

Investigation of the relationship between anthropometric properties and balance performance of volleyball players

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Abstract

Volleyball is a branch played in a relatively small area. Volleyball players have various tasks. During these tasks, keeping the balance plays an important role. Postural control during volleyball actions is very important for players. The main purpose of all sports branches is to continuously improve the physical characteristics necessary for this sport and to improve the performance of athletes. The main purpose of this study is to investigate the relationship between the anthropometric properties and balance performances of elite male volleyball players. In this study, which consists of male volleyball players playing in Turkish Men's Volleyball League (officially called The Efe League) in 2016-2017 season, the balance and anthropometric properties of twelve volunteer male volleyball players who played in MSK URFA (a team in Turkish Men's Volleyball League) in 2016-2017 season were investigated. As a result of the study, no significant relationship was found between balance and anthropometric properties. While the mean blindfolded balance of volleyball players was $1789.67 \pm$, the mean blindfolded squat balance was $2027,00 \pm 768,64$, and the mean dynamic balance was 1178.41 ± 473.36 , it was seen that there is only a low relationship between anthropometric properties of blindfolded balance and leg muscle weight/body weight percentage. There is a moderate relationship between the value of blindfolded squat balance and body mass index (BMI) and low relationship between the value of blindfolded squat balance and body fat index (BFI). It was seen that there is a moderate relationship between dynamic balance and BMI, BFI and leg muscle weight/body weight percentage.

Keywords: Volleyball, Balance, Anthropometry

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Introduction

The main purpose of all sports branches is to continuously improve the physical characteristics necessary for this sport and to improve the performance of athletes (Eylen et al., 2017). Balance can be defined as the body's ability to stabilize itself. Keeping the balance is the basis of complex interaction between visual functions and coordination of muscle activity and movements (Emery, 2003). Balance is also defined as the ability to position the centre of gravity correctly on the support surface during rest and activity (Brachman et al., 2017). Balance is very important for sports branches.

There are basically two types of balance: static and dynamic. Static stability means protecting stable state. Dynamic balance is to maintain balance on the move. Balance control is a fundamental requirement for sport, daily activities and sport (Anderson and Behm, 2005). Balance is the main component of many daily activities and sportive motor skills (Al-Eisa, 2008). Balance is of great importance for athletes' performance. All branches involve a certain balance in their techniques. It is known that balance plays a role in activities such as agility, mobility and pause, adjustment of the body to a certain position while displaying skills. (Taskin et al., 2015). Balance is divided into static and dynamic balance.

Static balance is the case when the net forces acting on an object are in equilibrium with each other and equal to each other. Dynamic balance is defined as the ability of the body to maintain control during the application of a movement. Biomechanically, the support area should be large, the body center of gravity should be close to the ground, and the gravity line should fall into the support area for a good balance (Karadenizli and Türegün, 2017).

Studies conducted have linked weakness in balance performance in both male and female athletes with an increased risk of lower extremity injuries. (Pappas et al., 2007; Hewett et al., 2009; Foss et al., 2014; Matthews et al., 2016). The balance abilities of athletes in different sports pose different challenges in biomedical competence. Therefore, it is necessary to perform a balance test to determine how these athletes perform in the balance test (Bressel, 2007). Volleyball branch is a team sport that involves complex movements and requires constantly moving and versatile skills. Therefore, important physical properties such as balance, endurance, reaction speed, explosive force and fast force emerge as the features that volleyball players should have (Siedentop et al., 2011). When the studies on balance are examined, it is seen that the research investigates the psychological, physiological and physical values required by senior athletes (Taşkın et al., 2015). It has become almost routine to incorporate balance exercises into training programs for athletes from different sports, fall prevention programs and rehabilitation programs for the elderly. Objectives and

benefits appear to be evident, for example, as indicated by performance improvement and injury prevention (Hrysomallis, 2011; Kümmel et al., 2016; Lesinski et al., 2015 act. Brachman et al., 2017). However, the most effective type of training remains unclear, and the frequency, intensity, and duration of exercise that will be most useful has not yet been determined. The main purpose of this review is to determine whether there is a balance education as in good standard as in gold standards in this field (Brachman et al., 2017).

When balance cannot be maintained a short time, the athlete may not perform the desired performance and may also face the danger of sporting injury (Börüklü, 2008). Balance performance is closely related to one's muscle tone, muscle strength and muscle endurance (Howe et al., 2011; Leung et al., 2011). Volleyball is a sport based on dynamic processes. In many studies conducted, it was found that being successful in volleyball branch is directly related to strength, speed, flexibility and low body fat percentage, which is one of the main motoric features (Koç and Aslan, 2010). Body Fat Percentage (BFP) is one of many methods used to determine body composition. According to Falk et al. (1996), it is a condition that negatively affects the excess fat tissue in the body and hence the lack of lean muscle mass and hence the performance for all sports branches. There is an increasing number of studies showing that the correlation between BMI and body fat percentage (BFI) is quite different between populations and there is uncertainty and different findings as to whether this relationship is linear or curved. For example, there is no difference in the relationship between BMI and BFP between whites and blacks living in New York, and the percentage between BMI and BFP is the same between the black population in Nigeria, Jamaica and the United States. Moreover, it was documented that the relationship between BFP and other anthropometric measures is related to ethnic origin, age and species (Akindele et al., 2016). Although there are many studies dealing with balance and body analysis in sports branches (Çon et al., 2012; Gürkan et al., 2012; Taşpınar et al., 2012; Gaurav and Singh, 2014; Taşkın et al., 2015; Akindele and et al., 2016; Göktepe, 2016; Eylen et al., 2017; Kılıç et al., 2018), there is not enough research comparing the balance performance of athletes.

The main purpose of all sports branches is to continuously improve the physical characteristics necessary for this sport and to improve the performance of athletes. This study aims at investigating the relationship between anthropometric characteristics and balance performances of elite male volleyball players.

Materials and Methods

Working Group

The sample of the study consists of 12 volunteer male volleyball players who played in MSK URFA, a team in Turkish Men's Volleyball League, in 2016-2017 season. The average age, height and body weight of the volleyball players participating in the study are shown in **Table 1**.

Table 1. Average age, height, body weight and body mass index of volleyball players

Parameter	N	X	Ss
Age (years)	12	26,50	4,10
Height (cm)	12	195,67	5,38
Weight (kg)	12	87,54	7,12

The study is in experimental model and balance measurements and anthropometric measurements of volleyball players were performed by physiotherapists at the beginning of 2016-2017 pre-season preparation period.

Data Collection

Balance

Teknobody Prokin device (Italy) was used to determine the balance performances of the volleyball players participating in the study. In balance evaluation, the person was asked to keep his balance for 25 seconds with double foot standing in straight position on the moving platform and in the double foot squat position. Before the test, the athletes were subjected to a 10-second retry in order to adapt and recognize the balance tests. In the study, general balance index score was used among the data obtained from the test results. The fact that general balance index score is high indicates that the loss of balance is high. Balance scores of 0 degrees represent the best balance.

Anthropometric properties

Body composition measurements of volleyball players were performed with Bioelectric Impedance Measurement Device (Tanita MC 180). The athletes were asked not to engage in heavy physical activity from 24 hours in advance and the measurement was performed with bare feet. During the measurement, athletes were asked to stand on the electrodes of the device and hold the hand electrodes. Any metal jewellery was removed during the measurement.

Data Analysis

SPSS 21.0 statistical package program was used for statistical analysis of the obtained data and significance level was taken as 0.05 in all analyses.

Findings

Balance Analysis Values of Volleyball players are shown in **Table 2**.

Table 2. Balance Analysis Values of Volleyball players

	N	X	S.S.
Blindfolded Balance	12	1789,67	621,71
Blindfolded Squat Balance	12	2027,00	768,64
Dynamic Balance	12	1178,41	473,36

In Table 2, the mean blindfolded balance of volleyball players was 1789.67 ± 621.71 , the mean blindfolded squat balance was 2027.00 ± 768.64 , and the mean dynamic balance was 1178.41 ± 473.36 .

Table 3. Anthropometric properties of volleyball players

	N	X	S.S.
BMI	12	22,85	1,32
VFP	12	9,91	3,21
Leg Muscle Weight/Body Weight Percentage	12	3,60	0,12

In Table 3, the mean BMI of volleyball players is 22.85 ± 1.32 , Body Fat Percentage is 9.91 ± 3.21 , and the ratio of Leg Muscle Mass to athlete's weight is 3.60 ± 0.12 .

Table 4. The Relationship Between Volleyball Players' Balance Values and Anthropometric Characteristics

	Blindfolded Balance	Blindfolded Squat Balance	Dynamic Balance	BMI	BFP	Leg Muscle Weight /Body Weight Percentage
Blindfolded Balance	1					
Blindfolded Squat Balance	0,508	1				
Dynamic Balance	-0,156	0,152	1			
BMI	0,111	0,586	0,352	1		
VFP	0,044	0,281	0,428	0,441	1	
Leg Muscle Weight /Body Weight Percentage	0,274	0,034	0,320	0,234	0,856	1

*p<0,05; **p<0,01

When the **Table 4** is examined, there is only a low relationship between anthropometric properties of blindfolded balance and leg muscle weight/body weight percentage. There is a moderate relationship between the value of blindfolded squat balance and body mass index (BMI) and low relationship between the value of blindfolded squat balance and body fat index (BFI). It is seen that there is a moderate relationship between dynamic balance and BMI, BFI and leg muscle weight/body weight percentage.

Discussion and Conclusion

In this study, which consists of male volleyball players playing in Turkish Men's Volleyball League (officially called The Efe League) in 2016-2017 season, the relationship between the balance performances and anthropometric properties of twelve volunteer male volleyball players who played in MSK URFA (a team in Turkish Men's Volleyball League) in 2016-2017 season were investigated.

As a result of the study, it was seen that there was no significant relationship between balance and anthropometric properties. While the mean blindfolded balance of volleyball players was 1789.67 ± 621.71 , the mean blindfolded squat balance was 2027.00 ± 768.64 and the mean dynamic balance was 1178.41 ± 473.36 , it was seen that there was a low relationship between the anthropometric

properties data of blindfolded balance and leg muscle weight/ body weight ratio. There is a moderate relationship with BMI and blindfolded squat balance and low relationship between blindfolded squat balance and BFPIt is seen that the dynamic balance has a moderately low relationship between BMI, VFP and leg muscle weight / body weight ratios. Similarly, parallel results have been reached in the studies conducted in the literature. For example, Kapşigay et al. (2013) could not find a statistically significant difference between dominant and non-dominant leg strength and body balance. Göktepe (2016) could not find a significant difference between dominant and non-dominant leg strength and balance performances of football players.

On the other hand, as a result of the study carried out by Gürkan et al (2012) to determine the balance and body fat percentages of elite football players and compare them to sedentaries, it was determined that the body fat percentages of football players are relatively lower than those of sedentaries, there was no significant difference between balance values of athletes and sedentaries, and there was a positive relationship between height and body weight of athletes and body weight and body fat percentages of sedentaries.

As a result of the study carried out by Taşpınar et al. (2012) to investigate the relationship between body composition and physical activity, balance and supportive factors in university students, it was found that there was no statistically significant relationship between body mass index values and physical activity and balance.

In another study, Göktepe (2016) determined that there was no relationship between body fat percentage, fat amount, dry mass, lean dry mass, body fluid, basal metabolic rate, body mass index, impedance values and static and dynamic balance of athletes, and there was no relationship between body composition, static and dynamic balance.

As a result of this study, although there is no one-to-one study, it was seen that similar studies have been conducted. Eylen et al. (2017) investigated the effect of different strength training on static and dynamic balance abilities of volleyball players. As a result of the study, it was found that different strength training applied to volleyball players had a positive effect on static and dynamic balance ability. It was said that regular strength training would increase static and dynamic balance abilities.

In light of these findings, the following recommendations were made:

For a successful performance in volleyball, it is thought that the balance that is important in the movements in the game such as attack and defence and BMI and Body fat percentage, which is moderately related to a successful performance, should be improved.

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