A Comparison of Anthropometrics Parameters by Different Court Play Position in Girl's Youth Volleyball

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Abstract

The aim of the study was to compare the anthropometrics parameters of young female volleyball players by different court play position. 52 female volleyball players (indoor court) (mean ± SD age: 15.7 ± 1.2 years) participated in the study. Players were divided based on their playing position (middle blocks, setters, liberos, and hitters (outside hitter/left side hitter and opposite hitter/right side hitter). They were examined in the field for anthropometric characteristics such as BM (mean ± SD: 61.4 ± 13.4 kg), height (mean ± SD: 163.6 ± 7.7 cm), Body Mass Index [BMI] (mean ± SD: 22.6 ± 3.1), waist circumference (mean ± SD: 70 ± 8.4 cm).All data are presented as mean ± SD, and the level of significance was set at $p \leq 0.05$. Therefore, a parametric analysis, one-way analysis of variance (ANOVA), was used to determine significant differences among positions in anthropometric parameters.Post hoc comparison indicated that height and body mass differed significantly among most groups; however, no significant differences were found between middle blocker and setters ($p = 0.20$) for height. In addition, no significant differences ($p > 0.05$) were detected between the setter and opposite hitters ($p = 0.55$) and between middle blocker and outside hitter ($p = 0.41$) for body-height. In conclusion this study indicates that significant differences exist among youth female volleyball players of different playing positions for body-mass, body-height, waist-circumference and BMI.

Keywords: volleyball, playing position, ANOVA, anthropometric parameters.

1. Introduction

Volleyball as a popular sport which required a combination of physiological, socio-psychological, tactical-technical and anthropometric parameters (Lidor et al., 2010).According to Nuri et al., 2013 volleyball is an open skill sports which is needs high-perceptual-cognitive demands because sports specific motor actions are performed in changingenvironment.

Ifanthropometric parameters such as body mass (BM) and body fat percentage (BF) are high, this causes a negative impact in jumping performance (Nikolaidis et al., 2013).

Twelve players compose volleyball team with middle blocks, setters, liberos, and hitters (outside hitter/left side hitter and opposite hitter/right side hitter). The role of libero is mainly a defender who is not allowed to serve or attack. The hitters have the role to blocks, attacks and receive the ball over the net left/right side. A setter run over the court to pass the ball that comes from the receivers, to the attackers (Malousaris et al., 2008).Each of this position have different role and duties in volleyball match (Gabbett&Georgieff, 2006).Considering the different role of each playing position it is likely that the anthropometric and physiological profiles of the players differ from one another (Sheppard et al., 2009). Furthermore, anthropometric differences among playing position is crucial due to demanding competition requirements (Sheppard et al., 2009).

Many studies have been undertaken to identify the physiological & physical characteristic of athletes in different sports and volleyball as team sport, player profiling by position has been studied (Gabbett et al., 2007). Volleyball players engage in a variety of performance motions during a volleyball match, including offensive and defensive jumps, blocks, sprint … which required strength, power, and agility (Gonzalez-Rave et al., 2011). Because of these prerequisites, ideal physical performance is required (Lidor&Ziv, 2010). In addition, it has been reported that excessive fat mass has a negative impact in athlete'sperformance because during jumping action the body mass is constantly lifted against gravity (Reilly, 2006).

The anthropometric profiles of female volleyball playersbetween playing positions have been compared in many studies more than jumping abilities or strength performance. However, there are still lack of information about the differentiation of this parameters in volleyball based on the position especially in Albania.

To the best of our knowledges no researches in Albania has made a comparison of anthropometric parameters by different court play position in girl's youth volleyball. Therefore, the aim of the studywas to compare the anthropometrics parameters of young female volleyball players by different court play position.

2. Materials and Methods

Subjects:

A group of 52 females volleyball players (indoor court) (mean ± SD age: 15.7 ± 1.2 years) participated in the study.Players were divided based on their playing position (middle blocks, setters, liberos, and hitters (outside hitter/left side hitter and opposite hitter/right side hitter). All players represented the same club in the city of Shkodra (in Albania). All participants provided their informed consent by their parents and volunteered in the study. Every subject was informed about the demands of the study and the nature of the research. Also, they were informed that they could withdraw from the study at any time.

Anthropometric parameters

They were examined in the field for anthropometric characteristics ((BM, height, Body Mass Index [BMI], waist circumference)The study was conducted in accordance with ethical standards of World Medical Association Declaration of Helsinki in 2013. Body-mass and body height measurement were made on the platform scale(Health O meter scale). These measurements were used to calculate BMI as the quotient of body mass (kg) to stature squared (m2). Waist circumference was measured by using elastic tape. All the participants were bare-food and lightly dressed.

Statistical analysis

A one-way analysis of variance was used to determine significant differences among positions in anthropometric characteristics.All data are presented as mean ± SD, and the level of significance was set at $p \leq 0.05$.Therefore, a parametric analysis, one-way analysis of variance (ANOVA), was used to determine significant differences among positions in anthropometric parameters with a Bonferroni post hoc comparison.

3. Results

The comparison among groups for anthropometric characteristics revealed significant differences with regards to anthropometric parameters (body height, body weight, BMI, waist circumference).In table 1 it is used the descriptive statistics which describes the mean, standard deviation (SD), minimum and maximum of anthropometric parameters (body-height, body-weight, BMI, waist-circumference).The mean of body-height and body -weight are presented with the value (163.6 ± 7.7 cm), (61.4 ± 13.4 kg). Whereas, the mean of BMI and waist circumference was (22.6 ± 3.1), (70 ± 8.4 cm). ANOVA provided information about whether or not groups differed with each-others. No difference was observed for body-height between setter and outside hitter (p=0.55). There was no difference among setter and middle blockers in body-height (p=0.2). The post-hoc comparisons using Bonferroni test can be seen in Table 3, 4. 5, 6.

Post hoc comparison indicated that height and body mass differed significantly among most groups; however, no significant differences were found between middle blocker and setters (p = 0.20) for height. In addition, no significant differences ($p > 0.05$) were detected between the setter and opposite hitters (p = 0.55) and between middle blocker and outside hitter (p = 0.41) for body-height.

Table 1: Anthropometric characteristics of the individual playing positions in youth female volleyball players.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	52	14.0	18.1	15.769	1.2715
Body_Height	52	149.0	180.0	163.692	7.7549
Body_Weight	52	34.5	94.6	61.423	13.4685
BMI	52	15.5	30.1	22.662	3.1847
Waist_Circumference	52	55.0	91.0	70.000	8.4157
Valid N (listwise)	52				

Table 2 indicates the one-way analysis of variance (ANOVA) between group, within group and total for body-height, body-weight, BMI, waist-circumference.

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Body_Height	Between Groups	1371.535	4	342.884	9.505	.000
	Within Groups	1695.542	47	36.075		
	Total	3067.077	51			
Body_Weight	Between Groups	4400.167	4	1100.042	10.657	.000
	Within Groups	4851.245	47	103.218		
	Total	9251.412	51			
BMI	Between Groups	227.171	4	56.793	9.202	.000
	Within Groups	290.072	47	6.172		
	Total	517.243	51			
Waist_Circumference	Between Groups	1874.667	4	468.667	12.679	.000
	Within Groups	1737.333	47	36.965		
	Total	3612.000	51			

The results showed in table nr 2 indicated significant differences in anthropometric parameters among playing position. All anthropometric parameters such as body-height, body-weight, waist -circumference, BMI have significant differences between groups.Fisher created the first pairwise comparison method, known as the least significant difference (lsd) test, in 1935. This method can be used only if AVONA is significant. The purpose of (Isd) is to find the smallest significant difference among to means.

Table 1 display ANOVA post hoc analysis- Multiple Comparisons LSD for body height

Dependent Variable	(I) Position	(J) Position	Mean Difference (I-J)	Std. Error	Sig.
Body Height	Setter	Outside hitter	-2.3333	3.877	0.55
		Opposite hitter	7.4375*	3.1853	**0.024**
		Middle blocker	-5.5	4.2471	0.202
		Libero	12.3333*	3.877	**0.003**
	Outside hitter	Setter	2.3333	3.877	0.55
		Opposite hitter	9.7708*	2.6721	**0.001**
		Middle blocker	-3.1667	3.877	0.418
		Libero	14.6667*	3.4677	**0.000**
	Opposite hitter	Setter	-7.4375*	3.1853	**0.024**
		Outside hitter	-9.7708*	2.6721	**0.001**
		Middle blocker	-12.9375*	3.1853	**0.000**
		Libero	4.8958	2.6721	0.073
	Middle blocker	Setter	5.5	4.2471	0.202
		Outside hitter	3.1667	3.877	0.418
		Opposite hitter	12.9375*	3.1853	**0.000**
		Libero	17.8333*	3.877	**0.000**
	Libero	Setter	-12.3333*	3.877	**0.003**
		Outside hitter	-14.6667*	3.4677	**0.000**
		Opposite hitter	-4.8958	2.6721	0.073
		Middle blocker	-17.8333*	3.877	**0.000**

According to analysis of variance (ANOVA) presented in table nr 3, significant results indicates that one group differs from another groups. ANOVA is frequently followed by certain comparisons which commonly involves comparing to means or 'pairwisecomparison'.

Table 2 ANOVA post hoc analysis- Multiple Comparisons LSD for body weight

Dependent Variable	(I) Position	(J) Position	Mean Difference (I-J)	Std. Error	Sig.
Body Weight	Setter	Outside hitter	-11.5333	6.558	0.085
		Opposite hitter	6.0063	5.388	0.271
		Middle blocker	-12.6	7.1839	0.086
		Libero	20.6333*	6.558	**0.003**
	Outside hitter	Setter	11.5333	6.558	0.085
		Opposite hitter	17.5396*	4.5198	**0.000**
		Middle blocker	-1.0667	6.558	0.871
		Libero	32.1667*	5.8657	**0.000**
	Opposite hitter	Setter	-6.0063	5.388	0.271
		Outside hitter	-17.5396*	4.5198	**0.000**
		Middle blocker	-18.6063*	5.388	**0.001**
		Libero	14.6271*	4.5198	**0.002**
	Middle blocker	Setter	12.6	7.1839	0.086
		Outside hitter	1.0667	6.558	0.871
		Opposite hitter	18.6063*	5.388	**0.001**
		Libero	33.2333*	6.558	**0.000**
	Libero	Setter	-20.6333*	6.558	0.003
		Outside hitter	-32.1667*	5.8657	0.000
		Opposite hitter	-14.6271*	4.5198	0.002
		Middle blocker	-33.2333*	6.558	0.000

Table 3 ANOVA post hoc analysis- Multiple Comparisons LSD for BMI

Dependent Variable	(I) Position	(J) Position	Mean Difference (I-J)	Std. Error	Sig.
BMI	Setter	Outside hitter	-3.5000*	1.6036	0.034
		Opposite hitter	-0.1062	1.3175	0.936
		Middle blocker	-2.8	1.7567	0.118
		Libero	4.5333*	1.6036	0.007
	Outside hitter	Setter	3.5000*	1.6036	0.034
		Opposite hitter	3.3938*	1.1052	**0.004**
		Middle blocker	0.7	1.6036	0.664
		Libero	8.0333*	1.4343	**0.000**
	Opposite hitter	Setter	0.1062	1.3175	0.936
		Outside hitter	-3.3938*	1.1052	**0.004**
		Middle blocker	-2.6938*	1.3175	0.047
		Libero	4.6396*	1.1052	**0.000**
	Middle blocker	Setter	2.8	1.7567	0.118
		Outside hitter	-0.7	1.6036	0.664
		Opposite hitter	2.6938*	1.3175	0.047
		Libero	7.3333*	1.6036	**0.000**
	Libero	Setter	-4.5333*	1.6036	**0.007**
		Outside hitter	-8.0333*	1.4343	**0.000**
		Opposite hitter	-4.6396*	1.1052	**0.000**
		Middle blocker	-7.3333*	1.6036	**0.000**

Table 4 ANOVA post hoc analysis- Multiple Comparisons LSD for waist circumference

Dependent Variable	(I) Position	(J) Position	Mean Difference (I-J)	Std. Error	Sig.
Waist Circumference	Setter	Outside hitter	-7.3333	3.9245	0.068
		Opposite hitter	4.5	3.2243	0.169
		Middle blocker	-7	4.2991	0.110
		Libero	14.0000*	3.9245	**0.001**
	Outside hitter	Setter	7.3333	3.9245	0.068
		Opposite hitter	11.8333*	2.7048	**0.000**
		Middle blocker	0.3333	3.9245	0.933
		Libero	21.3333*	3.5102	**0.000**
	Opposite hitter	Setter	-4.5	3.2243	0.169
		Outside hitter	-11.8333*	2.7048	**0.000**
		Middle blocker	-11.5000*	3.2243	**0.001**
		Libero	9.5000*	2.7048	**0.001**
	Middle blocker	Setter	7	4.2991	0.110
		Outside hitter	-0.3333	3.9245	0.933
		Opposite hitter	11.5000*	3.2243	**0.001**
		Libero	21.0000*	3.9245	**0.000**
	Libero	Setter	-14.0000*	3.9245	**0.001**
		Outside hitter	-21.3333*	3.5102	**0.000**
		Opposite hitter	-9.5000*	2.7048	**0.001**
		Middle blocker	-21.0000*	3.9245	**0.000**

* The mean difference is significant at the 0.05 level.

4. Discussion

The aim of this study was to investigate the anthropometrics parameters of young female volleyball players and compare these characteristics by different court play position. If significant differences are presented between playing positions, it may provide an insight in to anthropometrics parametersimportant for the position on the court. The results showed significant differences in anthropometric parameters which was consistent with our experimental hypothesis. Body type and body size are crucial requirements for successful participation in volleyball. The result of this study reported significant differences among female volleyball players of different playing position for body-weight, body height, waist circumference and BMI. However, no differences were found among other playing positions and setter for BMI. According to (Viviani &Casagrande, 1990; Gabbett et al., 2007) volleyball has as important factor the height in the players because the tall players are indispensable factor for success in team.

5. Practical Application

The first practical application from this study was the fact that this research provide data from anthropometric parameters for young female volleyball players according to their playing position in the city of Shkodra. Second, significant difference exists between volleyball players

in different playing position for height, body-mass, waist-circumference and BMI. Coaches can use the information of this study to decide the type of physical profile for each playing position.

6. Conclusion

The results of this study indicate that significant difference exist among youth female volleyball players of different playing positions for body-mass, body-height, waist-circumference and BMI. According to some authors, body-height is as important factor in volleyball discipline. Thus, during talent identification should consider anthropometric parameters as essential components. Consequently, the coaches and researches should work to improve the anthropometric parameters.

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