball players in the present study is greater than the volleyball players of West Bengal, India(173.10±4.19 cm) reported by Bandyopadhya (2007). The taller player in volleyball has an advantage because they can easier control both, defensive and offensive actions over the top of the net (Hadzic et al., 2012). Measuring vertical jump performance important since jumping is essential for performing blocking and spiking skills in a volleyball match (Lidor & Ziv, 2010). The results of the present study revealed that smasher players had better vertical jump height than setter players. It is suggested that maximum jump is one of the necessary components for spike and blocks during volleyball game (Gaurav & Singh, 2014). In this study, smasher players' mean vertical jumping height value was found to be (48.16 ± 1.40 cm) while setter players' male value was (45.16±1.40 cm). The results of the present study in line with the literature report of Gaurav et al.(2015), they observed that the U-19 spiker (57.33±6.11 cm) player (in the present study know as smasher) had better vertical jump height as compared to setter (52.00 ± 2.33 cm) players in volleyball. The findings of the present study are dis-agreed with the studies of some authors (Margues et al., 2009; Duncan et al., 2006). these studies found no differences in jumping capacity between playing positions among volleyball players. In this study, right hand grip strength of smasher players was found to be 28.92 kg, while left hand grip strength of smasher players was found to be 27.85 kg. In case of setter players right hand grip strength was found to be 27.92 kg, while left hand grip strength was found to be 26.85 kg. The hand grip strength values in the present study are greater than the previous studies. Kurkcu et al. (2008) observed that 10-11 years old male volleyball players' right hand grip strength was found to be 11.28 kg while their left hand grip strength was found to be 11.28 kg, and Chahal and Kumar (2014) examined the hand grip strength of junior male basketball players age ranging from 10-16 years, they observed that the right hand grip strength value was 25.83 kg and left hand grip strength was 27.40kg. It is concluded from this study that the smasher players were taller and heavier and also had more value in vertical jump performance, right and left hand grip strength as compared to setter players.

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