

Anthropometric Profile of Africa Elite Volleyball Club Players by Playing Position: Reports from Men's African Volleyball Club Championship 2023, Preliminary Study

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Abstract

This study aimed to establish anthropometric characteristics of volleyball players who participated in the 2023 Men's African Volleyball Club Championship and to identify the possible differences in these parameters in terms of individual playing positions. Player's age, height, and body mass (bm) were obtained from the African Volleyball Confederation Tournament's Control Committee. A total of 197 players from 15 teams were included and organized in four groups according to their ranks (G1–G4) and sub-grouped using their playing positions. Significant differences ($P < 0.05$) in age, height and body mass index (bmi) were observed among the studied groups (G1–G4). Players in G4 were the tallest and presented the greatest bm ($P < 0.05$) while those in G3 were the youngest. The lowest bm value was observed in G2 ($P < 0.05$). As far as attributes for the different playing positions are concerned, the Middle Blockers and the Opposite players were the tallest ($P < 0.05$). In addition, the opposite players had the greatest ($P < 0.05$) bm while the liberos possessed the greatest bmi values. This study presented anthropometric profile that differentiated levels of success among the teams. This information should serve as reference for statur-ponderal's average characteristics of volleyball players according to their positions at professional level.

Keywords: Height, Body mass, African Volleyball, player position, Team ranking.

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INTRODUCTION

Created in Holyoke, Massachusetts (United State of America) by William Morgan in December 1895 under the appellation Mintonette, Volleyball, as called today, is a team sport in which two teams of six players each are separated by a net [1]. The creation of the Fédération Internationale de Volleyball (FIVB) in the year 1947 permitted the game of volleyball to participate in the Summer Olympic Games program in Tokyo 1964. Other major international competitions standardized by FIVB include: world championships, continental championships, and international tournaments, as well as major club championships that are being played all over the world. The volleyball game currently is a popular

sporting discipline counting about 260 million licensed player with roughly 220 national federations affiliated amongst which 53 come from the African Volleyball Confederation; the popularity cannot be also undermined in Africa.

Played on a court of 18 m by 9 m where each team operate on a surface area of 81 m², volleyball is amongst the team sports practiced on the smallest area. Beside this characteristic, the rules of the game limit long distance displacement during actions by the players [2], and in most situations, short and fast displacements are performed with vertical jumps [3, 4]. In elite volleyball, according to the various game positions like setters (ST), outside hitters (OH) or receivers (OR), middle blockers

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(MB), opposites (OP) and liberos (LB) every player in a team has a function which orchestrate different movement patterns accompanied by corresponding physical demands for each player [5, 6], due to the different frequency of spike and block jumps per set and anthropometric characteristics as well as significant differences between the different positions [6]. Considering the height of the net, actions (spike, block) done near the net impose jumps and have an effect on the performance [7]. The jump skill is an important motor ability in volleyball which permits players to perform the game actions better and it is seen that athletes of elite teams have higher jump abilities [8, 9].

In addition to the other factors (technical, tactical, psychological) leading to the performance, anthropometric characteristics of the player are not to be under-looked. These characteristics sometimes differentiate players of various competitive level or posts and role in their teams. As it has been proven in handball by Vila *et al.*, [8] and Chaouachi *et al.*, [10], each specific position needs unique and/ or specific physiological and physical qualities relating to the technical and tactical obligations of each position in order to maximize performance on the playing ground.

In volleyball, the characteristics of players are defined by their positions based on the primary skill that is performed. In a game at the international level, almost half of the actions are represented by blocks and spikes and 80 % of the scores obtained are attributable to these two actions [11]. Nowadays, the modernization of volleyball has led to the separation of attackers into three groups based mostly upon their anthropometric and somatotype characteristics [12]. It can therefore be understood that these characteristics play an important role in the realization of the performance. Data concerning the anthropometrics of high class level volleyball players provides specific information to help orientate players to the most appropriate playing positions. Also, the data can be used by trainers during talent detection and/ or selection which involves the on-going process of identifying athletes at various stages who demonstrate prerequisites standards of performance for inclusion in a particular team. It is focused on choosing the most appropriate person, or group of persons, who can well carry out the task within a particular situation.

Thus, the purpose of this study was to describe the anthropometric profile of elite volleyball players who took part in 2023 men's African Volleyball Club

Championship and compare the characteristics based on the different playing positions.

MATERIALS AND METHODS

Study design

The present study was descriptive, cross-sectional and analytic involved among high trained athletes of the men's African volleyball club championship which took place in Kelibia, Tunisia from the 9th to the 21st may 2023. A total of 15 teams from 13 countries, with 197 players who participated in the tournament.

Data Collection

Rosters with player's age, body height, body mass were obtained from the African Volleyball Confederation tournament's Control Committee. All teams rosters and all the players who were registered for the tournament were included. Age and anthropometric parameters (height, mass, and body mass index), playing Positions, were obtain by the Confederation tournament's Control Committee.

Participants

Teams were organized according to their ranks (Figure 1) and sub-grouped using their playing positions.

Statistical analysis

Quantitative variables were expressed by mean \pm standard deviation. The analysis was conducted using StatView 5.0 (SAS Institute, Inc., Chicago, USA) software. In addition, differences of age, body height, body weight, BMI across groups (1 to 4), and playing positions were analyzed with one way analysis of variance (ANOVA). When a significant difference was revealed, the PLSD of Fisher post hoc test was used to specify where the difference occurred. Playing position-adjusted partial correlation coefficients were calculated to investigate the relationship between team rank, age, anthropometric characteristics and highest reach were performed with the Pearson's correlations. The level of significance was set at $p \leq 0.05$.

RESULTS

Anthropometric characteristics of volleyball players from the 2023 men's African volleyball club championship grouped according to ranks are resumed in Table 1.

ZML (Rank 2), ISEG (Rank 13), OMG (Rank 10) and OMG were older, with highest height, weight and had high BMI. However, CSV OMG (height), GBC (body mas), and PAD (BMI) had the lowest values.

Table 1: Anthropometric characteristics of players according to their ranks

Rank	Country	Team	N	Age (yr)	Body height (m)	Body Mass (kg)	Body Mass Index (kg/m ²)
1	Tunisia	MSB	14	26.6±5.3	1.91±0.1	81.4±8.7	22.3±2.0
2	Egypt	ZML	14	30.1±5.0	1.94±0.08	87.9±9.2	23.3±1.3
3	Algeria	JOA	14	25.9±3.9	1.94±0.08	81.5±6.2	21.7±2.2
4	Cameroon	PAD	14	25.6±5.8	1.90±0.06	78.6±7.6	20.1±6.0
5	Tunisia	ASM	13	26.4±6.0	1.90±0.07	82.0±8.3	22.6±1.1
6	Rwanda	REG	14	26.5±4.1	1.93±0.07	84.2±6.6	22.7±1.6
7	Kenya	KPA	14	26.9±5.0	1.88±0.08	78.4±10.4	22.1±2.4
8	Zambia	GBC	12	25.6±3.5	1.88±0.16	73.7±8.9	21.2±4.2
9	Nigeria	CNS	14	24.1±6.4	1.91±0.08	81.1±9.5	22.1±1.6
10	Mauritius	OMG	11	30.0±5.0	1.83±0.09	94.3±30.3	28.1±9.4
11	Cameroon	CSV	10	20.6±3.6	1.9±0.09	77.4±10.7	21.5±2.2
12	Burundi	RUK	13	24.0±5.0	1.84±0.11	81.9±8.0	24.1±1.4
13	Senegal	ISEG	14	26.2±3.5	1.98±0.07	83.9±7.1	21.4±1.4
14	Cote d'Ivoire	INJS	14	29.7±5.3	1.90±0.06	85.6±6.5	23.7±2.3
15	Ethopia	MCF	12	25.3±3.3	1.92±0.08	78.6±6.1	21.2±1.3
Overall			197	26.3±5.2	1.91±0.09	81.7±9.1	22.5±2.4

JOA: Jil Saad Commune Ouled Adouane; RUK: Rukinzo Volleyball; PAD: Port Volleyball Club; CSV: Cameroon Sport Volleyball; INJS: AS INJS; ZML: Zamalek; MCF: Mugher Cement Factory; KPA: Kenya Ports Authority; OMG: Olympique Montagne Goyaves; CNS: Chief of Naval Staff Spiker; REG: Rwanda Energy Group; ISEG: ISEG Sport; MSB : Mouloudia Sportive de Bou Salem; ASM : Avenir Sport de la Marsa ; GBC: Green Buffaloses; n: number of players

The age and the anthropometric parameters of volleyball players according to their groups are summarized in Table 2.

Players of group 1 were older ($p=0.02$), taller ($p=0.004$) and had less BMI ($p=0.01$) than players of

group 3. Athletes of group 3 were younger ($p=0.028$) and had higher BMI than those present of group 4 ($p=0.01$). Players of group 2 were less tall ($p=0.04$) and had higher BMI ($p=0.009$) than that of group 4.

Table 2: Anthropometric characteristics of players according to groups

	Age (yr)	Height (m)	Mass (kg)	BMI(Kg.m ⁻²)
Group 1 (n=56)	27.1±5.2*	1.92±0.08*	82.3±8.5	22.2±1.9*
Group 2 (n=53)	26.4±4.6	1.90±0.1*	79.7±9.3	22.2±2.5*
Group 3 (n=48)	24.7±6.0°	1.87±0.1*	82.0±11.0	23.4±2.72°
Group 4 (n=40)	27.1±4.5	1.94±0.08	82.9±7.1	22.1±2.0
Overall (n=197)	26.3±5.2	1.91±0.09	81.6±9.1	22.5±2.3

Group 1: Rank 1- 4; Group 2: Rank 5- 8; Group 3: Rank 9- 12; Group 4: Rank 13- 15
 *: significant difference between group 1 and 3; °: significant difference between group 3 and 4; *: significant difference between group 2 and 4, °: significant difference between group 2 and 3.
 *: $p<0.05$; °: $p<0.05$; **: $p<0.01$; ; $p<0.05$

Anthropometric characteristics of players according to their positions are presented in Table 3. The ST were older than the MB ($P<0.05$) and opposites were taller than ST ($P<0.001$) and the LI ($P<0.001$). In

addition, the OP players still presented the highest body mass but the highest BMI values were registered among the LI (Table 3).

Table 3: Anthropometric characteristics of players according to their positions

	Age (yr)	Body height (m)	Body Mass (kg)	BMI(Kg.m ⁻²)
OH (n=61)	26.5±5,6	1.91±0,07 ^{***} *	82.6±9,24	22.6±2,4
MB (n=53)	25.4±4.6*	1.95±0.07 ^{°°°°} §§§	84.0±5.6	22.1±2.3
LI (n=25)	27.3±5.1	1.80±0.09 [°] §	75.4±5.6	23.3±2.2
ST (n=30)	27.5±6.3	1.86±0.05 ^{£££}	77.6±9.2	22.4±2.6
OP (n=28)	25.6±3.8	1.96±0.07	85.4±6.9	22.3±2.2
Overall (n=197)	26.3±5.2	1.91±0.09	81.6±9.1	22.5±2.3

ST: setter; Middle bloker; Li: libero; OH: Outside hitter , OP: opposite
 *: significant difference between ST and MB; °: significant difference between OH and LI;
 *: significant difference between OH and ST; °: significant difference between LI and ST;
 §: significant difference between MB and SE; £: significant difference between ST and OP;
 °: significant difference between LI and OP
 *: $p<0.05$; °: $p<0.05$; **: $p<0.01$; ***: $p<0.001$; °: $p<0.05$; §§§: $p<0.001$; £££: $p<0.001$; °°°°: $p<0.001$;

DISCUSSION

With the aim to assess values for age and selected anthropometric parameters, the present study was conducted among male volleyball players of 15 teams which took part in the 2023 Men's African Volleyball Club Championship in Kelibia, Tunisia according to the rank of each team and in relation to the player's position in the game. Data provided give a general view of the player's anthropometric profile with respect to their teams, groups, rank and playing position.

Some studies have proven that the detection of athletes in some sports can be based on the anthropometric characteristics [13] and knowledge of athlete's anthropometric parameters could contribute to an insight understanding of the differences in performances [14]. Also, the realisation of some performances can be in association with morphological profiles of players of some sports like in volleyball [15]. Thus, other authors have shown that, taking part in elite sport training in association with selection of athletes with specific prerequisites and development of their specific anthropometric [16]. In volleyball, talented players are characterized by a higher stature as well as by a better jumping ability [17]. To succeed in a sport discipline, it is often important to have specific anthropometric attributes and knowledge of the physical characteristics of volleyball players can provide insight into the individual factors which influence the players' performance in the game [18].

The most striking comparison of anthropometric features of volleyball players in the present study was the difference in height and body mass. Volleyball players of G1 and those of G4 had the highest height and body mass compared with players of G2 and G3 (Table 2). Significant differences ($P < 0.05$) were noticed between parameters of athletes of G1, G4 and those of G2, G3. In a previous study carried by Albaladejo-Saura *et al.*, [19], among adolescent athletes, the performances differed significantly based upon stages of biological maturation. Athletes who had advanced maturation process proved to be the best. The ranking of the present study somehow is in accordance with the findings of the above cited study although the characteristics of G4 are not reflecting the rank. This can be justified by the fact that, even though the athletes present a good profile compared to those of G2 and G3, they are coming from volleyball budding countries. Martin-Matillas *et al.*, [20] in a study taken on morphological characteristics of elite female volleyball players from top Spanish league, concluded that elite players in top ranking teams were taller and had higher skeletal muscle mass. This result corroborates with the one of the present study considering the ranking of G1.

The most striking comparison of anthropometric features of volleyball players in the present study was the difference in height and body mass

among the groups. Although no significant difference ($P > 0.05$) was found, players in G4 were taller height with greater body mass when compared with players in G1. BMI was not significantly different ($P > 0.05$) across some groups but across others the difference was noted (Table 2). According to the rank, this result is not in accordance with the findings of some authors. Milic *et al.*, [21] and Sattler *et al.*, [9] who respectively worked on anthropometric and physical characteristics of young female volleyball players according to playing position and level of expertise; vertical jump performance of professional male and female volleyball players shown that the best performances belongs to athletes having better morphological characteristics. This poor ranking of G4 can be justified by the poor technical level of the players and also by the level of volleyball in the countries the teams belong to.

Players in G1 compared to those in G2 and G3 showed the highest body height and body mass (Table 2). In a study carried by Hamid *et al.*, [22] on the anthropometry of world class elite handball players who took part at the men's handball world championship, it appeared that the best teams in the final ranking of the competition were taller and had greater weights. Although this study was done among handball players, the results of the present study are similar and can be taken into consideration because as in handball [23], the physical characteristics of volleyball players influence the players' performance in the game.

A remarkable result of the current study was the average age of the more successful teams (G1) which was higher than in the other groups (exception with G4). In this way, playing experience seems to be an important component in the team success. This can also reflect the fact that the top players in G1 teams may have a longer career permitting them to play for longer time. In handball, a study carried among female elite players supports the role of age in successful teams, reporting that elite players were older than sub elite by about nine years; justifying why more experienced players play in elite settings [24].

As studied by some authors like Sibila et Pori [25], some anthropometrical parameters present significant influence on the position in relationship with performance in the domain of sport. Like in many other sports, volleyball is not left out and it is seen that the anthropometric characteristics of elite or even young players appear to be differ across positions. After analysing the anthropometric data from the participants of the present study with respect to playing position, many significant differences were found (Table 3). In the main body parameters (height and weight), significant differences were noted between players of different positions. The heights of OP and MB are the highest, meanwhile those of the LI were the lowest. Concerning the weight, the OP and the MB had the greatest and the

LI, the lowest. The results of this study are comparable with other previous studies done on male and female elite volleyball and also among young volleyball players [26, 21, 27]. The findings of these authors indicated the MB to be the tallest and most weighted. Also, the height and body mass of the LI were significantly lower than those of the other group of players. The shortness of the LI may be explained by the roles of these players, who are required for reception and low defense tasks which requires more of stamina and as such do not have the exigencies to intervene at the net like MB and OP who have to spike and block.

The anthropometric parameters comparison in this study according to positions reveals that, the tallest players are MB and OP while the shortest are LI. And in terms of body mass, MB and OP still have the highest and LI the lowest (Table 3). These results are almost the same like the one obtained by Mielgo-Ayuso *et al.*, [26] in a study on the influence of anthropometric profile in relation to playing position among 42 Spanish Super-League female volleyball players. They found that, in terms of height, middle blockers were the tallest (186.5 ± 1.4 cm), while LI were the shortest (166.7 ± 8.1 cm). In that same study, there were significant differences ($p < 0.05$) in body mass among positions with OP the heaviest (73.6 ± 5.5 kg), and LI the lightest (58.2 ± 5.7 kg).

CONCLUSION

This present study highlights that male volleyball performance are related to their anthropometric characteristic. The measurement of anthropometric characteristics provides a vision into the current status of volleyball players, permitting coaches to assess typical characteristics for elite performers. This information should serve as a reference for what the average body height, body mass, and BMI of volleyball players may be for positions at the professional level. This data can be used to develop a model of elite volleyball performance which can be used to supplement talent identification programs, and also in the building of real player improvement programs.

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Contributors

Mbang B. W. and Mekoulou J. N. designed the study, analysed and interpreted the data, and drafted the manuscript. Ebal E. M. assisted in defining the statistical analysis. Guessogo W. R., contributed to put the data in excel and analysis. Endele M. M., Dobgima J., and Assomo N. P. assisted with drafting the manuscript. All authors had full access to all of the data in the study and take responsibility for its integrity.

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