



## RELATIONSHIP BETWEEN ANTHROPOMETRIC CHARACTERISTICS AND JUMP SHOT SKILL IN FEMALE BASKETBALL PLAYERS

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### Abstract:

The aim of this study was to evaluate the Relationship between anthropometric characteristics and jump shot skill in female basketball players. The statistical population consisted of all adolescent female basketball players in Zahedan. The subjects were included in this study by convenient sampling. 30 teenage female basketball players (15-18 years old) were selected. Measurement of research variables including height, weight, BMI, hip circumference, leg circumference, arm circumference, forearm circumference, hip length, triceps skin fold, under the scapular and biceps fat thickness and jump shot skill were measured using standard tool. For statistical analysis of the data, the Pearson correlation coefficient was used. The results showed a significant relationship between the variables of height ( $P=0.0001$ ) and BMI ( $P=0.006$ ) and shot skill score, but the rest of variables showed no statistically significant difference in terms of shot skill score. While a significant relationship between height and BMI and shooting skills was observed, most of the variables had no significant relationship with shot skill and for clarification of the data in this regard, there need to do more research so that by understanding this information in selection of the players and identifying of talents in basketball and training development programs, useful information would be provided to coaches and athletes.

**Keywords:** anthropometric characteristics, jump shot skill, female basketball players

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## 1. Introduction

Basketball is one of team sports that is very popular at the international level and involves many functional skills (Boni, 2013). In this sport, physical, technical, mental and tactical features are paramount importance and can help basketball players in different positions in defence and attack. Jump shot in basketball is one of the basic skills that is important in winning a basketball game (Cengiz, 2013; Karalejic, 2011). The importance of free throws and turning it into a goal, in particular, three-point shot in determining the outcome of the game has caused this skill to be used to achieve a high percentage of success in the selection of talented players who can play at different times and under various physiological and psychological pressure and have successful shots (Pojskic, 2014; Visnapuu, 2008).

Some elements of the game of basketball such as technical-tactical skills are also influenced by the physical dimensions and subcutaneous fat and are important for success (Erculj, 2010; Semproli, 2007). The results of some studies have shown that the top teams' players have longer height and arm length compared to losing teams (Koley, 2011; Jurimae, 2009). In Basketball, talent finding has an important role in selecting athletes, which can be an important factor in the success and progress of this sport and among the most important factors in the selection of athletes in this sport are anthropometric indices (Stanojevic, 2014; Drinkwater, 2008). Various sports studies have reported that basketball players have special the physiological and anthropometric characteristics. Lack of proper physical conditions affects the performance of a successful basketball player and the difference between athletes importantly affects their performance and morphological factors (Ghalambor, 2012). Anthropometric characteristics are used in various aspects in sports medicine and talent finding. Despite the fact that there is no direct and precise manner for determining the physical structure of a person, however relative determination of it is of great importance in sports science. Therefore, with the help of it, indirect methods have been developed to help specify physical structure relatively accurately (Yavaz, 2012). Also, for best results, performance and improvement of the record in this competition, anthropometric measurement is an important advantage. Physical size is related to the sport's characteristics. In some sports, certain indexes are important; for example, the height in basketball has a more important role (Podmenik, 2014).

The duty of sports talent finders is the ability to choose the desired talent for the sport in question, which, according to most experts and specialists, is an important factor and basic prerequisite for success in the sport. Although neglect of some basic requirements and determining factors, that is called talent finding, doesn't make

success impossible, it will certainly narrow and weaken the possibility (Ladreev, 2015). One of the things that have attracted the attention of researchers and experts in physical education and sports is the relationship between anthropometric factors and sport success. Several studies have examined physical function in adolescents and its differences in terms of age, gender, height, body composition, and other anthropometric characteristics and physical fitness factors; yet different results have been obtained (Arab Momeni, 2013). Anthropometric characteristics of athletes are an important factor in determining the exercise date to the extent that these features are used in selection of young athletes to participate in various athletic competitions (Brunkhorst t, 2013).

Review of literature showed that no study on the relationship between basketball skill abilities and anthropometric characteristics of female basketball players had been conducted and only skills tests have been introduced. Thus, although there are norms in some physical and skill tests of elite international players, given the important role of race and climatic conditions in the scales and success of young players in Iran, and possibly measuring the characteristics of players based on it and given the importance of specific tests for each sport, and use of the related profile in the design of special exercises, and also evaluation of the progress of athletes, in this study, the relationship between anthropometric characteristics in female basketball players and shot skill was studied; therefore, this study aimed to answer the question whether there is a relationship between anthropometric characteristics in female basketball and shot skill.

## **2. Methodology**

In terms of the objective, this research was descriptive of correlational type. The statistical population of this study were all female basketball players in Zahedan. The subjects were included on a voluntary basis (convenient sampling). Of statistical population, 30 teenage female basketball players (18-15 years old) were selected. They had at least 5 years of experience at this level of activity and have at least the presence of at least 3 days per week in basketball practice. Anthropometric indices including weight, height, BMI, hip circumference, leg circumference, arm circumference, forearm circumference, hip length, triceps skin fold, under the scapular and biceps fat thickness measured. In this study, anthropometric indicators were independent variables and basketball shot skills were dependent variables.

**Table 1:** Methods and tools for data collection

Measurement index	Measurement method
Weight	No shoes, sports clothes and measurement is done using standard scale.
Height	No shoes, after a deep breath using a scaled the wall with a tape measure.
Hip circumference	While the subject is in the standing anatomical position, circumference of gluteal muscles is measured from the hip with a tape measure.
Leg circumference	The circumference of the largest part of the leg is measured while standing subject is measured with a tape measure.
MUAC	While the subject is standing, circumference of the most voluminous part of the arm is measured by a tape measure
Forearm circumference	While the subject is standing, circumference of the most voluminous part of the forearm is measured by a tape measure
Hip length	While the subject is in the standing anatomical position, and leg bends to the knee and is placed on the chair so that the angle between the knee and the leg is 90 degrees, and then, the distance between the upper edges of the patella to the groin in the frontal is measured with a tape measure.
Triceps	Vertically and in the middle between the acromion and condyle while the hand is relaxed on the side of the body, it is measured with calipers.
Under the scapula	Diagonally, just below the inferior angle of the scapula, with an angle of 45 degrees from the horizon towards the midline of the body, it is measured using a caliper.
The two ends of the arm	Vertically, on the opposite side of the measuring point of arm triceps, it is measured by calipers.

### AAHPERD basketball shot test

Person stood in the spot on the penalty line and with the desired method, he shot so that the balls enters the ring without hitting the board. This operation was performed 15 times. The test scoring was as follows: every shot directly gotten into the ring out of 15 shots would get two points and every shot gotten into the ring after touching the ring would get one score and if the ball didn't get into the goal without touching the ring, it would get a score of zero, and a maximum of 30 scores could be obtained.

That came up 30 points.

$\text{Weight in kg} \div (\text{height in meters squared}) = \text{BMI}$

Subcutaneous fat was measured using calipers.

### 2.1 Data analysis method

After extracting data, descriptive statistics was used for classification, organizing of data, determining the central indices (mean and median), specifying of dispersion (standard deviation and variance) and drawing tables and charts. To calculate and

analyze data and extract the final results, the statistical method of Pearson correlation coefficient was used.

### 3. Results

The results showed that there is a significant relationship between weight and shot skill points in girls. According to the results, the correlation coefficient between these two variables is inverse and statistically insignificant ( $P= 0.429$ ). There is a significant relationship between height and shot skill points in girls. According to the results, the correlation between these two variables was direct and statistically significant ( $P= 0.0001$ ). There is a significant relationship between BMI and shot skill points in girls. According to the results, the correlation coefficient between these two variables is inverse and statistically significant ( $P= 0.006$ ). There is a significant relationship between leg circumference and shot skill points in female basketball players. According to the results, the correlation coefficient between these two variables is direct and statistically insignificant ( $P= 0.065$ ). There is a significant relationship between arm circumference and shot skill points in female basketball players.

According to the results, the correlation coefficient between these two variables is direct and statistically insignificant ( $P= 0.427$ ). There is a significant relationship between forearm circumference and shot skill points in female basketball players. According to the results, the correlation coefficient between these two variables is direct and statistically insignificant ( $P= 0.767$ ). There is a significant relationship between hip circumference and shot skill points in female basketball players. According to the results, the correlation coefficient between these two variables is inverse and statistically insignificant ( $P= 0.237$ ). There is a significant relationship between subcutaneous fat of the back of upper arm and shot skill points in female basketball players. According to the results, the correlation coefficient between these two variables is direct and statistically insignificant ( $P= 0.561$ ). There is a significant relationship between under the scapular subcutaneous fat and shot skill points in female basketball players. According to the results, the correlation coefficient between these two variables is direct and statistically insignificant ( $P= 0.481$ ). There is a significant relationship between subcutaneous fat of biceps and shot skill points in female basketball players. According to the results, the correlation coefficient between these two variables is inverse and statistically insignificant ( $P= 0.552$ ).

#### 4. Discussion and Conclusion

So far, many studies have been done on the factors affecting the success in basketball. Among the findings is that correct technical skills as well as anthropometric and physical characteristics affect success of basketball players. Since shot is a basic skill in basketball, proper implementation of its technique has always attracted the attention of players and coaches of this sport. The results of researches show that when implementing shot, the biomechanical factors such as speed, launch angle and angular motion are effective in the fruitful ball (Boccolini, 2013; Miller, 1996). The mechanical analysis of shot techniques in theory suggests that the circumference and length of the body organs can affect implementing of shot techniques; however, experimental study of this issue in this research showed that in general, the circumference had no significant effect on the ability of shooting in female basketball players. It should be noted, however, that based on results, height and BMI affected the ability of free throws of subjects, which was statistically significant. The low effect of circumference of organs on the ability of shooting (free throws) in subjects has important implications. First, many anthropometric and biomechanical factors can contribute to fruitful shot. One of these factors is the anthropometric characteristics. The extent of this impact appears to be weak (Nikolaos, 2015). Study and research findings also show that shot is a complex skill in basketball and many factors affect successful implementation of this complex move. Moreover, it can be said that when performing shot skills, opposition of function of organs and the correct use of them take the form of a kinematic chain, so studies show that the involvement of organs and joints with multiple angles and speeds results in the ball getting into the goal (Tsai, 2006).

The main weakness of body mass index as an indicator of obesity is that it ignores a possibility. The possibility that muscle tissue contribute more to increase of weight compared to height contribute than fat tissue, namely, most subjects of greater body mass index had more musculoskeletal mass than increasing obesity given the body height (Cavedon, 2015). Given body mass index is obtained as the ratio of weight to height squared, this index isn't popular among athletes because this index doesn't consider body composition type, and endomorph mesomorph body type is hard to discriminate and in case of equality of height (Zapartidis, 2009). Probably due to being an athlete, and having mesomorph physical form, and in view of the fact that the higher is body mass index in mesomorph people, Since the basketball needs fast movement, excess fat will be a limiting factor for subjects of this research. That's why measuring of body fat and skin fold thickness of basketball players suggests they are thinner than the ordinary people of society. Fat percentage of male players is reported at 3.8-5.13. Lower

league players and European players have a higher fat percentage. Guard players usually have less fat percentage than the other players.

Fat percentage of female players has been reported at 5.19-22.26 (Ghasimi, 2014). Excess fat in the long workouts is considered a negative factor due to the high heat tolerance. Generally, in most sports, high level of body fat a limiting factor in implementing the known skills. In sports that require agility and fast speed, excess fat increases body mass, and according to Newton's second law, motion acceleration is reduced. The results indicated that handball and soccer players, basketball players were taller and heavier and had less body fat percentage compared to badminton, hockey and judo players (Wong, 2009). Researchers have reported that the highest differences between different positions are respectively, height, body mass and ectomorphy body type. Research on basketball show that all three energy systems are equally involved during the game. The nature of basketball skills, such as starting, stopping, jumping, running, throwing, counterattack and ability of shift to attack and defence require both aerobic and anaerobic energy systems. In addition, its explosive skills require high power, speed and agility at a very high level. In other words, basketball is an aerobic game, which involves short and explosive skills of phosphagen system and depending on intensity continuity, lactate system is involved (Ivanovic, 2011). Research shows that today's basketball players are taller and heavier than the past, but at the same time, they are faster than players 20 years ago. Speed of basketball has given much credit to the players who have the ability to run fast, are very agile and have explosive movements. Upper body and hand's strength to receive and control the ball and that of legs for jumping is more necessary (Berdejo, 2012).

Evaluation of the effects of other independent variables in this study also showed that fat percentage of triceps, under the scapula and biceps did not have a significant effect on the ability of shooting. Although high fat percentage is inversely correlated with body efficiency of different athletes, most studies have been reported that the percentage of body fat is associated with the sport as in some sports, the sufficient amount of fat leads to successful performance, while in others, it is a limiting factor of the performance.

Among the limitations of this study was lack of control group, unfamiliarity of subjects with the test and conditions for scientific research and conditions for normal training, control of nutrition, sleep and mental states of subjects. Among the important factors that should be addressed when performing the shot technique are speed of motion and speed of the throw. Since according to biomechanical relations, length and circumference of the body impact on the speed of motion, then the anthropometric characteristics, length and circumference of organs could affect shot technique. Thus, at

the selection of players, for the guard and forward positions, if less consideration is given to the anthropometric characteristics, the main task of the players, which is to earn points through the action of the long shot, may be affected. Therefore, it is essential to study the effectiveness of the anthropometric characteristics, circumference and length of organs, on ability of shooting of the basketball ability, so that some of the questions of the coaches in this regard would be resolved. At the selection of players for the position of guard and forward, coaches can as much as necessary shift their attention from factors of height and length of the limbs to the other factors, which are required for the players in the said positions, such as shot techniques. While a significant relationship between height and BMI and shooting skills was observed, most of the variables had no significant relationship with shot skill and for clarification of the data in this regard, there need to do more research so that by understanding this information in selection of the players and identifying of talents in basketball and training development programs, useful information would be provided to coaches and athletes.

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