Comparison of Some Anthropometric Features and Balance Ability of Basketball and Volleyball Athletes

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Abstract

İntroduction: The aim of this study is to compare some anthropometric measurements and dynamic balance parameters of volleyball and basketball players between the ages of 15-17.
Materials and method:12 male basketball and 12 male volleyball players participated in the study. Skinfold device (measurement of subcutaneous fat) and anthropometric measurement set (measurement of diameter and circumference) were used for anthropometric measurements in the study. Prokin PK200 WL Dynamic Balance Measurement System was used for dynamic balance measurement. Shapiro wilk test was used for normality analysis. Independent T test and Pearson correlation test were used to compare normally distributed variables. Mann Whitney u test was used to compare independent paired groups that did not show normal distribution.
Result:independent t test, a significant difference was found between Mediolateral Right-left displacement (ML) variables of volleyball players and basketball players ($p<0.05$). There was no significant difference between anthropometric measurements ($p<0.05$). As a result, it can be said that ML balance values of basketball players are better due to the fact that basketball players are more affected by external forces than volleyball players and that object control is higher.
Conclusion: In the literature, a difference was found in favor of volleyball players in some studies and in favor of basketball players in some others. Essentially, in order to reach a definite conclusion on the subject, a balance training program should be applied to the subjects who play active volleyball and basketball sports, and their development levels should be compared.

Introduction

Balance, static or dynamic, is the body's ability to create the desired state during activity. Balance plays an important role in all sports activities, especially dance and gymnastics activities, as well as maintaining a healthy, comfortable and productive life in the daily life. Balance is the basis of all sports movements. there are two types of balance, static and dynamic. While static balance covers movements in which the body center of gravity is kept constant, in dynamic balance movements the position of the center of gravity differs depending on the applied movement. All human movements can have static balance, dynamic

balance, or both. It plays an important role in the development and perfection of locomotor, manipulative and balancing movements[1].The biomechanical expansion of balance, on the other hand, is that the individual is active in dynamic equilibrium and is under the influence of external forces and moments[2; 3,21,22]. In other words, the creation of balance requires muscle activity to be provided with sufficient power in addition to the analysis of the data reaching the periphery[4]. Balance is the coordinated working process of the neuromuscular system, which includes the preservation of the projection of the center of gravity on the support base, with the feedback reaching the center from the eye, vestibular and neural senses in different parts of the body[5]. As in many sportive activities, social relation[20] , balance is very important for success in basketball and volleyball. These two sports show parallelism as a focal point in training aimed at conditioning (such as strength, speed, endurance, flexibility) and coordinative (such as balance, coordination) functions applied to increase the performance of individuals in these two sports activities. While running with and without the ball, double fights and jumps in basketball form the general movement form, in volleyball it includes stepping, jumping and hitting the ball without carrying the ball. Studies in the field of sports have shown that each sport has its own skill demands and the environmental demands of the sport branch provide postural adaptations specific to that branch and greatly change the balance abilities of the athletes[6; 7]. Performance athletes use sensory information more actively in order to reveal the balance character required by the branches[8]. From this point of view, the realization of motor skills specific to each sport branch requires different levels of sensory-motor interaction. In this study, it was aimed to compare the upper extremity and lower extremity Y balance test performances of individuals who actively play basketball and volleyball, which have different game forms.

Materıal and method

12 Volleyball and 12 Basketball players voluntarily participated in the research in the age range of 15-17, who do sports actively at the amateur level and do not have any disease or injury.

Prokin Tecno Body Balance Measurement

Prokin Tecno Body, PKW 200 PL, Italy device was used to compare the Dynamic balances of Volleyball and Basketball players[9]. Prokin has a mobile circular platform, it detects the simplest angular movements thanks to the chip on the platform and transfers the information from the platform to the computer. Four different applicators can be placed under the mobile platform: easy, medium hard and rectangular. There is a circle and coordinated screen on the computer so that changes can be tracked. During the test, the athlete is instructed to "try to stay in the middle of the circle as much as possible". Results can be positive or negative.

Data collection with Prokin Tecno Body Balance Meter; After explaining the working principle of the device to the subjects, a demonstration was performed. Subsequently, the subjects were given the opportunity to get on the platform and try several times. Easy applicator mounted on the mobile mobile platform. While the subject was barefoot, in the bipedal position (feet parallel to each other, shoulder-width apart from each other), and the subject was asked to maintain this position for 30 seconds. If the position could not be maintained for 30 seconds, the measurement was repeated. The measurement was automatically evaluated according to 5 parameters. These parameters are;

1. PL: Perimeter Length: The circumference that the person walks on Prokin
2. E – Estimation: Area gap percentage: Displacement percentage
3. MS: Mediumspeed: Average speed while relocating
4. AP: Anteroposterior: Anteroposterior displacement
5. ML: Mediolateral: Right-left displacement[10].

Anthropometric Measurements

Gulick Measure; Thanks to the spring attached to the tip, it provides constant tension and measurement accuracy. It returns results in both centimeters and inches.

Big-Little Anthropometer; The Large Anthropometer has a measuring range of 0-60 cm in 0.1 cm increments. It is used to measure shoulder width and long bone lengths. It uses spring bearing in the floating C-shaped arm to ensure accurate and precise measurement. The Small Anthropometer has a measuring range of 0 - 30 cm in 0.1 cm increments. It is used to measure wrist, elbow, knee, ankle widths along with small muscle groups such as biceps and calf muscles. It uses spring bearing in the floating C-shaped arm to ensure accurate and precise measurement.

Skin Fold Thickness Measurement*;* It is the most scientific instrument that calculates the amount of body fat based on the thickness of the skin folds. The practitioner compresses the skin in certain areas and reads the skin thickness with the help of an instrument from 1 cm below. It takes 2 measurements per region (in mm) and averages them and compares them with the reference values.

Anthropometric Set; The Harpenden Anthropometric Set is a metering instrument that moves easily between measuring arms. Anthropometry is used to measure the human body and limbs. Unlike other anthropometers, it is so sensitive that you can feel it with just your fingertips, and it has an absolute degree of accuracy in your measurements. It gives precise and direct results in millimeters between 50 mm and 570 mm. Thanks to miniature ball bearings, it provides working without any sticking. The set consists of Straight and Hooked Measuring arms, extension bars that allow measuring up to 2 Meters.

Height Gauge Harpenden Stadiometer*;* It is a balanced and easily moving height measuring instrument with counter. It gives precise and direct length measurement results in millimeters between 600 mm and 2100 mm. Thanks to miniature ball bearings, it provides working without any sticking.

Body Weight Measurement; Body weight measurements of the athletes in the study group were measured with a scale with a precision of ± 100 g. The measurement was provided in kg in bare feet and anatomical posture while the athletes were only wearing shorts and an athlete.

Statistical analysis

The data obtained from the athletes were transferred to the electronic environment via IBM SPSS Statistics 22.0 software and various statistical analyzes were applied. Frequency analysis was performed to determine the demographic characteristics of the athletes. The shapiro wilk test was applied to determine whether the data were suitable for normal distribution. Independent t-test was used for groups with normal distribution, and Mann Whitney-u test was used for groups that did not.

Results:

Table No 1. Demographic İnformation Of Volleyball Players And Basketball Players

Demographic information	**Volleyball N=12**	**Basketball N=12**	**Test statistic**	
	Average (max-min)	**Average (max-min)**	**T**	**P**
Length (m)	171 (178-165)	179,4 (193-167)	-3,37	**,00**
Age (years)	15,33 (17-15)	15,58 (17-15)	-92	,36
Body weight (kg)	60,71 (69,3-52,7)	68,49 (87-50,9)	-2,31	**,03**
Bki (kg/m2)	20,65 (22,2-18,9)	21,25 (27,5-18)	-65	,52

When Table 1 is examined, it is seen that 12 athletes are volleyball players and 12 athletes are basketball players. It was seen that the age and bki data of volleyball and basketball players

were similar. Height and body weight showed a significant difference ($p<0.05$), and basketball players were found to be taller and heavier than volleyball players.

Table No 2. Independent t-test results of anthropometry measurements of volleyball and basketball players

Variables	Branches	Average	Ss	T	P
Biceps girth in muscular position	Voleyball	27,3333	1,81325	-1,128	,272
	Basketball	28,4583	2,94231		
Biceps girth in relaxed position	Voleyball	25,2917	1,32216	-659	,519
	Basketball	25,8750	2,76442		
Calf Diameter	Voleyball	45,6667	3,69480	-,734	,471
	Basketball	47,0417	5,33197		
Shoulder Diameter	Voleyball	102,7917	4,09799	-1,586	,127
	Basketball	105,7500	4,99773		
chest depth	Voleyball	19,6750	1,59038	-1,422	,169
	Basketball	20,6333	1,70845		
Hip Diameter	Voleyball	28,4000	1,54626	-1,266	,219
	Basketball	29,2750	1,82763		
Shoulder Diameter	Voleyball	38,9000	5,56156	-1,534	,139
	Basketball	41,5667	2,30467		

As a result of the independent t-test for parametric measurements made according to Table 2, no significant difference was found between the variables of volleyball and basketball players. $P>0.05$

Tablo No 3. Independent t-test results of balance measurements of volleyball and basketball players

Variables	Branches	Average	Ss	T	P
PL: Perimeter Length	Voleyball	347,0883	64,97787	-1,751	,094
	Basketball	388,9425	51,31310		
E – Estimation: Area gap percentage	Voleyball	10,1642	8,03675	-1,935	,066
	Basketball	18,9325	13,48160		
MS: Mediumspeed	Voleyball	11,5783	2,17267	-1,738	,096
	Basketball	12,9650	1,70925		
AP: Anterioposterior	Voleyball	-1,9475	1,30452	-1,399	,176
	Basketball	-1,1492	1,48498		
ML: Mediolateral	Voleyball	-,0475	1,37332	-2,269	**,033**
	Basketball	1,0792	1,03542		

As a result of independent t-test for parametric measurements made according to Table 3, while there was a significant difference between the ML: Mediolateral variables ($T=-2.269$; $p<0.05$) of volleyball players ($X=-.0475\pm Ss=1.37332$) and basketball players ($X=1.0792\pm Ss=1.03542$), there was no significant difference between the other variables. $P>0,05$

Table No 4. Mann Witney-U Test Results of Volleyball Players and Basketball Players According to Skin Fold Thickness Variables

As a result of the Mann Whitney – U test for unrelated measurements made according to Table 4, while there was a significant difference between the skinfold thickness variables of volleyball players and basketball players only in the Scapula (U=36,000; p<0.05), there was no significant difference between the other variables. P>0.05

Table No 5. Mann Witney- U Test Results for the Variables of Joint Diameter of Volleyball Players and Basketball Player

Variables	**Branches**	**S.O**	**U**	**Z**	**P**
Elbow Diameter	Voleyball	12,71	69,500	-,147	,883
	Basketball	12,29			
Wrist Diameter	Voleyball	12,25	69,000	-,185	,853
	Basketball	12,75			
Knee Diameter	Voleyball	9,79	39,500	-1,910	,056
	Basketball	15,21			
Ankle Diameter	Voleyball	15,04	41,500	-1,788	,074
	Basketball	9,96			

As a result of Mann Whitney - U test for unrelated measurements made according to Table 5, no significant difference was found between some joint diameter variables of volleyball players and basketball players. P>0.05

Variables	**Branches**	**S.O**	**U**	**Z**	**P**
Abdominal	Voleyball	11,04	54,500	-1,014	,311
	Basketball	13,96			
Chest	Voleyball	12,17	68,000	-,232	,817
	Basketball	12,83			
Triceps	Voleyball	10,58	49,000	-1,330	,184
	Basketball	14,42			
Biceps	Voleyball	12,75	69,000	-,175	,861
	Basketball	12,25			
Scapula	Voleyball	9,50	36,000	-2,096	**,036**
	Basketball	15,50			

Discussion

12 male athletes (35.3%) playing basketball and 12 (35.3%) playing volleyball participated in the study. The average age of the athletes was found to be 15.33 (17-15) years in volleyball and 15.58 (17-15) years in basketball. The average height of the athletes was found to be 171 (178-165) cm in volleyball and 179.4 (193-167) cm in basketball. The average weight of the athletes was found to be 60.71 (69.3-52.7) kg in volleyball and 68.49 (87-50.9) kg in basketball. BMI values of the athletes were found to be 20.65 (22.2-18.9) in volleyball and 21.25 (27.5-18) in basketball.

In the study, no significant difference was found between the anthropometric variables of volleyball and basketball players as a result of the independent t-test for parametric measurements between groups (P>0.05). Likewise, anthropometric study on 14 elite basketball players and 14 volleyball players that there was no difference between the heights of basketball and volleyball players[11], there was no difference between the weights of basketball and volleyball players, and there was no difference in body fat content between basketball and volleyball players. In the Serbian national league, the mean age was found in basketball (17.08±0.28) and in volleyball (17.36±0.74). In the study conducted on basketball

(13) and volleyball (14) athletes, there was no significant difference between the groups in terms of BMI and body bone content, and also there was no significant difference between the heights and body weights of basketball and volleyball players[12].In a study on volleyball (36) and basketball (27) male students aged between 18-25 years in India, it was found that basketball players have significantly higher height ($p<0.01$) and weight ($p<0.01$) compared to volleyball players, and also biceps ($p<0.01$) and suprailliac ($p<0.01$) skinfold thicknesses, calf circumference ($p<0.05$), and body fat percentage were found to be significantly higher in basketball players ($p<0.01$)[13].

In the measurement of dynamic balance (Prokin Tecno Body, PKW 200 PL), there was no significant relationship between PL, E – Estimation, MS Mediumspeed, AP Anteroposterior in the variables obtained from volleyball and basketball players, but in the ML: Mediolateral variables ($T=-2.269$; $p<0$,05) a significant difference was found. In a study comparing the Strength, Agility and Dynamic Balance Modified Bass tests to volleyball (n=20) and basketball (n=20) athletes aged 15-17 years, a significant difference of 2.628* was found in favor of volleyball players in terms of dynamic balance ($p > 0.05$)[14],were applied Bass Stick Lengthwise Static Balance Test and Bass Stick Crosswise Static Balance Test to a total of 167 female athletes (volleyball, n=108 and basketball, n=59) having mean age 12.38±1.46 years, mean height 159.32±10.41 cm, mean weight 50.84±10.67 kg.A significant difference was found between lengthwise and crosswise static balance measurement values according to the branches[15].They concluded that the difference in both static balance tests was due to the basketball branch. In addition, Altavilla G. et al., found that basketball athletes have better balance skills in the closed-eye static balance test than children who do swimming and do not do sports in a study comparing the balance skills of children aged 11-13 who do and do not do sports[16]. Tabrizi H. B., et al., found that athletes playing basketball had better static balance skills than athletes in handball and futsal sports branches in a study comparing the balance skills of athletes in different branches[17]. In another study, compared the balance skills of the athletes in different branches and found that the static balance skills of the athletes playing basketball were better than the athletes in other branches[18].Ipekoglu,G.,et al., In their study, they found a decrease in balance error scores as a result of the bosu training applied to 24 elite taekwondo athletes[19].

When the study is compared with the literature, some studies show parallelism while some others show contrast. We can attribute the main reason for this situation to the fact that the studies conducted in our study are in the nature of due diligence and, accordingly, the athletes' backgrounds of the subjects are not known in detail, and there is no information about the trainings for the development of balance in the training plans.

Conclusion

In the study in which balance and some anthropometric measurements of volleyball and basketball players aged between 15-17 years were compared, a significant difference was found only in the ML: Mediolateral Right-left displacement dimension in the data of the Prokin PK 200 device, in which dynamic balance was measured with 5 movement planes and also a significant difference was found only in the measurement taken from the scapula of the 5 points where the skinfold thickness was measured.

In the literature, a difference was found in favor of volleyball players in some studies and in favor of basketball players in some others. Essentially, in order to reach a definite conclusion on the subject, a balance training program should be applied to the subjects who play active volleyball and basketball sports, and their development levels should be compared.

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