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Comparative Analysis of Anthropometric Attributes Among Bosnian and Herzegovinian National Volleyball Team Senior and Junior Male Players: Advancing Insights into Athletic Development

Análisis Comparativo de Atributos Antropométricos entre Jugadores Masculinos Senior y Junior del Equipo Nacional de Voleibol de Bosnia y Herzegovina: Avances en el Conocimiento del Desarrollo Atlético

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SUMMARY: Morphological dimensions are reliable representations of the functioning, growth, and development of the skeletal-muscular system, defining a significant role in the sport of volleyball. In volleyball, it is imperative to identify the anthropometric constitution generated by endogenous and exogenous factors. The aim of the study was to determine the differences in morphological characteristics between junior and senior members of the BIH national team. The sample of respondents included 29 male volleyball players from the national team of BIH, divided into a subsample of seniors (n=13; Body Height = 194.77 ± 7.01 cm; Body weight = 92.92 ± 7.02 kg) and a subsample of juniors (n=16, Body Height = 197.06±4.65cm; Body weight = 83.19±5.15 kg). Thirteen (13) variables of anthropometric space were measured. Anthropometric measurements were conducted following the ISAK standard procedure guidelines. The standard metric instruments were applied: Stadiometer (SECA 213, Germany) - used for measuring body height; Body mass was measured by a digital scale (Tefal/0-160kg); Circumference measurements were measured with a foldable non-elastic tape measure and a Gullick Tape (Baseline Measurement Tape/300cm) and a Calliper measured skin folds. The T-test results revealed statistically significant differences (approximately 54%) between the senior and junior players in various anthropometric measurements, including weight (T=4.307, p<0.001), leg length (T= -4.251, p<0.001), hand length (T=2.661, p<0.015), upper arm circumference (T= 4.514, p<0.001), forearm circumference (T=5.275, p<0.001), upper arm skinfold (T= 5.741, p<0.001), and abdominal skinfold (T= 3.098, p<0.009). The male volleyball national team of VIH's senior players displayed superior anthropometric attributes compared to their junior counterparts. Identifying discrepancies at an early stage can optimize both the training regimen and the process of selecting players at a young age.

KEY WORDS: Anthropometry; Volleyball; Age; Morphology.

INTRODUCTION

Achieving success in elite sports is determined by a complex interplay of physiological, psychological, and anthropometric factors (Toselli & Campa, 2018). This multifaceted approach acknowledges that peak athletic performance is not solely about physical attributes but also involves mental and emotional aspects (Pavlovic *et al*., 2022). Further, stress the importance of understanding athletes' anthropometric characteristics as a foundation for designing effective training and competition strategies. They argue that specific motor tasks in sports require a certain morphological profile, which should align with the athlete's primary sport. This correlation between an athlete's physical build and their sporting discipline underscores the need for personalized training programs that cater to the unique morphological needs of each athlete, enabling them to optimize their performance in their chosen sport .

It is precisely the anthropometric characteristics that are responsible for the processes of the dynamics of growth and development of the organism and, as such, are indispensable in training transformation processes. The anthropometric profile of athletes has often been analyzed,

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defining the composition and proportionality between different anthropometric characteristics, the so-called morphological optimization that enables the achievement of optimal body structure, body composition, and somatotype for the best results in any sport, including volleyball (Baramenti & Platanou, 2010; Carvajal *et al*., 2012; Pavlovic *et al*., 2021).

Anthropometric characteristics of athletes are important prerequisites for successful volleyball, which is among the most popular sports today (Duncan *et al*., 2006). Volleyball is a versatile team sport, a sport of tactics, strength, and fast pace, which requires extremely quick thinking, a high level of ability, and technical application, followed by appropriate morphological parameters (Singh & Singh, 2021). It is an extremely dynamic high-intensity integrative sports game, interspersed with periods of lower intensity (Gabbett & Georgieff, 2007; Singh & Singh, 2013), characterized by different skills (jumps, steps, blocks, landings) and intense movements in different planes, with short periods of rest such as walking and often standing (Gulati *et al*., 2021). Playing volleyball requires a high level of technical-tactical performance in accordance with anthropometric characteristics (Gaurav *et al*., 2010; Fields *et al*., 2018). Papadopoulou *et al*. (2002) suggests that technical-tactical performance in volleyball with anthropometric characteristics and individual motor skills are the most significant factors of competitive success.

A previous study highlighted the key attributes defining volleyball players, including jumping ability, power output, and force (Toselli & Campa, 2018). These critical skills are significantly influenced by various anthropometric characteristics. Specifically, factors such as height, body composition, and somatotype components play a pivotal role in determining a player's effectiveness in these areas (Toselli & Campa, 2018).

Height is particularly important in volleyball for actions like spiking and blocking. Body composition, which includes the distribution of muscle and fat, affects a player's agility and power, crucial for quick movements and explosive jumps. The somatotype, which refers to the classification of body build (whether ectomorphic, mesomorphic, or endomorphic), also influences an athlete's physical capabilities and performance. This understanding of how anthropometric characteristics impact a volleyball player's skill set is essential for targeted training and talent identification in the sport. Kinanthropometric assessment is of particular importance in volleyball, where a certain degree of physical status is due to the need for effective player response on the field, where morphological parameters together with physical status play an important role in determining the resulting success (Singh *et al*., 2017). These statements are confirmed by a previous study that suggests volleyball requires manipulating the ball above the head, so anthropometric characteristics (especially the height) of the player are an advantage in this sport, so it is not surprising that volleyball players are usually taller than players in other sports (Rahmawati *et al*., 2007). Body height has been noted as the difference factor between successful and unsuccessful teams.

In volleyball, taller athletes often have an advantage due to their ability to reach over the net more effectively, which enhances their performance in various game aspects such as serves, receptions, blocks, and attacks. This perspective is supported by the previous studies, which all highlighted the significance of body height in volleyball (Stamm *et al*., 2003; Faraji *et al*., 2014; Khanna & Koley, 2020). Faraji *et al*., (2014) emphasize that body height is the most crucial anthropometric characteristic, often correlating with enhanced strength in players. Moreover, body height, along with body mass, is a key factor in identifying potential talents in volleyball (Shchepotina *et al*., 2021).

Furthermore, volleyball, being a team sport, requires players to have well-developed morphological characteristics that enable them to react optimally in various game situations. The study of anthropometric characteristics and their impact on team sports like volleyball is intricate. This complexity arises from the need to understand how individual player characteristics integrate within the team, thus forming a cohesive unit. The position of a player within a team is crucial for interpreting these morphological characteristics, as different positions in volleyball have varying physical demands and requirements.

In recent years, the focus on studying the relationship between morphological status and physical capability in relation to success in various sports has significantly increased. This trend is highlighted in a previous research, which underscores the growing interest in understanding how an athlete's physical attributes and abilities contribute to their performance in specific sports (Goranovic *et al*., 2022). This area of study is crucial for developing training methods and selection criteria tailored to the unique demands of each sport. Many researchers suggest that training athletes can be expected to have adequate morphological and functional dimensions that are particularly favorable for their primary sport (Hussain *et al*., 2011; Hussain *et al*., 2013, Mohammad, 2015). In addition, one study's findings advocated that specific morphological characteristics are significantly related to success in sports, and different sports require different morphological characteristics to achieve maximum performance (Khanna & Koley, 2020).

Volleyball belongs to those sports activities in which the anthropometric characteristics of its players influence the level of sports success. According to Singh & Singh (2021) compared to most other athletes, volleyball players have characteristic anthropomorphological characteristics, while anthropometric characteristics play an important role in determining the success of athletes. This is the first study of its kind in Bosnia and Herzegovina that analyses the anthropometric characteristics of male volleyball players and members of the national team of Bosnia and Herzegovina.

This study's primary objective was to analyze and identify any differences in the anthropometric characteristics between male volleyball players at the senior and junior competition levels who are members of the Bosnia and Herzegovina national team. This analysis aims to understand how physical attributes vary across different levels of expertise and age groups within the same sport, providing valuable insights for training, development, and selection processes in volleyball.

MATERIAL AND METHOD

Participants. The sample of respondents included 29 male volleyball players from the national team of BIH divided into a subsample of seniors (n=13; body height = 194.77 ± 7.01 cm; body mass = 92.92 ± 7.02 kg) and a subsample of juniors (n= 16, body height = 197.06±4.65 cm; body weight = 83.19±5.15 kg). All study participants were healthy and physically fit, with no history of injuries in the last six months. The Council of the University of East Sarajevo approved this study under approval number 01-C-396-XXXVIII/10, dated November 25, 2010, which was conducted per the Declarations of Helsinki (2010). Before the commencement of this study, every participant received a comprehensive overview of the study's specifics and outcomes assessment methods, and they provided signed consent forms as evidence of their agreement to participate. The study followed the STROBE guideline while conducting the study procedures, as explained in Figure 1.

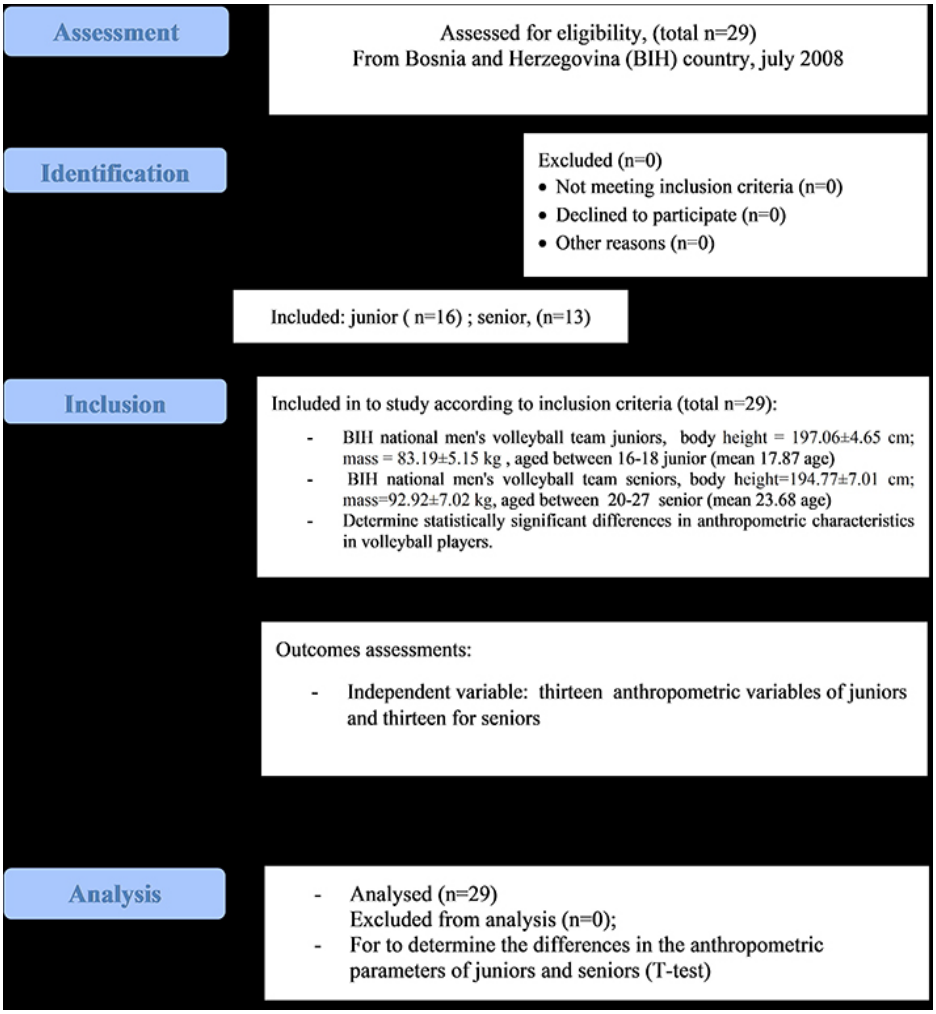

Fig. 1. STROBE Flow Diagram.

Measurements. Anthropometric measurements were performed according to the International Society for the Advancement of Kinanthropometry methodology - ISAK standard procedures.

Body height. Body height was assessed by employing a portable stadiometer (SECA 213, Germany), measuring from the vertex to the floor while adhering to the anatomical position and the Frankfurt plane. The measurements were conducted with the subjects standing barefoot, maintaining an upright posture, and recorded to the nearest millimeter (1 mm). It was assessed in cm (centimetres) (Malousaris *et al.*, 2008).

Body Mass. Body mass was measured by digital scale (Tefal/0-160 kg). It was evaluated in kg (kilogram) (Malousaris *et al.*, 2008).

Volume measurements. The process of measuring body circumferences, as outlined in the "Manual of Anthropometric Procedures" (Norton & Olds, 2001; Centers for Disease Control and Prevention, 2009), involves the use of specific tools like a collapsible non-elastic measuring tape or a Gullick tape (Baseline Measurement Tape/300 cm). These measurements are recorded in centimeters (cm) to the nearest 0.5 cm for precision. Key areas measured include the biceps, forearm, thigh, and lower leg. These measurements are taken while the individual stands upright, ensuring accuracy. To enhance reliability, each circumference is measured three times, and the average of these three readings is calculated and used for further data analysis. This methodical approach ensures consistency and accuracy in anthropometric data collection.

Measurement of fold thickness. The thickness of a skinfold, as described in the "Manual of Anthropometric Procedures" (Centers for Disease Control and Prevention, 2009) and by Norton & Olds (2001), refers to the layer of fat that is present between the two layers of skin when the skin is pinched and folded at specific points on the body (Norton & Olds, 2001; Centers for Disease Control and Prevention, 2009). This measurement is typically taken on the right side of the body. It's measured in millimetres (mm) using a specialized tool known as a Skinfold calliper, with the John Bull brand from LTD, England, noted for its precision of 0.2 mm. This method provides a reliable means of assessing body fat percentage, which is a key factor in many health and fitness evaluations.

Arm, leg, hand, and foot length. Arm length is taken from the tip of the humerus bone (acromion) to the tip of the middle finger (dactylic) of the right hand while the arm hangs down laterally in relation to the body (Norton & Olds, 2001). The length of the leg is measured by placing the anthropometer in a vertical position next to the legs, the tip of the movable horizontal arm is placed on the front upper femoral spine (spina iliaca anterior superior), and the distance of the mentioned point from the base is measured.

According to Norton & Olds (2001), the measurement of full hand length is determined by the distance from the tip of the middle finger to the midline of the distal wrist crease. This method provides an accurate assessment of hand size. Similarly, foot length is measured from the tip of the longest toe to the back of the heel. These measurements are critical for understanding body proportions and are often used in anthropometric studies to analyze physical characteristics related to health, ergonomic design, and athletic performance.

Statistical analysis. Data processing was carried out using the IBM SPSS Inc. version 26.0 for Windows, a statistical program designed for personal computers. Descriptive statistics were employed to compute the arithmetic mean and standard deviation for each variable. The assessment of distribution normality involved two methods: examining Skewness for asymmetry and assessing Kurtosis for homogeneity. The normality of the distribution of results was tested using the Kolmogorov-Smirnov (K–S) test. A T-test was used to identify differences between the groups. For all statistical analyses, the level of significance was set at 95% i.e., $p<0.05$.

RESULTS

Table I in the mentioned study presents a comprehensive overview of descriptive statistics for various variables, comparing senior and junior subsamples. Additionally, the table includes results from the Kolmogorov-Smirnov (K-S) test, which is used to assess the normality of the distribution of these results. The K-S test values indicate that the distributions are not significantly different from a normal distribution, as they fall within the threshold of statistical significance ($p \leq 0.05$).

Furthermore, the coefficient of variation (CV%) in the table suggests a significant homogeneity within the subsamples. This uniformity supports the conclusion that the distribution of results across all variables is normal. Based on this normality, the study then justifies the use of parametric statistical procedures, such as the t-test for independent samples, to identify potential differences between the senior and junior subsamples. This approach is crucial in ensuring the accuracy and relevance of the statistical analysis conducted in the study.

Please paste Table I here. Out of 13 measured anthropometric attributes of male volleyball players, the numerical parameters of the T-test recorded a statistically significant difference in seven variables, which is about 54% (Table II). The analysis showed a higher body mass of seniors than juniors ($t=4.307$, $p\leq0.0001$). On the other hand, juniors had a greater longitudinality, i.e. greater leg length ($t=4.251$, $p\leq0.001$), while seniors had a greater hand length ($t=2.661$, $p\leq0.015$). More voluminousness is present in seniors (arm biceps circumference, $t=4.514$, $p\leq0.0001$; forearm circumference, $t=5.275$, $p\leq0.0001$; thigh circumference, $t=5.741$, $p\leq0.0001$), while juniors had a lower percentage of fat in abdomen skinfold variables ($t=3.098$, $p\leq0.009$).

Table I. Descriptive statistic of anthropometric characteristic.

Variables	Age	Mean±SD	Range	CV%	Skew.	Kurt.	K-S
Height (cm)	Seniors	194.77±7.01	182.00-206.00	3.60	-0.16	-0.50	0.110
	Juniors	197.06±4.65	190.00-206.00	2.36	0.12	-0.55	0.130
Body mass (kg)	Seniors	92.92±7.02	80.00-110.00	7.55	0.80	2.66	0.157
	Juniors	83.19±5.15	76.00-93.00	6.20	0.22	-0.88	0.142
Arm length (cm)	Seniors	79.92±3.86	75.00-88.00	4.83	0.86	-0.20	0.152
	Juniors	79.44±3.52	76.00-90.00	4.43	1.91	4.76	0.203
Leg length (cm)	Seniors	100.85±5.06	93.00-108.00	5.20	-0.05	-1.24	0.138
	Juniors	107.44±3.22	102.00-112.00	3.02	-0.10	-1.30	0.176
Hand length (cm)	Seniors	21.31±0.95	20.00-23.00	4.45	0.66	-0.03	0.219
	Juniors	20.44±0.81	19.00-22.00	3.98	-0.20	-0.21	0.255
Foot length (cm)	Seniors	29.00±1.22	28.00-32.00	4.22	1.29	1.59	0.254
	Juniors	29.06±0.77	28.00-30.00	2.66	-0.11	-1.19	0.219
Standing reach (cm)	Seniors	255.08±11.06	235.00-272.00	4.34	-0.13	-0.48	0.125
	Juniors	253.50±5.18	244.00-265.00	2.04	0.29	0.50	0.100
Arm (biceps) circumference (mm)	Seniors	30.69±1.03	30.00-33.00	3.36	1.27	0.46	0.244
	Juniors	28.69±1.30	27.00-32.00	4.54	0.87	1.54	0.217
Forearm circumference (mm)	Seniors	29.54±1.13	28.00-31.00	3.81	-0.11	-1.28	0.197
	Juniors	27.56±0.89	26.00-29.00	3.24	-0.21	-0.37	0.250
Thigh circumference (mm)	Seniors	61.85±2.54	57.00-67.00	4.11	0.53	1.25	0.245
	Juniors	56.19±2.71	53.00-62.00	4.83	0.46	-0.32	0.164
Calf circumference (mm)	Seniors	39.92±1.85	37.00-43.00	4.63	0.13	-0.01	0.175
	Juniors	39.06±1.77	36.00-42.00	4.53	0.06	-1.05	0.175
Triceps skinfold (mm)	Seniors	8.15±3.65	4.00-16.00	44.74	0.94	0.66	0.177
	Juniors	8.13±2.55	5.00-13.00	31.42	0.83	-0.28	0.232
Abdomen skinfold (mm)	Seniors	14.54±5.87	5.00-22.00	40.36	-0.13	-1.61	0.188
	Juniors	9.25±3.17	6.00-18.00	34.30	1.69	2.86	0.218

K-S: Kolmogorov-Smirnov test; CV%: coefficient of variation; Kurt.: Kurtosis; Skew: Skewness

Table II. Differences in anthropometric characteristics between volleyball players.

Variables	Age	Mean±SD	t-value	p	p-Levene	95 %CI	
						Lower	Upper
Height (cm)	Seniors	194.77±7.01	-1.057	0.324	0.151	-6.754	2.167
	Juniors	197.06±4.65					
Body mass (kg)	Seniors	92.92±7.02	4.307	0.0001**	0.712	5.098	14.373
	Juniors	83.19±5.15					
Arm length (cm)	Seniors	79.92±3.86	0.354	0.729	0.473	-2.331	3.302
	Juniors	79.44±3.52					
Leg length (cm)	Seniors	100.85±5.06	-4.251	0.001**	0.081	-9.773	-3.410
	Juniors	107.44±3.22					
Hand length (cm)	Seniors	21.31±0.95	2.661	0.015*	0.797	0.199	1.541
	Juniors	20.44±0.81					
Foot length (cm)	Seniors	29.00±1.22	-0.168	0.875	0.157	-0.828	0.703
	Juniors	29.06±0.77					
Standing reach (cm)	Seniors	255.08±11.06	0.507	0.642	0.027	-4.801	7.954
	Juniors	253.50±5.18					
Arm(biceps)circumference (mm)	Seniors	30.69±1.03	4.514	0.0001**	0.641	1.093	2.916
	Juniors	28.69±1.30					
Forearm circumference (mm)	Seniors	29.54±1.13	5.275	0.0001**	0.245	1.207	2.744
	Juniors	27.56±0.89					
Thigh circumference (mm)	Seniors	61.85±2.54	5.741	0.0001**	0.533	3.636	7.681
	Juniors	56.19±2.71					
Calf circumference (mm)	Seniors	39.92±1.85	1.278	0.215	0.753	-0.521	2.243
	Juniors	39.06±1.77					
Triceps skinfold (mm)	Seniors	8.15±3.65	0.025	0.981	0.406	-2.337	2.395
	Juniors	8.13±2.55					
Abdomen skinfold (mm)	Seniors	14.54±5.87	3.098	0.009**	0.001	1.786	8.791
	Juniors	9.25±3.17					

*- Significant value, if p<0.05; **-Highly significant value if p<0.01; t: T-statistics; CI: Confidence interval.

DISCUSSION

The objective of this study was to conduct an analysis aimed at discerning and establishing disparities in the anthropometric attributes of male volleyball players participating at both senior and junior levels of competition, all of whom are integral members of the Bosnia and Herzegovina national team.

Anthropometric traits are crucial in influencing the performance of athletes. In volleyball, teams engage in competitive matches, often involving overhead ball handling, where height stands out as a paramount physical attribute (Koley *et al*., 2010). The genetic makeup significantly influences body height, which is the defining characteristic among volleyball players (Gaurav & Singh, 2014). This study indicates the existence of differences between senior and junior volleyball players. Higher body mass and hand length were recorded in senior volleyball players, while higher leg length was recorded in junior volleyball players. A previous study highlights that a higher body mass in volleyball players may negatively impact their ability to achieve optimal jump heights for spikes and blocks, as they need to lift more weight during these actions (Khanna & Koley, 2020). This observation is significant in volleyball training and player development, emphasizing the importance of maintaining a body mass that allows for maximum vertical leap efficiency.

Additionally, another researcher in a study points out that the nature of volleyball, which typically lacks body contact, suggests that players do not necessarily benefit from having a larger body mass in terms of improving performance (Bandyopadhya, 2007). Instead, the ability to jump high is a critical component for executing effective spikes and blocks. This insight underlines the importance of focusing on developing explosive power and agility, rather than just increasing body mass, for volleyball players to excel in these key aspects of the game. The mean body mass of senior volleyball players in this study is (92.92±7.02 kg) and junior (83.19±5.15 kg), and it is higher in contrast to Indian volleyball players (73.39±9.10 kg) (Gaurav & Singh, 2014). Comparing the body mass values with the national team of Brazil (90.3±13.0 kg), it is noticeable that the senior volleyball players had a higher body mass, and the juniors had a lower body mass (Petroski *et al*., 2013).

In this study, higher body mass values of senior volleyball players compared to junior volleyball players may be harmful in achieving good vertical jump because the players have to lift more body mass. A longer leg length was recorded for junior volleyball players, while a higher hand length was recorded for senior volleyball players.

Genetic factors overwhelmingly dictate anthropometric characteristics, particularly for measurements of length and breadth, and they remain impervious to alteration through training efforts (Norton & Olds, 2001). The proportions of the lower body, specifically the feet, thigh, and leg, play a crucial role in the mechanics of vertical jumping. These body parts, along with the length of the connected moment arms (the distances from the joints to the points of force application), essentially act as mechanical levers. The effectiveness of these levers significantly influences how force is generated and applied during a jump.

In biomechanics, the concept of leverage is fundamental. Longer-moment arms can potentially generate more force, assuming the muscles have the strength to utilize this mechanical advantage. Therefore, the dimensions and proportions of an athlete's lower limbs can have a direct impact on their ability to perform activities like vertical jumps, which are integral in sports like volleyball and basketball. This understanding is vital for training and conditioning programs aimed at enhancing jumping performance. One study found that leg length accounts for a substantial 69% of the variation in vertical jump height among elite male athletes (Aouadi *et al*., 2012). This significant correlation underscores the impact of leg length on jumping ability. Similarly, another study reinforces this observation by noting that individuals with longer legs tend to achieve relatively higher vertical displacement in their jumps compared to those with shorter legs (Caia *et al*., 2016).

These findings highlight the biomechanical advantage conferred by longer legs in activities requiring vertical lift, like jumping. The longer levers provided by extended leg length can generate greater force, translating into higher jumps. This information is particularly relevant in sports where jumping ability is a critical skill, guiding both talent identification and training methods (Aouadi *et al*., 2012; Caia *et al*., 2016).

In sports, body fat constitutes a paramount component because every ability has a large and negative correlation with adipose tissue, like agility, strength, speed, flexibility, and jumping ability (Aytek, 2007).

This study recorded higher abdominal skinfold values in senior volleyball players (14.54±5.87) compared to juniors (9.25±3.17). Comparing our results with the results reported in a previous study conducted with junior volleyball players of the Turkish national team (7.49±2.69) and senior volleyball players (9.76±3.32), it is noticeable that the volleyball players of Bosnia and Herzegovina have a higher percentage of fat (Aytek, 2007).

In the realm of sports, particularly activities involving jumping, maintaining a low level of body fat is generally sought-after. For male athletes, it's important to note that the minimum acceptable body fat percentage should not fall below 5%. This is because a certain level of body fat is essential for supporting physiological and metabolic functions. On the flip side, volleyball demands a high degree of agility, and achieving agility often goes hand in hand with having a lower body fat percentage (Aytek, 2007).

CONCLUSION

In volleyball, anthropometric traits emerge as crucial determinants for particular player positions, with morphological features exhibiting variances tied to the player's competitive level and designated role on the court. As such, volleyball coaches can better utilize this study's findings to grasp anthropometric attributes and their significance regarding player positions. In addition, a sports physiotherapist, trainer, or coach may enhance the output of the rehabilitation programs and practice sessions, particularly in injury prevention, performance optimization, and talent identification, after a thorough insight into the anthropometrical disparities between male volleyball senior and junior teams.

Ethics statement and consent to participate. The Council of the University of East Sarajevo approved this study under approval number 01-C-396-XXXVIII/10, dated November 25, 2010 and the study was conducted per the Declarations of Helsinki (2010). A signed consent form was obtained from each participant as a proof of consent to participate in this study before starting the study.

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RESUMEN: Las dimensiones morfológicas son representaciones confiables del funcionamiento, crecimiento y desarrollo del sistema músculo-esquelético, definiendo un papel importante en el deporte del voleibol. En el voleibol es imperativo identificar la constitución antropométrica generada por factores endógenos y exógenos. El objetivo del estudio fue determinar las diferencias en las características morfológicas entre los miembros junior y senior del equipo nacional de BIH. La muestra de encuestados incluyó 29 jugadores de sexo masculino de voleibol del equipo nacional de BIH, divididos en una submuestra de mayores (n=13; altura corporal = 194,77 ± 7,01 cm; peso corporal = 92,92 ± 7,02 kg) y una submuestra de juveniles (n =16, Altura corporal = 197,06±4,65 cm; Peso corporal = 83,19±5,15 kg). Se midieron trece (13) variables del espacio antropométrico. Las mediciones antropométricas se realizaron siguiendo las pautas de procedimiento estándar de ISAK. Se aplicaron los instrumentos métricos estándar: estadiómetro (SECA 213, Alemania), utilizado para medir la altura corporal; La masa corporal se midió con una báscula digital (Tefal/ 0-160 kg); Las mediciones de la circunferencia se midieron con una cinta métrica plegable no elástica y una cinta Gullick (cinta métrica de referencia/300 cm) y un calibrador midió los pliegues de la piel. Los resultados de la prueba T revelaron diferencias estadísticamente significativas (aproximadamente 54 %) entre los jugadores senior y junior en varias medidas antropométricas, incluido el peso (T=4,307, p<0,001), la longitud de las piernas (T= -4,251, p<0,001), longitud de la mano (T=2,661, p<0,015), circunferencia del brazo (T= 4,514, p<0,001), circunferencia del antebrazo (T=5,275, p<0,001), pliegue cutáneo del brazo (T= 5,741, p<0,001), y pliegue cutáneo abdominal (T= 3,098, p<0,009). Los jugadores senior del equipo nacional masculino de voleibol de VIH mostraron atributos antropométricos superiores en comparación con sus homólogos juveniles. Identificar discrepancias en una etapa temprana puede optimizar tanto el régimen de entrenamiento como el proceso de selección de jugadores a una edad temprana.

PALABRAS CLAVE: Antropometría; Vóleibol; Edad; Morfología.

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