

## Differences in Anthropometric Characteristics Between Two Elite Female Basketball National Teams – Participants at Eurobasket 2019 in Latvia and Serbia

Diferencias en las Características Antropométricas entre Dos Equipos Nacionales de Elite de Baloncesto Femenino - Participantes en Eurobasket 2019 en Letonia y Serbia

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**SUMMARY:** The aim of this research was to determine the differences among the female basketball players of the National team of Ukraine and the National team of Montenegro, in terms of their anthropometric characteristics and body composition. A sample of 27 subjects was divided into two sub-samples. The first sub-sample of the subjects consisted of 13 players of the National team of Ukraine, of the average age  $24.92 \pm 4.09$ , while the other sub-sample consisted of 14 players of National team of Montenegro, based on the average age of  $22.36 \pm 4.14$ . All players were tested in Podgorica, in lasting period of two days, while they held preparations for the European Championship, one month before the start of the Championship. Anthropometric characteristics in the body composition were evaluated by a battery of eleven variables: body height (cm), body weight (kg), triceps skinfold, back skinfold, biceps skinfold, abdominal skinfold, thighs skinfold, calf skinfold, body mass index (BMI), percentage of fat and muscle mass (kg). Differences in anthropometric characteristic and composition of the body of the female basketball players of two national teams, Ukraine and Montenegro, were determined by using a discriminatory parametric procedure with t-test for small independent samples. It was found that the basketball players of Montenegro are slightly lower and have more body mass. Also, there are significant statistical differences by 3 variables that estimate the abdominal skinfold, calf skinfold and fat percentage, in favor of the National team of Ukraine.

**KEY WORDS:** Anthropometric characteristics; Body composition; Female basketball players.

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### INTRODUCTION

Basketball is a team sport and as a game is a highly dynamic activity characterized by explosive movements. It represents a structurally complex sport that is composed of numerous movements. It requires players to possess excellent skills of high level, morphological characteristics and motor skills (Ljubojevic & Nikolic, 2012; Popovic *et al.*, 2013; Mihajlovic, 2014; Ochoa Martínez *et al.*, 2014). When it comes to anthropometry, we need to know that anthropometry is important, above all, in the selection of basketball players. On the other hand, their performance and skills, to a greater or lesser extent, are closely linked to anthropometric characteristics (Claessens *et al.* 1991; Carter *et al.*, 2005). Basketball is a sport of tall people (Guarav *et al.*, 2009; Karalejic & Jakovljevic, 2009), especially since height was found to be positively related to the precision of

throwing the ball into the basket. Basketball requires tall people that are above-average, with large longitudinal body dimensions to cover as much space on the ground as possible (played both horizontally and vertically). In addition to longitudinal dimensions (body height, arm span, reach height ...), very important indicators for basketball are the volume and weight of the body, as well as the evaluation of subcutaneous adipose tissue (Riezebos *et al.*, 1983; Shambaugh *et al.*, 1991; Ljubojevic & Nikolic; Masanovic, 2019).

Basketball is the second most popular sport in Montenegro. Montenegro is the smallest country (622,359 census population from January 2018) to ever participate in the World Basketball Championships - in 2019, the men's

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senior team participated in World Basketball Cup in China. The women's team is a regular participant in the European Championships. However, women's basketball is not that popular, which makes it difficult to make a selection of players, due to a fact of a small number of women that are interested in playing this sport. There are very few clubs in the I Senior League (5 clubs and about 70 players). In addition, the senior league is played by only 5 players (who are originally from Montenegro) who are over eighteen (18), the remaining players belong mostly to younger categories. The players who are members of the national team are mostly playing in foreign clubs, except for a few younger ones. In spite of all this, Montenegro's female national team is a regular participant in European Championships (in Poland in 2011 they were sixth, in France in 2013 they were tenth, in Hungary 2015 they were seventh, in the Czech Republic they ended on sixteenth position, lastly, in Latvia and Serbia in 2019 they were twelfth). On the other hand, Ukraine is a national team that has a much larger number of female basketball players that can provide a successful selection on a national level. The Ukrainian league has 6 clubs, but, unlike Montenegro, most national team players play in a domestic league. They ended up on sixteenth place at the Championships of 2009, 2013, 2015 and 2019. Due to all of the above, the aim of this research was to show the values of the morphological characteristics of two national teams. Specifically, to compare variables of the best Montenegrin female basketball players with the variables of the female basketball players of the other European team – such as Ukraine, that is also a European Championship participant. Finally, based on this outcome, compare potential specificities in the selected variables.

## MATERIAL AND METHOD

**Sample of subjects.** A sample of the subject consists of a total of 27 top-level female senior players who were members of two national teams who participated on Eurobasket 2019, in Latvia and Serbia. The first sub-sample of the subjects consisted of 13 players of National team of Ukraine, average age  $24.92 \pm 4.09$ , and 14 players of National team of Montenegro, average age  $22.36 \pm 4.14$ . The players were tested in May 2019 in Podgorica, when two teams held preparations for the European Championship, one month before the start of the Championship.

**Sample of measures.** Anthropometric measurements were taken according to the IBP-International Biology Program recommendations. For the purpose of this study 8 morphological measures have been taken: body height, body

weight, triceps skinfold, biceps skinfold, back skinfold, abdominal skinfold, calf skinfold, thigh skinfold, and 3 body composition assessment variables: body mass index (BMI), fat percentage and muscle mass. In order to evaluate the body composition Tanita body fat scale – model BC-418MA was used. The principle of this scale is based on indirect measurement of the body composition; a safe electrical signal is transmitted through the body via electrodes located in the standalone unit. Tanita scale, thanks to its athletics mode, enables athletes to closely monitor their body weight, health condition and form with all relevant parameters. Anthropometer and caliper were used for morphological measurements.

**Data processing method.** The data obtained through the research are processed by descriptive and comparative statistical procedures. For each variable, central and dispersion parameters, as well as asymmetry and flattening measures are processed. Differences in anthropometric characteristics and the composition of the body of the basketball players of these two national teams were determined by using a discriminatory parametric procedure with t-test for small independent samples, with statistical significance of  $p < 0.05$ .

## RESULTS

Basic descriptive statistical parameters of anthropometric variables and body composition of the basketball players of the two national teams, where the values of central measurements and dispersion tendencies are calculated, are presented in Tables I and II: minimal (Min) and maximal (Max) values, arithmetic mean (Mean), standard deviation (S.D.), coefficient of curvature (Skewness) and elongation (Kurtosis). First, the central and dispersion parameters of the variables were analyzed to evaluate the anthropometric characteristic and body composition of the female basketball players of National team of Ukraine (Table I).

As shown in Table I, it can be noted that all the variables are placed within the normal distribution boundaries, which results are based on dispersion and central parameters. In general, according to all the statistical parameters listed, we can conclude that the survey is conducted on a sample that is known for top basketball players. By the value of skewness, it can be noticed that in the variables of the biceps skinfold (2,00), triceps skinfold (1,64), abdominal skinfold (1,54) and calf skinfold (1,72), there was a slight inclination on the side of the lower results, which is good because subcutaneous fat is a disrupting factor for professional athletes. An insight into the results of the peak of the Gaussian

Table I. Descriptive data for Ukraine female basketball players.

	N	Range	Minimum	Maximum	Mean	Skewness	Kurtosis
Age	13	13	19	32	24.92±4.09	0.307	-1.085
Body height (cm)	13	38.5	165.5	204	182.69±9.86	0.403	0.833
Body weight (kg)	13	32.4	59.1	91.5	73.77±10.66	0.159	-1.014
Triceps skinfold	13	11	10.1	21.1	13.14±3.38	1.645	2.088
Back skinfold	13	10	7	17	11.3±3.12	0.678	-0.646
Biceps skinfold	13	13	5	18	8.46±3.55	2.008	4.664
Abdominal skinfold	13	16	10	26	14.49±5.28	1.545	1.559
Calf skinfold	13	15.8	5.4	21.2	10.21±4.04	1.726	4.136
Thigh skinfold	13	10	12	22	18.01±3.24	-0.818	0.001
Body mass index (BMI)	13	8	18	27	22.15±2.34	0.399	-0.256
Percentage of fat	13	16	11	26	18.12±4.04	-0.035	0.323
Muscle mass (kg)	13	14	27	41	34.07±4.14	-0.021	-0.747

curve (kurtosis) shows that for most variables there is no significant deviation from the normal distribution of the results. The most significant deviation from the normal values is seen in the variables biceps skinfold (4.66), calf skinfold (4.13), abdominal skinfold (1.55), where athletes are most homogeneous.

Table II showed the central and dispersion parameters of the variables that were analyzed to evaluate the anthropometric characteristics and body composition of the female basketball players of national team Montenegro.

Based on the central and dispersion parameters of the values of the skewness and the kurtosis of the National team Montenegro it can be stated that all the variables are within the normal distribution boundaries and that the values are very similar to those of the female basketball players from Ukraine national team. It can also be noted that female basketball players of National team of Montenegro are younger in average. In addition, almost all variables of quantitative value are in favor of the players of National team of Ukraine. However, a comparative statistical procedure, t-test (Table III), will show whether this is

statistically significant. By the value of the skewness, it can be noticed that in the variables of the biceps skinfold (1.35) and back skinfold (2.31) there was a slight inclination on the side of the lower results, which is good because subcutaneous fat is a disrupting factor for professional athletes. An insight into the results of the peak of the Gaussian curve (kurtosis) shows that in most there is a significant deviation from the normal distribution of results. The largest significant deviation from the normal values is seen in the variables back skinfold (6.79), BMI (5.20), body weight (3.94) and biceps skinfold (2.20), where it is evident that there is a grouping of results around the mean.

In order to determine whether there are statistically significant differences in the analyzed variables of the top basketball players of these two national teams, the statistical procedure t- test (Table III) was applied.

Based on results of t-test (Table III) it was found that female basketball players of two national teams have statistically significant differences by the three variables that estimate the abdominal skinfold, thigh skinfold and fat percentage.

Table II. Descriptive data for Montenegro female basketball players.

	N	Range	Minimum	Maximum	Mean	Skewness	Kurtosis
age	14	16	15	31	22.36±4.144	0.536	0.741
body height(cm)	14	27	166.7	193.7	181.579±7.3023	-0.391	-0.098
body weight (kg)	14	42.9	55.6	98.5	74.036±9.3516	0.784	3.946
triceps scinfeld	14	16.8	9.3	26.1	15.993±4.7338	0.501	-0.057
back skinfold	14	14	9	23	12.59±3.502	2.317	6.791
biceps scinfeld	14	16	5	22	10.58±4.404	1.35	2.208
abdominal skinfold	14	16	12	28	19.66±5.017	0.298	-1.188
calf skinfold	14	14.2	6.2	20.4	13.521±4.9933	0.058	-1.326
thigh skinfold	14	14	15	29	23.02±4.787	-0.327	-1.314
body mass index (BMI)	14	9	20	29	22.38±2.186	1.907	5.202
percentage of fat	14	16	16	31	21.38±3.938	1.006	2.328
muscle mass (kg)	14	14	24	38	32.84±3.431	-1.057	2.046

Table III. Descriptive data and t-test of 27 female basketball players members of two national teams (Ukraine and Montenegro).

Variables	UK	MNE	t	Sig. (2-tailed)
	Mean±Std. Deviation	Mean±Std. Deviation		
age	24.92±4.09	22.36±4.14	1.617	0.118
body height (cm)	182.69±9.86	181.58±7.3	0.335	0.74
body weight(kg)	73.77±10.66	74.04±9.35	-0.069	0.945
triceps skinfold	13.14±3.38	15.99±4.73	-1.79	0.086
back skinfold	11.3±3.12	12.59±3.5	-1.01	0.322
biceps skinfold	8.46±3.55	10.58±4.4	-1.368	0.184
abdominal skinfold	14.49±5.28	19.66±5.02	-2.61	0.015
calf skinfold	10.21±4.04	13.52±4.99	-1.886	0.071
thigh skinfold	18.01±3.24	23.02±4.79	-3.16	0.004
Body mass index (BMI)	22.15±2.34	22.38±2.19	-0.258	0.799
Percentage of fat	18.12±4.04	21.38±3.94	-2.126	0.044
Muscle mass (kg)	34.07±4.14	32.84±3.43	0.845	0.406

## DISCUSSION

In the last couple of decades, basketball has undergone major changes. By changing the rules of the basketball game in terms of shortening attack time, changes in the dynamics and style of the game, it resulted that basketball became more demanding for players and implies anthropological characteristics adequate to that level of quality performance, as well as functional and motor skills. Morphological characteristics occupy an increasingly important place in the primary selection of basketball players.

If we compare the values of the height of the national team of Montenegro and Ukraine we can conclude that they are approximate. In comparison with the other participants in Eurobasket 2019, we can conclude that the teams of Montenegro and Ukraine have the second most valuable result in body height, as do the teams of Russia, Sweden, while the tallest team is Turkey, with an average height of 185cm (Table IV). In terms of age structure, Montenegro is in seventh place as there are older teams, such as: Great Britain (29), Russia (27), Serbia (28), Spain (30), Sweden (27), Turkey (27), while Italy, Latvia and Ukraine are in the same age structure - 26 years (Table IV). The average teams, in terms of younger players, are Slovenia and Belorussia (24), as well as Hungary (25) (Table IV).

If we compare the results of body height, which are on the official FIBA website, with the results obtained in our study, we can see that the values differ: Ukraine - 182.69 ± 9.86, and Montenegro - 181.58 ± 7.39 in our study; while, on the other hand, FIBA official website states height of 184cm in case of both national teams. It is important to emphasize that this difference is due to the fact that basketball players are usually measured in their footwear. Therefore, in the further analysis we will compare the results obtained in our study.

The results of anthropometric measures showed that the average height of the both teams was lower than the values given by Salgado Sánchez *et al.* (2009) regarding Spanish first (183.2 cm), but they result higher than values of Spanish second (180.2 cm) division players. In addition, the average height of Montenegrin players, as well as Ukraine, shows higher results than resulted obtained by Ismet *et al.* (2009) in examinees from Bosnian first league teams (177.6 cm). Also, similar results appear with Nunes *et al.* (2008), who analysed the Brazilian National Team, whose average height is 182.6 cm). Additionally, Carter *et al.*, who examined 14 teams from the Women's World Basketball Championships, Australia 1994, gain results that showed an average height of 180cm. Results in this research, concerning Montenegro and Ukraine national teams, are higher than the ones obtained by Bayios *et al.* (2006), whose examination showed that Greek basketball players, from second division, have 174.7 cm average height.

There for we can conclude that the average height of Montenegrin female basketball players is at a very high level, relative to the values of national selections, but also to the heights of players in national leagues. In favor of this reasoning, that high positioning in body height is supported by the fact that the population from which selection is made is very high, also comes a research done by Popovic (2018), who claims that female Montenegrins, with an average height of 169.36, are second in height in the world, after Lithuanians whose average is 169.8.

The average body mass values of the respondents are also approximate and range (Ukraine 73.77±10.66 and Montenegro 74.09±9.35). We can conclude that the players of Montenegro and Ukraine have approximately equal values

of body height and body weight. Results in weight of Montenegro and Ukraine players are similar and narrow to the Salgado Sánchez *et al.* values in Spanish second division players. Body mass values are lower than those of the first division basketball players of England Basketball Division (Berdejo-del-Fresno *et al.*, 2012), and those of the Second Spanish League (Salgado Sánchez *et al.*), and have approximat values with the players of the First Spanish League (74.3 kg), according to Salgado Sánchez *et al.*

According to the results of the t-test, the values of all six tested skinfolds were in favor of the national team of Ukraine. But, not all of them have shown statistical significance. This means that the values of the skinfold of the abdomen significantly differs by 0.015, in favor of representation of Ukraine. Also, the value of thigh skinfold has shown a statistical significance of 0.004. In addition, values of upper skinfolds (biceps, triceps, back) are in favor of the national team of Ukraine, but that did not show special significance. Having this mind, it can be concluded that the Ukrainians have less subcutaneous adipose tissue than the Montenegrin players.

Table IV. Body height and age of national teams participating in EuroBasket - Latvia and Serbia 2019 (ranked by European Championship ranking). (<http://www.fiba.basketball/womenseurobasket/2019>)

Final standings	National team	Average height (cm)	Average age (years)
1.	Spain	182	30
2.	France	182	28
3.	Serbia	182	28
4.	Great Britain	181	27
5.	Belgium	181	27
6.	Sweden	184	27
7.	Hungary	183	25
8.	Russia	184	27
9.	Italy	182	26
10.	Slovenia	180	24
11.	Latvia	183	26
<b>12.</b>	<b>Montenegro</b>	<b>184</b>	<b>26</b>
13.	Belorusia	182	24
14.	Turkey	185	27
15.	Czech R.	181	29
<b>16.</b>	<b>Ukraine</b>	<b>184</b>	<b>26</b>

Observing the results of values of BMI for Ukraine ( $22.15 \pm 2.34$ ) and Montenegro ( $22.38 \pm 2.19$ ) we can conclude that there are no significant differences between the two national teams. We can state that these results are the same in comparison with other studies (Nunes *et al.*; Salgado Sánchez *et al.*; Berdejo-del-Fresno *et al.*).

During the game, players move in different ways: walking, walking in different directions and with different body orientation relative to the direction of movement, walking with pivoting, straight running, running in different directions and with different body orientation with respect to the direction of movement, jump up one leg, high jump with both legs (Nazaraki *et al.*, 2009). In order to have excellent motor movements mentioned above we must emphasize that the value of body fat component is important from a physiological point of view. Statistical significance was also obtained for the fat percentage variable. The values of this parameter are  $18.12 \pm 4.04$  for Ukraine and  $21.38 \pm 3.94$  for Montenegro. Statistical significance is at 0.044 in favor of Ukraine. The results of average value in case of Ukraine (18.12) are slightly better, and in the case of Montenegro (21.38) slightly lower, compared to results of the highest level basketball players according to Salgado Sánchez *et al.*, whose fat percentage was 19.01. It should be noted that Montenegro players have poor results when it comes to fat percentage, which can affect their motor performance, since it is known that players with lower body fat content would invariably perform at a higher level than those with higher body fat (Ostojic, 2006). Perhaps the reason for such poor results lies in the traditional national cuisine of this region, which is dominated by foods of high nutritional value. This cannot be justified, as the nutrition of athletes is designed based on their daily needs.

Results of the muscle mass value were in favor of Ukraine (34.07), while Montenegro national measured some lower results (32.84), but this did not show notable significance, 0.406. However, compared to the results obtained by Salgado Sánchez *et al.*, that showed 44.3, we may conclude that both national teams show poorer values. It is precisely these results that show that the representations of Montenegro and Ukraine, in terms of anthropometric characteristics, differ from the elite teams that compete on major competitions, such as Spain, team that won a gold medal at the Eurobasket 2019 Championship. While, Montenegro and Ukraine took 12th and 16th place.

## CONCLUSION

The subject of this paper was to study the morphological status of top elite female basketball players, who are members of two selections that participated in the 2019 European Championship. The goal was also to obtain quantitative data that can be used to determine the morphological model and define control of the morphological status of elite female basketball players.

Results showed that the players of Montenegro and Ukraine are equal in age and height, they are second in the European Championship in terms of height, and they are on average level higher than many previous researches that have taken into account major international competitions but also national leagues. It was also found that Ukrainian players had better skinfolds, better BMI values, and fat percentage value. Finally, we can conclude that results obtained in this research can serve to compare future national selections of Montenegro and Ukraine. But, also, to be used in comparison with other selections that achieve better results than those treated here.

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**LJUBOJEVIC, M.; BOJANIC, D.; BJELICA, D.; VASILJEVIC, I. & VUKOTIC, M.** Diferencias en las características antropométricas entre dos equipos nacionales de elite de baloncesto femenino - Participantes en Eurobasket 2019 en Letonia y Serbia. *Int. J. Morphol.*, 38(4):857-862, 2020.

**RESUMEN:** El objetivo de esta investigación fue determinar las diferencias entre las jugadoras de baloncesto del equipo nacional de Ucrania y el equipo nacional de Montenegro, en términos de sus características antropométricas y composición corporal. Una muestra de 27 sujetos se dividió en dos submuestras. La primera submuestra de las jugadoras consistió en 13 miembros del equipo nacional de Ucrania, con una edad promedio de  $24,92 \pm 4,09$ , mientras que la segunda submuestra consistió en 14 jugadoras del equipo nacional de Montenegro, con una edad promedio de  $22,36 \pm 4,14$ . Todas las jugadoras fueron evaluadas en Podgorica, durante dos días, mientras realizaban los preparativos para el Campeonato de Europa, un mes antes de su comienzo. Las características antropométricas en la composición corporal se evaluaron mediante once variables: altura corporal (cm), peso corporal (kg), pliegue de tríceps, pliegue de espalda, pliegue de bíceps, pliegue abdominal, pliegue de muslos, pliegue de pantorrilla, índice de masa corporal (IMC) porcentaje de grasa y masa muscular (kg). Las diferencias en las características antropométricas y la composición del cuerpo de las jugadoras de baloncesto de dos equipos nacionales, Ucrania y Montenegro, se determinaron mediante el uso de un procedimiento paramétrico discriminador con prueba t para pequeñas muestras independientes. Se descubrió que las jugadoras de baloncesto de Montenegro son ligeramente más bajas y tienen más masa corporal. Además, existen diferencias estadísticamente significativas entre 3 variables que analizan el pliegue cutáneo abdominal, el pliegue cutáneo de la pantorrilla y el porcentaje de grasa, a favor del equipo nacional de Ucrania.

**PALABRAS CLAVE:** Características antropométricas; Composición corporal; Jugadoras de baloncesto.

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