THE RELATIONSHIP OF ANTHROPOMETRIC FEATURES AND BODY COMPOSITION WITH THE PERFORMANCE OF ADOLESCENT GENIUS VOLLEYBALL PLAYERS OF IRAN

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ABSTRACT

The aim of current study is to determine the relationship of anthropometric features and body composition of Iran adolescent genius volleyball players with their performance.

25 in touch adolescent genius volleyball players were selected purposely. Anthropometric features included: height, weight, BMI, sitting height, length of 2 arms, and also body composition included: body fat percentage and muscular mass, were all measured. The performance of players included service, on-net defense and spike that were specified through analyzing their exhibition. To study the relationship among the variables, one used Pierson correlation factor test in a significant level of P ≤0.05.

A significant relationship was observed among height, weight, sitting height and length of the arms, with performance of spike, defense but not service in adolescent genius volleyball players (P<0.05), so that by increasing height, weight, sitting height and length of the arms, the performance of spike and on-net defense increases in these players. Also a significant relationship was observed between BMI with spike performance but not defense and service (P< 0.05). As BMI has increased, the spike performance increased in adolescent genius volleyball

players. In contrast, no significant relationship was observed among body fat percentage and muscular mass with the performance of volleyball players (P>0.05).

We can conclude that, by increasing the stature features, the performance of spike and on-net defense increases in these players. These stature features probably are determinant not back of field but in on-net defense. And probably body composition is not related to the performance.

Keywords: Volleyball, Anthropometric, Body Composition, Sport Performance and Spike

INTRODUCTION

Optimum performance of athletic skills is based on complex interaction of the factors such as physiologic, anthropometric, psychological, and dynamic environment together. The necessity and pre condition thing for the athletic achievement is to have body abilities such as certain anthropometric features. Getting familiar with anthropometric features is one of the important factors for the athletes. When an athlete compares himself with other athletes, these features play important roles in reforming his weak points, and also help to design a correct exercise plan **[1].**

Some surveys have studied the relationship of anthropometric features with different sports, and it is believed that, these features influence the performance, so they are used for selecting players **[1,2,3].** Height and weight are the important parts of anthropometric features, that are used for athletic and medical surveys, and also are worthy in determining athletic norms in different sport fields. For instance comparing current weight with previous weight is important in many sport fields. Moreover some proofs based on type of performance can be obtained by comparing fat percentage with body weight. We can get useful information about choosing sport field for kids and adolescents by combining factors such as height, weight, age and gender **[4].**

Detecting body features play an important role in athlete's success. For example, the importance of player's stature in some team sport, like volleyball and basketball is accepted and we know, the body height has positive effects on whole body component length, and it can influence on athlete's performance itself **[5].** Different surveys have studied the relationship of body features in volleyball players. In one survey, it is indicated that, biological features of aged volleyball players have much differences with young players which mostly depend on their biological age **[6].** In mentioned survey, no significant difference observed in the weight of those 2 groups although, aged

players were 10 cm shorter, so their BMI was more **[6].**

Another survey has studied the league a volleyball players in Brazil. The performance level of Brazilian volleyball players was not influenced by age. The results have shown that experienced players have not had better performance than younger's; it means that age has no impact on volleyball players' performance **[7].** There is a positive relationship between volleyball skills with background of playing (age), it means however the playing experience is more, and the success factor in the performance would increase. On the other hand, recent surveys have shown that there was no significant difference in vertical jump and movement speed in genius and amateurs. In a survey, the relationship of some body features have been studied, such as height, weight, age with vertical jump and concluded that, age and height have positive effects on the performance of vertical jump while, the weight has no effect on vertical jump, but instead, the body fat percentage has a significant effect on the performance of vertical jumps **[8].**

There is a significant positive relationship in performing of service skills with anthropometric features such as height, weight and bust height, that means when the height is higher and body mass is more, there would be more success achievements because of precise performance and better service skills. Moreover there is a positive relationship among claw skills with height and weight that would be a good reason for the importance of premier body features in successful performance of volleyball skills **[9].** In some studies, only mass and body height are reported and in some others, only body composition indexes are mentioned, and a few of these studies have investigated the body structure variables. So the surveys that detect these body relations and clarify their role with the performance are few or at least inadequate in volleyball.

Therefore, the aim of current study is to determine anthropometric features and body composition of adolescent genius volleyball players with their performance in Iran.

SUBJECTS AND METHODS

After coordinating with Iran volleyball federation, 25 in touch, adolescent and genius volleyball players were selected as objects. According to previous coordination with the athletes and coaches, their performance scores such as spike, service and on-net defense were recorded based on computer analyzing. Then anthropometric features and certain body composition such as weight, height, BMI, body fat percentage,

muscular mass, sitting height and length of the arms were measured for 25 participants.

It is necessary for athletes to get familiar with their nutrition recommendation the day and before the test and also day test. At the end, the correlation between anthropometric features and body composition with skill performance was measured with stature meter and digital scale. The BMI was also measured by weight/height^2 (m). Sitting height by scaled wall, the length of arms by Arm Stan, body fat percentage and muscular mass by body composition set have been measured. The direct spike point, service point and on-net defense point were obtained by computer analyzing.

Pierson correlation factor is used to study the relationships among predictor and basis variables in a significant level (P≤0.05).

RESULTS

The average and scale deviation of survey are presented in table 1. Also the results of Pierson correlation factor test are in table 1.

There was significant relationship between the height and spike and also between the height and defense (P=0.001). There was significant relationship between the height and service (P=0.93). There was significant relationship between the weight and spike,

and also between weight and defense (P=0.001), but the relationship was not significant between weight and service (P=0.94). A significant relationship was between BMI and spike (P=0.001), but no significant relationship was between neither, BMI and defense (P=0.08) nor BMI and service (P=0.54). No significant relationship was among body fat percentage and muscular mass with the performance (P>0.05). A significant relationship was between sitting height and spike, and also between sitting height and defense (P=0.001), but no significant relationship was observed between sitting height and service (P=0.64). The relationship was significant between the length of arms and spike, and also between the length of arms and defense (P=0.001), but no significant relationship was observed between the length of arms and service (P=0.57).

In fact, the results have shown that by increasing height, weight, sitting height and length of arms, the performance of spike and on-net defense increases in adolescent genius volleyball players. Meanwhile, by increasing BMI, the performance of spike increases in these players.

Table 1: Average and scale deviation of survey data

Variables	Scale deviation ± average
Age (year)	17.92 ± 0.81
Height (cm)	194.88 ± 6.18

Weight (kg)	**87.20 ± 6.24**
BMI (kg / m^2)	**23.19 ± .041**
Fat percentage	**13.59 ± 2.19**
Muscular mass (kg)	**69.91 ± 4.99**
Sitting height (cm)	**105.4 ± 5.87**
Length of arms (cm)	**186.12 ± 6.53**
Spike	**50.92 ± 6.14**
Service	**47.84 ± 8.70**
Defense	**-0.36 ± 17.81**

Table 2: Results of Pierson correlation factor in order to study the relations among the variables

Predictor variable	Scale variable	R	P
Height	Spike	0.88	*0.001
	Service	0.018	0.93
	Defense	0.68	*0.001
Weight	Spike	0.87	*0.001
	Service	0.016	0.94
	Defense	0.64	*0.001
BMI	Spike	0.65	*0.001
	Service	0.12	0.54
	Defense	0.35	0.08
Fat Percentage	Spike	-0.02	0.91
	Service	-0.15	0.44
	Defense	0.15	0.46
Muscular Mass	Spike	-0.16	0.42
	Service	-0.32	0.10
	Defense	-0.18	0.37
Sitting Height	Spike	0.81	*0.001
	Service	-0.09	0.64
	Defense	0.72	*0.001
Length of Arms	Spike	0.83	*0.001
	Service	-0.11	0.57
	Defense	0.60	*0.001

Significant in level of P≤0.05

DISCUSSION

According to current findings, a significant relationship was observed among weight, height, sitting height and length of arms with the performance of spike and defense, but not service in adolescents genius volleyball players. So, by increasing the height, weight, sitting height and length of arms, the performance of spike and on-net defense increases in the players. Also a significant relationship was observed between BMI and spike performance, but not defense and service. So that by increasing BMI, the performance of spike increases in the players. The observed relationship for weight and BMI is may be because of the effect of increasing height on weight and BMI.

In contrast, no significant relationship was between body fat percentage and muscular mass with the performance of the players. Athlete's success depends on different factors and evaluating some body factors. They themselves cannot include all the factors **[10].** Nevertheless, most of these indexes can predict player's success in sports like volleyball, because they play an

important role in principle skills of this field such as jump, spike and defense **[11].**

Studying the average age of world national teams in national competition, and adolescents, youth and adults' classes, a significant correlation was observed between team's ages with their achievements **[12].** According to most researchers, experienced teams have more chance for success. The stature length is the important body factor in volleyball **[13,14].** Salimi et al (2009) has researched 1536 players from 128 national teams which had attended in national competitions, and the stature average difference of youth, adolescents and youth-adult class were respectively 1.30 cm and 1.29 cm **[12].** On the other hand some coaches and sport scientist believe that, taller and heavier athlete's heredity is slow in speedy movements **[15].** So that according to game necessities (agility and speed), coaches should select taller players that are evaluated in speedy features **[16].**

Gabbett and Georgieff (2007) have studied accessible height index in the talented discovery comprehended plan of Queensland athletic academy on 153 Australian adolescents in three classes of national, league and amateurs and have reported the average index, respectively 256.4, 250 and 248.2 **[17].** Trajković et al (2011) also has studied this index for under 16 Serbian national team and has reported the index 253.21±9.53 **[18].** You and Huang (2000) have expressed that, the length of arms has consistency with most volleyball technique skills, especially hitting the ball. Also for maximum use of created speed when turning the hand, players with longer arms have better advantage **[19].** High fat percentage has a negative role in the performance of athletes. Petroski et al (2013) have studied body index of Brazil national teams since 1995 till 2005 and expressed increasing body mass and decreasing fat percentage, the reasons for morphological changes of players **[20].**

Also, according to surveys in universal competitions since 2003 till 2011, the BMI are posed in participant teams with fixed average of 21.3±0.8 **[21].** This expresses that BMI can be one of the proper chosen indexes in national stage for adolescent. In most surveys, it is reported that body composition have more relationship with the sport field and high level of body fat is a limited factor in performing some of athletic skills; but in some other, fat percentage ends up to success in the performance **[22].**

Proper body composition values in athletes are very important because, over atrophy (underweight) and having necessary fat, may

damage their best performance **[23].** Today, body composition evaluation methods have provided good information for all people, especially for coaches and athletes **[24].** Using these methods have some advantages such as creating seasonal exercise plan, knowing physiological fitness level of different sport fields in professional class, helping to body ratios recognition and changes during the exercise period and getting informed about weight control principles, especially in sports which weight is important **[25]**. Although, the size and whole body weight are important, body composition is more important **[26].** The factors such size and body composition with performance indexes of movement skills, playing an important role for people who want to choose certain sport field **[27].** Researchers have pointed that, long time sport activities have a direct relationship with decreasing in subcutaneous fat **[28].**

Wilmore has expressed that, whatever fat percentage would be higher in athletes, they have undesirable situation in performing activities. This condition is more important, especially when the body detaches from the floor **[29].** Like volleyball, Krill has calculated the 50 % correlation factors between body qualities (height and weight) and the athlete's motion-physical activities

that indicated, the inborn factors can be effective in body efficiency of people; Cortion et al (1975) have studied the boys and concluded that, there is 35% of correlation exists among age, height and weight with body tests results **[30].** Kalagen and Broha (1964) have expressed their research results that, weight and height have reverse relationship with physical abilities test. The only positive relationship was observed between weight and height with contracting the hand's fingers muscles **[31].** Slater has studied 68 children between 7-12 years old and considered the relationship among physical fitness and variables like height, weight and fat percentage. The 1600 meters, 540 m, 45m and pair foot length jump and vertical jump tests are used to compare physical motion fitness.

The relationship among variables associated with height, age and fat percentage, was in a way that corpulent bodies significantly had negative correlation with jump and running, and thin bodies had positive relationship with jump, but totally, the relation of these variables was little with test subjects **[32].** The surveys have shown that, anthropometric and body composition are effective in initial identification of the athlete, talent discoveries, skill improvement and their physical- movement performance **[33,34,35].**

As it gives principle and special information about movement features and increasing skill level and performance for reaching to higher level of sport performance and success to the coaches and athletes **[36].**

Volleyball is the fastest world sport that requires high physical attempt in the shortest time during the exhibitions and trainings **[37,38].** So according to the nature of this sport field, it has different and individual body composition in compare with other sports **[33,39,40,41].** Currently, anthropometric features (height, weight, BMI and etc) and body composition measurement such as body fat percentage, fat weight and fatless weight are used for identifying talented adolescent and young volleyball players that are talented to their physical performance such as jumping ability, agility, strength, speed, flexibility and explosive power **[33,37,38,39,41].** So, this could be effective for physical performance, low body fat and proper muscle weight **[38,42].** Because high body fat causes relative strength decreasing in athletes and their weak performance **[14,42].**

Wilmore and Felk have recommended that, men's body fat should be 11-12% and in women should be 16-25%, depends on sport activity **[14,38].** BMI is a valid index for body composition measurement and people's obesity scale based on the height and weight, and this is the main reason for dividing people into different weight groups in different sport fields. So BMI is a scale for evaluating people in participating in different sport competitions and should not use it for evaluating body fat value, because it does not separate fat weight and fatless weight from each other **[43].**

Anthropometric indexes are mentioned as the important factors in volleyball, and it is believed that the indexes like height, body mass and length of organs are important factors in determining proper talent for volleyball **[8].** It is expressed that, whatever the height be higher and body mass be more, more success could be achieved, because the performing service skills are more accurate and better. Moreover, there is a positive relationship among claw skill with height and weight, and this is the reason for the importance of body superior features in performing volleyball skills successfully. There is positive relationship between player's height and height of their jump. In recent decades, the height index is confirmed as the most important part for anthropometric index **[8].** Although in current research, a significant relationship was observed among anthropometric features with spike, defense but not service. There was no significant

relationship observed between body composition and volleyball performance. Obviously, we still require more researches to get more accurate results.

CONCLUSION

According to current findings, it is concluded that, by increasing the stature features, the performance of spike and on-net defense would increase in adolescent genius volleyball players of Iran. Probably, these stature features are determinant in on-net performance but not back of field. Also body composition probably is not related with the performance. It is recommended to consider the stature features such as height, sitting height and length of arms in volleyball.

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