

# Comparison of Anthropometric Characteristics Among Volleyball Players Regarding with the Respect of Their Playing Positions in Ethiopian Men Premier League

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**Abstract Introduction:** Performance in sport depends on comprehensive physical, technical, tactical, psychological and anthropometric aspects. Among them, profiling presents as major means for success in volleyball sport, and it has a significant effect on physical, technical and tactical as well as overall performances of the players. That is why it has been a prerequisite to recruit gifted and talented players plus assign in specific playing of positions. Yet, a few related studies had been carried out in Ethiopian volleyball players. Still, no report has been made so far on the anthropometry characteristics of Ethiopian men volleyball premier league players. **Objective:** The aim of this study was to examine the current anthropometry characteristics of men volleyball players in Ethiopian premier league regarding to the players playing-positions. **Methods:** To achieve the set goal of current study, cross-sectional research design was adopted. 48 male volleyball players (mean age  $24.5 \pm 1.6$  years) from Ethiopian Premier League clubs in the year 2021/22 competition participated in. Mean and One-Way ANOVA data analysis tools were performed to compare the mean difference among player positions. **Results:** The finding revealed there was a statically significant difference in

most anthropometric characteristics among players in relation to the playing positions. Players differ in height, weight, spike reach height and blocking reach height (p 0.01); the whole arm and leg length (p 0.01); also circumstance for arm, chest and calf circumference (p 0.05); yet, no significant differences were found on players' body mass index, upper arm, waist and thigh circumference. **Conclusions:** Up on the finding, there was a statistical significant variance found among different position volleyball players on anthropometric characteristics. Setters and liberos are shortest and lightest players among blockers and spikes.

**Keywords** Profiling, Volleyball Players, Playing Positions

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## 1. Introduction

Optimal sport performance depends on players technical, physical, tactical, psychosomatic and anthropometric aspects [1]. It is believed that, success in volleyball is

critically influenced by player's anthropometric characteristics [2]. Since, effective execution of numerous activities in volleyball based on the players can reach height [3]. Considered, an obstacle that influences a player's effective performance in the game is, height of the net [3, 4]. As a result, the tallest player has a great advantage to perform an actions over the top of the net [5], similarly; long leg muscle players are more capable to jump over, higher than short leg muscle players [6, 7]. As a result, ectomorph, also tallest players have been a great tendency to recruit and be successful participation in volleyball [8]. In the same time, the heavier players with normal adipose tissue until 10% were becoming more preferable than lighter players with that in volleyball sport [6, 9]. In fact, huge body mass is a problem for succession of optimum jumping performance [10]. Yet, a body weight with in a high density of bones and the proportion of lean muscle mass have a positive relationship for performance [11]. That is why anthropometry characteristics have been recognized as critical factors for outstanding volleyball performance and considered as a key prerequisite to identifying gifted and talented players as well as assign in specific playing positions [12].

Obviously, players had meaningfully various anthropometric characteristics in relation to their playing position [13]. As a result, the previous study indicates that middle blocker players were taller and heavier and also hitters are taller than setters and liberos, fact setter and liberos are the shortest, lightest [14]. Also, Marques et al. [15] suggest that hitters are heaviest while, second hitters were taller than libero and setter, while setter and liberos are the shortest, lightest. It indicates that middle blocker players are longer and heavier than outside hitters and setter players.

Given the values of anthropometry characteristics on performances of volleyball players as well as the interrelation between physical characteristics and assigning of specific role of playing position, there have been only few studies conducted in the current study area, particularly in Ethiopian men premier league participant players, no scientific evidence was made on this area. At same time, players' recent status is not-well identified. Thus, the aim of current study was to examine the recent anthropometry characteristics of male volleyball players in Ethiopian premier league regarding to their playing-positions.

The present study contributes to fulfilling the above stated research gaps and benefits for volleyball players, coaches and researchers as well as other interested parties working in the field. The finding will improve the literacy of athletes and coaches in understanding to assign players in specific playing position, recruiting and identifying gifted and talented players for this sport. Plus to that, this study was valuable for every concerned body in the area to know how far Ethiopian players from the international players. Thus, the aim of current study was to examine the

recent anthropometry characteristic status of male volleyball players in Ethiopian premier league regarding to players playing-positions.

## 2. Material & Methods

### 2.1. Study Design

To realize the set goal of the current study, the cross-sectional study design is adopted. In fact, the goal of this study was to examine the current anthropometry characteristics of volleyball players in Ethiopian male premier-league regarding to their playing positions.

### 2.2. Participants

In this study, 48 elites (mean age  $24.5 \pm 1.6$  years old) were involved from four Ethiopian premier league participant volleyball clubs namely, Ethiopian Army force (ETAF), Mugger Cement (MC), Wolita Dicha (WD), and Tana Bahir Dar (TBDR) in 2021/22 competition years. Bahir Dar University that was declared to conduct this study was also approved by the University Ethics Committees. All members provided have written informed consensus.

### 2.3. Procedures

To attain first hand imperial date, researchers adopted, practical implementation of field test. Tap meter, and weighing machine that serve as tolls were used to measure anthropometry characteristics of players. In detail, tap meter is used to measure height, length also circumstances of body; weighing machine serves to measure weight, while exceptionally, BMI is calculated by the given formula  $BMI = W/H^2$

### 2.4. Statistical Analysis

Based on the goal of study, descriptive statistics are presented as mean values ( $\mu$ )  $\pm$  Standard-Deviation (SD), One-Way-ANOVA is used to compare the significant variances of anthropometry characteristics and also P-values of less than 0.05 were considered as statistical declaration.

### 2.5. Validity

Test-validity implies the degree, to which the test measures, what it states to measure and the extent to which conclusions, inferences, and decisions made based on test scores are suitable and expressive [16]. For the guarantee of test-validity, researchers adopt formerly designed and applied tests by other authors in the Feld, such like, anthropometric tests were used by [5, 8, 17, 18]. In fact, researchers used standardized measurement tools and for further clarification before tests were applied, all of the instruments were examined by sport science professionals

in Bahir Dar University.

## 2.6. Reliability

Test-reliability implies the degree to which a test is reliable and steady in assessing what it is intended to measure [19]. In this study, the test reliability was approved by using the test-retest method. The middling marks showed a greater degree of reliability-coefficient ( $r = 0.863$ ). In fact, researchers attempted to mitigate other factors that might have influenced the test results at the time of the test administration, such as the dressing of players; diet time before tests was also experience of testers by providing training on the detailed process of the tests. All tests were properly recorded with recording instruments like record sheet, photo.

## 2.7. Inclusion/Exclusion Criteria

According to the set goal of this study, only examine physical characteristics status of the partakers according to their playing-positions, some of basic criteria such as injuries, diet and training time, dressing style are considered as inclusion criteria whereas, genetically predisposition characteristics like behavioral, personality, physiological and environment conditions become an exclusion criteria.

## 3. Results

The current anthropometric characteristics of the players in relation to their playing positions were presented in Table 1. As a result, there were statically differences in most anthropometry characteristics among the player's in relation to their playing positions (Table 1). The statistical analysis indicated that of Basic measurement, there were mean differences in standing reach height, among players in accordance to their playing positions. Supreme standing height was obtained by middle-blockers (MB) followed by outside-hitters (OtH) and opposite-hitters (OpH), while, lowest result was obtained by setters (S) and liberos (L). Likewise, there were differences in body mass among the players according to their playing positions. MB has heavy body mass, within relative differences followed by outside hitters (OtH), opposite hitters (OpH) and setters (S), while the lost was recorded by liberos (L). Regarding to BMI, there were relative differences among players, high BMI obtained by setters (S) with relative differences followed by middle blockers (MB) and liberos, while minimal by hitters. Also, there was a difference in spike and block reach height among players in different positions. The maximal spike and blocking reach height are attained from middle blockers (MB) followed by outside hitters (OtH), and opposite hitters (OpH) while, lost obtained by setters (S) and liberos (L). Length, as presented in Table 1, there was a difference among the players in most length variables depending on playing positions. MB players

relatively advanced in both arm and leg lengths followed by OtH, and OpH, while minimal upper and lower body lengths are recorded by S and L. In addition, Girth, as Table 1 indicates that, there was minor variation in most circumference measurements among male players in relation to playing positions. As Table 1 indicates, middle blockers (MB) players relatively advanced in for arm, upper arm, waist, hip and calf circumferences than of the other position players, while setters (S) in slight difference. Almost closed result with MB, they obtained higher mean chest and thigh circumferences results, while the lost results in most body circumference obtained by outside hitters (OtH), followed by opposite hitters (OpH) and the list from liberos.

The statistical analysis in Table 2 indicates that there was a statically significant variance in standing height, weight, spike and blocking reach height among the players in relation to their playing positions ( $p < 0.01$ ). Whereas, there were differences in body mass index yet, which was not significant ( $p > 0.05$ ). In fact, the best standing height was obtained from middle blockers followed by outside hitter, opposite hitters, while the last result was attained by setter and liberos. Likewise, middle blocker players have heavy body mass, with in relative differences followed by outside hitters, opposite hitters and setters while the lost were recorded by liberos. Regarding to body mass index, the highest result obtained by setters was followed by middle-blockers and opposite-hitters whereas the lost attained by outside-hitters and liberos but, it was not significant. In contrary, there was a significant difference in spike and block reach height among players in different positions. The result indicates that, the maximum spike and blocking reach height was attained by middle blockers followed by outside and opposite hitters, while the minimal spike and blocking reach height obtained from setters and liberos position players.

As presented in Table 3, there was a significant difference in all length measurements among the players depending on playing positions ( $p < 0.01$ ). In fact, middle blocker players were relatively greater in the whole arm and leg length variables followed by outside and opposite hitters while, the minimal leg and arm length was recorded by setter and libro players.

Regarding to Girth measurement in Table 4 that presented that, middle blocker had a relative greater average for-arm, upper-arm, hip and waist circumferences than the other position players, while setters in slight difference have higher mean chest and thigh circumferences, while the lost result in most body circumference obtained by outside hitters, followed by opposite hitters and the list from liberos. Based on the result, there was a significant difference in hip circumference ( $p < 0.01$ ), for arm circumference, chest circumference and calf circumference ( $p < 0.05$ ). In contrary, there were no significance differences in upper arm, waist and thigh circumference ( $p > 0.05$ ) among the players based on their playing positions.

**Table 1.** Basic Anthropometric-measurement based on players playing position (Mean  $\pm$  SD)

Variables	Outside- Hitters (n=11)	Middle-Blockers (n=11)	Opposite-Hitters (n=12)	Setters (n=8)	Libros (n=6)
Standing Height (cm)	194.18 $\pm$ 0.5	195.27 $\pm$ 0.6	188.67 $\pm$ 0.4	179.75 $\pm$ 0.4	173.83 $\pm$ 0.6
Weight (kg)	79.27 $\pm$ 6.2	81.90 $\pm$ 7.1	75.50 $\pm$ 3.3	74.12 $\pm$ 9.5	65.16 $\pm$ 8.2
Body Mass Index (kg/m <sup>2</sup> )	20.78 $\pm$ 1.0	21.83 $\pm$ 2.2	21.13 $\pm$ 1.4	23.01 $\pm$ 2.9	21.28 $\pm$ 1.6
Spike Reach Height (cm)	316.90 $\pm$ 12	320.81 $\pm$ 15	310.00 $\pm$ 12	298.75 $\pm$ 13	284.50 $\pm$ 22
Blocking Reach Height (cm)	307.72 $\pm$ 13	312.09 $\pm$ 12	297.25 $\pm$ 17	289.37 $\pm$ 13	276.16 $\pm$ 18
Full Arm Length (cm)	88.00 $\pm$ 4.4	88.18 $\pm$ 4.0	83.83 $\pm$ 2.8	77.00 $\pm$ 3.2	73.83 $\pm$ 4.0
Forearm Length (cm)	31.81 $\pm$ 1.7	32.09 $\pm$ 1.4	30.41 $\pm$ 1.0	28.00 $\pm$ 1.1	26.66 $\pm$ 1.5
Upper Arm Length (cm)	36.09 $\pm$ 1.9	36.18 $\pm$ 2.0	34.25 $\pm$ 0.8	31.25 $\pm$ 1.5	29.66 $\pm$ 1.8
Full Leg Length (cm)	106.0 $\pm$ 2.1	107.18 $\pm$ 2.7	103.50 $\pm$ 2.4	97.0 $\pm$ 4.0	89.66 $\pm$ 7.8
Upper Leg Length (cm)	52.81 $\pm$ 1.4	53.27 $\pm$ 1.5	51.25 $\pm$ 1.4	47.25 $\pm$ 2.0	43.66 $\pm$ 3.5
Lower Leg Length (cm)	46.09 $\pm$ 1.7	46.36 $\pm$ 1.8	44.25 $\pm$ 1.5	41.12 $\pm$ 1.8	38.33 $\pm$ 2.7
For Arm Circumference (cm)	26.90 $\pm$ 1.2	27.54 $\pm$ 1.5	26.66 $\pm$ .98	27.25 $\pm$ 2.0	24.50 $\pm$ 1.8
Upper Arm Circumference (cm)	28.09 $\pm$ 1.4	28.81 $\pm$ 1.8	27.83 $\pm$ .93	28.75 $\pm$ 2.3	25.66 $\pm$ 2.2
Chest Circumference (cm)	90.36 $\pm$ 6.0	94.63 $\pm$ 7.1	90.25 $\pm$ 5.3	96.37 $\pm$ 9.9	80.83 $\pm$ 8.7
Waist Circumference (cm)	78.27 $\pm$ 5.7	82.45 $\pm$ 5.9	81.16 $\pm$ 5.8	82.25 $\pm$ 8.9	72.16 $\pm$ 5.8
Hip Circumference (cm)	91.81 $\pm$ 4.0	95.00 $\pm$ 5.0	91.00 $\pm$ 2.7	94.87 $\pm$ 6.4	83.83 $\pm$ 6.0
Thigh Circumference (cm)	52.81 $\pm$ 3.0	53.54 $\pm$ 2.2	52.83 $\pm$ 3.0	54.37 $\pm$ 4.0	49.16 $\pm$ 4.1
Calf Circumference (cm)	34.36 $\pm$ 1.9	35.63 $\pm$ 1.9	34.66 $\pm$ 1.7	35.25 $\pm$ 3.1	30.83 $\pm$ 1.6

Notice, M-mean SD: standard deviation, BMI: body mass index

**Table 2.** Basic Anthropometric measurements by playing position (Analysis of variance)

Variables	Outside- Hitters (n=11)	Middle- Blockers (n=11)	Opposite- Hitters (n=12)	Setters (n=8)	Libros (n=6)	<i>P-value</i>
Standing Height (cm)	194.18 $\pm$ 0.5	195.27 $\pm$ 0.6	188.67 $\pm$ 0.4	179.75 $\pm$ 0.4	173.83 $\pm$ 0.6	0.01
Weight (kg)	79.27 $\pm$ 6.2	81.90 $\pm$ 7.1	75.50 $\pm$ 3.3	74.12 $\pm$ 9.5	65.16 $\pm$ 8.2	0.01
Body Mass Index (kg/m <sup>2</sup> )	20.78 $\pm$ 1.0	21.83 $\pm$ 2.2	21.13 $\pm$ 1.4	23.01 $\pm$ 2.9	21.28 $\pm$ 1.6	0.06
Spike Reach Height (cm)	316.90 $\pm$ 12	320.81 $\pm$ 15	310.00 $\pm$ 12	298.75 $\pm$ 13	284.50 $\pm$ 22	0.01
Blocking Reach Height (cm)	307.72 $\pm$ 13	312.09 $\pm$ 12	297.25 $\pm$ 17	289.37 $\pm$ 13	276.16 $\pm$ 18	0.01

The mean difference is significant in 0.05. level

**Table 3.** Length Anthropometric measurements by playing position (Analysis of variance)

Variables	Outside- Hitters (n=11)	Middle- Blockers (n=11)	Opposite- Hitters (n=12)	Setters (n=8)	Libros (n=6)	<i>P-value</i>
Full Arm Length (cm)	88.00 $\pm$ 4.4	88.18 $\pm$ 4.0	83.83 $\pm$ 2.8	77.00 $\pm$ 3.2	73.83 $\pm$ 4.0	0.01
Forearm Length (cm)	31.81 $\pm$ 1.7	32.09 $\pm$ 1.4	30.41 $\pm$ 1.0	28.00 $\pm$ 1.1	26.66 $\pm$ 1.5	0.01
Upper Arm Length (cm)	36.09 $\pm$ 1.9	36.18 $\pm$ 2.0	34.25 $\pm$ 0.8	31.25 $\pm$ 1.5	29.66 $\pm$ 1.8	0.01
Full Leg Length (cm)	106.0 $\pm$ 2.1	107.18 $\pm$ 2.7	103.50 $\pm$ 2.4	97.0 $\pm$ 4.0	89.66 $\pm$ 7.8	0.01
Upper Leg Length (cm)	52.81 $\pm$ 1.4	53.27 $\pm$ 1.5	51.25 $\pm$ 1.4	47.25 $\pm$ 2.0	43.66 $\pm$ 3.5	0.01
Lower Leg Length (cm)	46.09 $\pm$ 1.7	46.36 $\pm$ 1.8	44.25 $\pm$ 1.5	41.12 $\pm$ 1.8	38.33 $\pm$ 2.7	0.01

The mean difference is significant at the 0.05 level

**Table 4.** Circumstance measurements by playing position (Analysis of variance)

Variables	Outside-Hitters (n=11)	Middle-Blockers (n=11)	Opposite-Hitters (n=12)	Setters (n=8)	Libros (n=6)	P-value
For Arm Circumference (cm)	26.90±1.2	27.54±1.5	26.66±.98	27.25±2.0	24.50±1.8	0.03
Upper Arm Circumference (cm)	28.09±1.4	28.81±1.8	27.83±.93	28.75±2.3	25.66±2.2	0.06
Chest Circumference (cm)	90.36±6.0	94.63±7.1	90.25±5.3	96.37±9.9	80.83±8.7	0.03
Waist Circumference (cm)	78.27±5.7	82.45±5.9	81.16±5.8	82.25±8.9	72.16±5.8	0.06
Hip Circumference (cm)	91.81±4.0	95.00±5.0	91.00±2.7	94.87±6.4	83.83±6.0	0.01
Thigh Circumference (cm)	52.81±3.0	53.54±2.2	52.83±3.0	54.37±4.0	49.16±4.1	0.06
Calf Circumference (cm)	34.36±1.9	35.63±1.9	34.66±1.7	35.25±3.1	30.83±1.6	0.02
The mean difference is significant at the 0.05 level						

## 4. Discussion

The main objective of this study was to examine the current anthropometry characteristics of men volleyball players with the respect of player's playing-position. The finding indicates that, there were significance mean differences in most anthropometry characteristics variables among men volleyball players in relation to their playing positions. As result shows, men volleyball players were significantly different in standing height, body weight, spike and block reach height ( $p < 0.01$ ) while no significant differences were found in body mass index ( $>0.05$ ), middle-blocker and outside-hitter players are the tallest and the heaviest than of the other position players, whereas setters and liberos are the shortest and the lightest. In consistence, result reported by Marques et al. [15] shows players had meaningfully diverse anthropometric characteristics in relation to their playing position, as a result middle blocker players were taller and heavier and also hitters are taller than setters and liberos. In addition, Mart ń-Matillas et al. [20] suggest that hitters are heaviest while, second hitters were taller than libro and setter, while setter and liberos are the shortest, lightest. Similarly, inconsistence, Sheppard et al. [21] indicate that in volleyball sport middle blocker players are longer and heavier than outside hitters and setter players. Meanwhile, it indicates that in volleyball middle blocker players are longer and heavier than outside hitters and setter players. The reason, behind the above deviation might be interrelated with the requirement of specific positions and specializations with regard to the actions they execute. A result, middle-blocker, outside and opposites have a critical role in spiking and blocking while, setter and liberos are responsible for setting and receiving as well as digging, respectively [22], implies that, profiling is a major means of identifying talented players; classifying the strengths and weaknesses players to assign in specific playing position to attain optimal performance [23].

Study shows, ectomorph, the tallest players have been a great tendency to recruit and successful participate in volleyball sport. In modern volleyball game, very tall players have an empirically greater potential for effective involvement in volleyball sport [24] cited in [12]. However, the average height of Ethiopian men volleyball players was ( $1.88 \pm .093$ ) which was lesser than international advanced male volleyball players ( $197 \pm 7$  cm) by Palao [14]. Also, Hadzic et al. [25] finding indicates average height of Montenegro premier league players was ( $198.53 \pm 3.89$  cm). Also, Bojanic et al. [26] found the average height of men volleyball players in USA 196.2 cm, Italy 195.81 cm, Brazil 194.4 cm, Argentina 194.75 cm, Russia 201.81 cm, Spain 195.9 cm, Netherland 198.7 cm and Cuba 197.3 cm. This implies, an average height of Ethiopian players is not align-up which is 6-10 cm lesser than of the international male volleyball players. As result, this variable perhaps is considered as one factor which affects Ethiopian to be a competitive nation in African confederation championship as well as international competition level.

Regarding to length measurement there were significant differences in both of the whole arm and leg lengths among the players in relation to their playing positions (0.01) middle blocker players relatively greater in the whole arm and leg length variables followed by outside hitters and opposite hitters while the minimal arm and leg length were recorded by setters and libro players. **However**, the average full arm length of Ethiopian players was ( $83.39 \pm 6.48$  cm) which is higher than average full arm lengths of **junior** under-14 ( $70.61 \pm 2.71$ ), under-17 ( $74.42 \pm 3.26$ ) male players [21] also, ( $81.34 \pm 4.23$  cm) college men volleyball players [27]. Whereas leg length of Ethiopian players was ( $102.10 \pm 6.87$  cm), which is relatively higher than that of college male volleyball players ( $100.07 \pm 5.43$  cm) reported by [28]. The reason behind the above deviation might be **age** categories, level of players between the current study subjects and the previous study participant subjects. Notice never gets

length resulted in elite level discovered by previous researchers.

Concerning to body circumstance, this study's result revealed that there were slight mean differences in most circumstance measurement among players in different positions and there is less significant difference in arm, chest, hip and calf circumstance yet not significant in waist, thigh girth variables. In fact, circumstance measurements among the players middle blocker players had relatively greater in most body circumstance such as: mean for arm, upper arm, waist, hip and, calf circumstances. While, setter players are greater in chest and thigh circumstances. Whereas, the minimal results in most body circumstance obtained by outside hitters and, opposite hitters and minimal were obtained from liberos.

## 5. Conclusions

The aim of current study was to examine the recent anthropometry characteristics of male volleyball players in Ethiopian premier-league regarding to their playing-position. Up on the finding the following conclusions were drawn. There were significant differences in most of the anthropometric characteristics among volleyball players with the respect of their playing positions. On average, middle-blocker and outside-hitters were the highest plus heaviest than of the other positioned players and have characteristics that are more favorable to perform spiking and blocking actions while, setter and liberos are the shortest and lightest and they have appearances that are more appropriate for, receiving, setting and digging.

Furthermore, the average anthropometric profiles of Ethiopian men volleyball players are too lesser than that is referred to the international men volleyball players. It might be considered as the single factor which upsets player's success in this sport.

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## Conflicts of Interest

The authors declare that having no conflict interests.

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