**Anthropometric attributes of male hockey players playing at different positions in Obafemi Awolowo University**

**Abstract**

The significance of anthropometry attributes of hockey players on the pitch tremendously influences their performance level, personal skill, and mental ability. This study examined the anthropometry of male hockey players playing at different positions in Obafemi Awolowo University (OAU), Nigeria. The experimental survey design, which adopts the purposive sampling technique and the protocol of the International Society for the Advancement of Kinanthropometry (ISAK), was employed to assess twenty-two male hockey players drawn from the university male hockey team. The examined anthropometric variables include height, weight, body circumferences (chest, waist, and thigh), and Body Mass Index (BMI). Data collected were analyzed using descriptive statistics and Analysis of Variance (ANOVA). The results revealed that hockey players differ significantly from one another in their anthropometric characteristics with respect to their playing positions in height [F= 3.087, p > 0.05]; weight [ F=14.334, p < 0.05]; chest circumference [ F = 5.081, < 0.05]; waist circumference [F = 17.751, p < 0.05]; and body mass index [ F= 17.636, p < 0.05] but they were not significantly different in thigh circumference [ F=1.160, p > 0.05]. In conclusion, male hockey players in OAU differed in their anthropometric characteristics and there were no significant differences in the anthropometric profile of male hockey players playing at different positions.

**Keywords:** Anthropometry, Hockey, Height, Weight, Body circumferences, Body mass index

**1.0 Introduction**

Field hockey is a high-intensity activity sport with a multidirectional nature. The ability to change direction rapidly while maintaining balance without loss of speed and agility is therefore an important physical fitness component necessary for successful performance in field hockey [1]. Elite field hockey players also need a high level of technical skills such as dribbling without losing running speed. For a technically good player, dribbling is essentially an automatic process, and the better players distinguish themselves by their running speed while dribbling the ball. The study of selected motor fitness components i.e. agility, speed, explosive strength, and endurance along with selected anthropometric variables of offensive and defensive hockey players has been found to have no significant difference between offensive and defensive hockey players in selected motor fitness components and selected anthropometric variables [2]. Hockey is a complex, tactical, and strenuous non-contact sport that requires the modern player to possess special physical abilities, among other factors, to achieve optimal performance in executing skills involving strength in running, and swinging, as well as speed, coordination and agility. Such physical abilities are, most often, determined by the athlete’s overall somatic profile expressed as somatotype or body physique. This represents one of the most important biological factors underlying the effective execution of specific game skills and team tactics. Hockey players playing in different positions were found to differ in some anthropometric measurements and body composition [3].

Anthropometry is the study and recording of the measurement and physical properties of the human body. Measurement of living human individuals is done to understand human variation and come up with optimized products. Understanding these variations will be key to the development of talent in sports, most especially in hockey. Anthropometry is divided into static and dynamic anthropometrics. Static anthropometry deals largely with the physical structure of the body [4]. It consists of the measurement of the distance of bones between joint centers including some soft tissue measures in contour dimensions which include the wobbly stuff that covers our bodies such as muscles, fat, skin, and bulk. Dynamic anthropometrics centers its measurement on the functional distance covered by the body as it performs various activities. Measurements are taken when the body is in motion or engaged in physical activity. It includes reach, clearance, and volumetric data. Reach signifies the extent that limbs can get to while clearance is the space for a certain part of the body or the whole body itself [5].

Anthropometry characteristics of a sportsman have a tremendous influence on the performance level besides personal skill and mental ability and a range of studies have been done on sportsmen about their morphological evaluation along with their performance-related morphological issues. It has been found and accepted by physical educators that body size and proportions, physique and body composition are important factors in physical performance [6]. The whole-body level of body composition characterizes body size and configuration, which is often described by anthropometric measures such as body weight, skinfold thicknesses, circumferences, and body mass index (BMI) among others have been seen to have propelled athletes to greater heights in sports. One of the prominent sporting activities which require body fitness is hockey [7].

Anthropometry is the longest-used measure of human variation, and since it measures surface morphology, is intuitively understood at the elementary level. By standing in any major junction of any major city on Earth, one can easily marvel at the range of human physical diversity: short, tall, thin, fat, long-legged, stumpy; native wit provides the face validity for the study of anthropometric variation and its application [4]. Ideas of biological differences between human populations are of great antiquity but only became quantitatively formalized in the nineteenth century, with early attempts at doing so having taken place in the eighteenth century. Before innovations that could identify variation at microscopic levels, including physiological, biochemical, endocrinological, and genetic ones, morphology was the prime means of classification of nature [8].

Successful play at an elite level in contemporary hockey depends on how individuals are knitted together into a competent unit, and so the combination of physical and psychological characteristics may vary from player to player. Anthropometric and fitness demands have been identified as key predictors of success in the game of hockey. Several studies have been carried out to survey the anthropometric characteristics imposed on players at different positions among professional hockey players [9-12]. However, the study on the anthropometrics of male hockey players especially in Obafemi Awolowo University (OAU), Ile-Ife, Nigeria has not been adequately investigated; hence this study. Every individual desires to become champions which bring the necessity to determine the association of anthropometric dimension and fitness demand in OAU male hockey players. The anthropometric characteristics (height, weight, BMI) of Obafemi Awolowo University male hockey players playing in different positions were investigated in this study.

Material and method

**2.0 Research Design**

The experimental survey research design will be used for this study. The use of this design is considered appropriate because it enables the researcher take measurement of respondents as well as carry out fitness tests on them so as to be able to collect first hand data on the measurement as well as record performance data of respondents in real-time [13].

**2.1 Sampling**

A total of 22 players were purposively selected from 40 players that are on the OAU team. All players participating in the tests will be selected based on those who are registered as team players and have the intention of representing the school in any competition. After the selection process, players were subjected to anthropometric measurement testing in terms of height, weight, and body mass index

**2.2 Research Instrument**

A self-designed data sheet titled “Anthropometric of hockey players playing at different positions in Obafemi Awolowo University” was adopted. The data sheet contains 15 items grouped into 3 sections. The focus of each section of the data-sheet is presented below:

* Section A (items 1-2); this section is based on the respondent’s personal data which will include sex and play position.
* Section B (item 3-9): this section focuses on the anthropometric data of the respondents’ such as height, weight, chest circumference, waist, thigh, and body mass index.

The protocol of the International Society for the Advancement of Kinanthropometry (ISAK) will be used to guide the measurement of respondents and measurements will be recorded to the nearest 0.1 Kg and 0.1 cm respectively.

**2.3 Parameters Measurement**

The anthropometric parameters measured include height; weight; and chest, waist, and thigh girth using a stadiometer, weighting scale, and measuring tape respectively according to ISAK protocol. The body mass index was measured as a ratio of mass (weight) and the height of an individual [14].

**2.4 Instrument Validation**

A data sheet was presented to the researcher’s supervisor and two (2) other experts in the Department of Kinesiology, Health Education and Recreation, OAU for validation. Necessary corrections were effected before the administration of instruments in order to improve the content and face validity of the instrument after which it will be administered to respondents.

**2.5 Procedure for Data Collection**

Participants for the research were selected from the OAU hockey team and 22 copies of the data sheet for this study were administered to the respondents. Administration of the data sheet was carried out on the OAU hockey pitch. The administration of the data sheet lasted for two weeks.

**2.6 Data Analysis Procedure**

Descriptive statistic was used to report data. The result of the data collected was interpreted using descriptive statistics and ANOVA. The levels of significance were set at p < 0.05.

**3.0 Results and Discussions**

**3.1 Respondents Distribution Based on Players’ Positions**

Table 1 presents the distribution of respondents based on players’ positions. A total of 22 respondents responded to the datasheet and all of the respondents used for the study (100%) are male hockey players who have represented the university in a competition. It can be seen that; 3 (13.6%) of the respondents were Goalkeepers, 8 (36.4%) were Defenders, 6 (27.3%) were Midfielders and 5 (22.7%) were Forwards.

Table 1: Respondents distribution based on players’ positions

|  |  |  |
| --- | --- | --- |
| **Position** | **Frequency** | **Percent** |
| Goalkeeper | 3 | 13.6 |
| Defender | 8 | 36.4 |
| Midfielder | 6 | 27.3 |
| Forward | 5 | 22.7 |
| Total | 22 | 100 |

**3.2 Descriptive Statistic of Respondents in Anthropometric Characteristics**

Table 2 presents the descriptive statistics of the anthropometric characteristics of the respondents. The results showed the mean values for the height, weight, chest circumference, thigh, biceps, waist circumference, and body mass index to be 1.67 m, 64.86 kg, 33.63 in, 21.95 in, 3.31 mm, 31.06 in, and 38.54 respectively. The minimum values for the height, weight, chest circumference, thigh, biceps, waist circumference, and body mass index were measured to be 1.53 m, 50 kg, 30 in, 16 in, 2 mm, 25 in, and 32 while the respective maximum values are 1.85 m, 93 kg, 37 in, 26 in, 5 mm, 40 in and 50.

Table 2: Descriptive statistic of respondents in anthropometric characteristics

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Descriptive Statistics** | **N** | **Minimum** | **Maximum** | **Mean** | **Std. Deviation** |
| Height (m) | 22 | 1.53 | 1.85 | 1.6764 | 0.09006 |
| Weight (kg) | 22 | 50 | 93 | 64.8636 | 10.297 |
| Chest (in) | 22 | 30 | 37 | 33.6364 | 2.12234 |
| Thigh (in) | 22 | 16 | 26 | 21.9545 | 2.69439 |
| Biceps (mm) | 22 | 2 | 5 | 3.3182 | 0.83873 |
| Waist (in) | 22 | 25 | 40 | 31.0682 | 3.5767 |
| BMI (kg/m2) | 22 | 32.3 | 50.6 | 38.5455 | 4.71833 |
| Valid N | 22 |  |  |  |  |

**3.3 Anthropometric Characteristics of Hockey Players**

Table 3 presents the anthropometric characteristics of the respondents at the various hockey-playing positions.

**3.3.1 Based on Height**

Among the goalkeepers, none was between 1.51 m - 1.60 m; 1 (33.3%) was between 1.61 m -1.70 m; 1 (33.3%) was between 1.71 m - 1.80 m; while 1 (33.3%) was between 1.81 m - 1.90 m. Among the defenders, 3 (37.5%) were between 1.51 m - 1.60 m; 2 (25%) were between 1.61 m - 1.70 m; 3 (37.5%) were between 1.71 m - 1.80 m; while none was between 1.81 m -1.90 m. Among the midfielders, 3 (50%) were between 1.51 m - 1.60 m; 3 (50%) were between 1.61 m - 1.70 m; none was between 1.71 m - 1.80 m; while none was between 1.81 m - 1.9 m. Among the forwards, none was between 1.51 m - 1.60 m; 3 (60%) were between 1.61 m - 1.70 m; 2 (40%) were between 1.71 m - 1.80 m; while none was between 1.81 m-1.9 m.

**3.3.2 Based on Weight**

Among the goalkeepers, none was between 50 kg – 59 kg; none was between 60 kg – 69 kg; 1 (33.3%) was between 70 kg – 79 kg; 1 (33.3%) was between 80 kg – 89 kg; 1 (33.3%) was between 90 kg – 99 kg. Among the defenders, none was between 50 kg – 59 kg; 3 (37.5%) were between 60 kg – 69 kg; 5 (62.5%) were between 70 kg – 79 kg; none was between 80 kg – 89 kg; none was between 90 kg – 99 kg. Among the midfielders, 1 (16.6%) was between 50 kg – 59 kg; 2 (33.3%) were between 60 kg – 69 kg; 3 (50%) were between 70 kg - 79kg; none was between 80 kg – 89 kg; and none was between 90 kg – 99 kg. Among the forwards, none was between 50 kg – 59 kg; 1 (20%) was between 60 kg – 69 kg; 4 (80%) were between 70 kg – 79 kg; none was between 80 kg – 89 kg; and none was between 90 kg – 99 kg.

**3.3.3 Based on Chest Circumference**

Among the goalkeepers, none was between 20 in - 24 in; none was between 25 in – 29 in; none was between 30 in – 34 in; 3 (100%) were between 35 in – 39 in. Among the defenders, none was between 20 in – 24 in; none was between 25 in – 29 in; 2 (25%) were between 30 in – 34 in; 6 (75%) were between 35 in – 39 in. Among the midfielders, none was between 20 in – 24 in; none was between 25 in – 29 in; 1 (16.7%) was between 30 in – 34 in; 5 (83.3%) were between 35 in – 39 in. Among the forwards, none was between 20 in – 24 in; none was between 25 in – 29 in; 4 (80%) were between 30 in – 34 in; and 1 (20%) was between 35 in-39 in.

**3.3.4 Based on Thigh Circumference**

Among the goalkeepers, none was between 16 in – 20 in; 3 (100%) were between 21 in – 25 in; none was between 26 in – 30 in. Among the defenders, none was between 16 in – 20 in; 3 (37.5%) were between 21 in – 25 in; 5 (62.5%) were between 26 in – 30 in. Among the midfielders, none was between 16 in – 20 in; 3 (50%) were between 21 in – 25 in; 3 (50%) were between 26 in – 30 in. Among the forwards, 1 (20%) were between 16 in – 20 in; 3 (60%) were between 21 in – 25 in; and 1 (20%) between 26 in – 30 in.

**3.3.5 Based on Waist Circumference**

Among the goalkeepers, none had a waist circumference between 25 in – 29 in; none had a waist circumference between 30 in – 34 in; 2 (66.7%) had a waist circumference between 35 in – 39 in; 1 (33.3%) had waist circumference between 40 in – 44 in. Among the defenders, 3 (37.5%) had waist circumference between 25 in – 29 in; 5 (62.5%) had waist circumference between 30 in – 34 in; none had waist circumference between 35 in – 39 in; and none had waist circumference between 40 in – 44 in.

Among the midfielders, 2 (33.3%) had waist circumference between 25 in – 29 in; 4 (66.7%) had waist circumference between 30 in – 34 in; none had waist circumference between 35 in – 39 in; none had waist circumference between 40 in – 44 in. Among the forwards, 2 (40%) had waist circumference between 25 in – 29 in; 3 (60%) had waist circumference between 30 in – 34 in; none had waist circumference between 35 in – 39 in; none had waist circumference between 40 in – 44 in.

**3.3.6 Based on Body Mass Index (BMI)**

None of the goalkeepers had BMI between 30 kg/m2 – 34 kg/m2, none of the goalkeepers had BMI between 35 kg/m2 – 39 kg/m2, none of the goalkeepers had BMI between 40 kg/m2 – 44 kg/m2, 1 (33.3%) had between 45 kg/m2 – 49 kg/m2, 2 (66.7%) had between 50 kg/m2 -54 kg/m2. Among the defenders, none of the defenders had BMI between 30 kg/m2 – 34 kg/m2, 6 (75%) had BMI between 35 kg/m2 – 39 kg/m2, 2 (25%) had BMI between 40 kg/m2 – 44 kg/m2, none had between 45 kg/m2 – 49 kg/m2 and none had between 50 kg/m2 – 54 kg/m2. Among the midfielders, 2 (33.3%) had BMI between 30 kg/m2 – 34 kg/m2; 3 (50%) had BMI between 35 kg/m2 – 39 kg/m2, 1 (16.7%) had BMI between 40 kg/m2 – 44 kg/m2; none had between 45 kg/m2 – 49 kg/m2, and none had between 50 kg/m2 – 54 kg/m2. Among the forwards, 1 (20%) had a BMI between 30 kg/m2 – 34 kg/m2, 4 (80%) had a BMI between 35 kg/m2 – 39 kg/m2; none had BMI between 40 kg/m2 – 44 kg/m2; none had between 45 kg/m2 – 49 kg/m2; and none had between 50 kg/m2 – 54 kg/m2.

Table 3: Anthropometric characteristics of the respondents at the various hockey-playing positions

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Anthropometric Characteristics** | **Position** | **Goalkeeper** | | **Defender** | | **Mid-fielder** | | **Stricker** | |
|  | **Levels** | **Frequency** | **%** | **Frequency** | **%** | **Frequency** | **%** | **Frequency** | **%** |
|  | 1.51 - 1.60 | - | - | 3 | 37.5 | 3 | 50 | - | - |
| Height (m) | 1.61 - 1.70 | 1 | 33.3 | 2 | 25 | 3 | 50 | 3 | 60 |
|  | 1.71 - 1.80 | 1 | 33.3 | 3 | 37.5 | - | - | 2 | 40 |
|  | 1.81 - 1.90 | 1 | 33.3 | - | - | 0 | - | - | 0 |
|  | **Total** | **3** | **100** | **8** | **100** | **6** | **100** | **5** | **100** |
|  | 50 - 59 | - | - | - | - | 1 | 16.6 | -- | --- |
| Weight (kg) | 60 - 69 | - | - | 3 | 37.5 | 2 | 33.3 | 1 | 20 |
|  | 70 - 79 | 1 | 33.3 | 5 | 62.5 | 3 | 50 | 4 | 80 |
|  | 80 - 89 | 1 | 33.3 | - | -- | --- | -- | --- | --- |
|  | 90 - 99 | 1 | 33.3 | -- | -- | --- | -- | --- | --- |
|  | **Total** | **3** | **100** | **8** | **100** | **6** | **100** | **5** | **100** |
|  | 20 - 24 | -- | -- | --- | --- | --- | ---- | --- | -- |
| Chest | 25 - 29 | --- | -- | -- | ---- | ---- | ---- | --- | --- |
| circumference (in) | 30 - 34 | --- | --- | 2 | 25 | 1 | 16.7 | 4 | 80 |
|  | 35 - 39 | 3 | 100 | 6 | 75 | 5 | 83.3 | 1 | 20 |
|  | **Total** | **3** | **100** | **8** | **100** | **6** | **100** | **5** | **100** |
|  | 16 - 20 | -- | --- | --- | ----- | ---- | ---- | 1 | 20 |
| Thigh | 21 - 25 | 3 | 100 | 3 | 37.5 | 3 | 50 | 3 | 60 |
| Circumference (in) | 26 - 30 | --- | --- | 5 | 62.5 | 3 | 50 | 1 | 20 |
|  | Total | 3 | 100 | 8 | 100 | 6 | 100 | 5 | 100 |
|  | 25 - 29 | 2 | ------ | 3 | 37.5 | 2 | 33.3 | 2 | 40 |
| Waist | 30 - 34 | 1 | ---- | 5 | 62.5 | 4 | 66.7 | 3 | 60 |
| circumference (in) | 35 - 39 | 3 | 66.7 | --- | -- | --- | --- | ---- | --- |
|  | 40 - 44 |  | 33.3 | --- | --- | --- | --- | --- | --- |
|  | **Total** |  | **100** | **8** | **100** | **6** | **100** | **5** | **100** |
|  | 30- 34 | ---- | --- | ---- | --- | 2 | 33.3 | 1 | 20 |
| Body Mass Index (kg/m2) | 35- 39 | ---- | ---- | 6 | 75 | 3 | 50 | 4 | 80 |
| (BMI) | 40- 44 | ---- | ---- | 2 | 25 | 1 | 16.7 | ------ | ---- |
|  | 45- 49 | 1 | 33.3 | ----- | ---- | ---- | ---- | ----- | --- |
|  | 50- 54 | 2 | 66.7 | --- | --- | --- | --- | --- | --- |
|  | **Total** | **3** | **100** | **8** | **100** | **6** | **100** | **5** | **100** |

**3.4 Observation**

A total of 22 hockey players participated in the experiment studies of this research work, 3 (13.6%) were goalkeepers, 8 (36.4%) were defenders, 6 (27.3%) were midfielders, and 5 (22.7%). The findings showed that the goalkeepers are the tallest and the heaviest players on the team than other outfield players (forwards, midfielders, defenders). Moreover, midfielders cover far greater distances as compared with defenders. In the phase of an attacker, midfielders take the ball to the opponent’s half, whereas the defenders, in most cases, make a slight shift forward, and the forwards wait for the ball from the midfielders [15]. In the defensive phase, forwards run (short runs at low intensity), midfielders run back, and the defenders wait for the opposing players. The specific role of the midfielders on the team could be responsible for their physical characteristics. Nevertheless, lack of height is not in itself a bar to success in hockey; it represents just one criterion for positional role selection.

**3.5 Hypotheses Testing**

Table 4 presents the test of the hypothesis that there will be no significant difference in the anthropometric characteristics of hockey players in Obafemi Awolowo University. The hypothesis was tested using Analysis of Variance (ANOVA) and it was tested with a 0.05 level of significance. The height, weight, chest circumference, thigh circumference, waist circumference, and Body Mass Index (BMI) were examined across the various playing positions as anthropometric characteristics.

The table shows that hockey players differed significantly from one another in their anthropometric characteristics based on playing positions in height [F= 3.087, p > 0.05]; weight [F=14.334, p < 0.05]; chest circumference [F = 5.081, < 0.05]; waist circumference [F = 17.751, p < 0.05]; and body mass index [ F= 17.636, p < 0.05] but they were not significantly different from one another in thigh circumference thigh circumference [F=1.160, p > 0.05]. Given the above, the hypothesis that there will be no significant difference in the anthropometric characteristics of hockey players in Obafemi Awolowo University is rejected, and the alternate hypothesis that there will be a significant difference in the anthropometric characteristics of hockey players in Obafemi Awolowo University. Thus, it can be concluded that hockey players in Obafemi Awolowo University differ significantly from one another in the anthropometric characteristics based on their playing positions.

Based on the significance of the difference in anthropometric characteristics of respondents, a post hoc test was carried out to examine the pattern of difference in anthropometric characteristics among the players in the different playing positions. The least Significant difference was used to test this at a 0.05 level of significance.

Table 4: Analysis of Variance (ANOVA) test of differences in anthropometric characteristics of hockey players based on playing positions

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **ANOVA** | **Sum of Squares** | **Df** | **Mean Square** | **F** | **Sig.** |
| Height in m | 0.058 | 3 | 0.019 | 3.087 | 0.053 |
|  | 0.112 | 18 | 0.006 |  |  |
|  | 0.17 | 21 |  |  |  |
| Weight in kg | 1569.591 | 3 | 523.197 | 14.334 | 0 |
|  | 657 | 18 | 36.5 |  |  |
|  | 2226.591 | 21 |  |  |  |
| Chest in in | 43.374 | 3 | 14.458 | 5.081 | 0.01 |
|  | 51.217 | 18 | 2.845 |  |  |
|  | 94.591 | 21 |  |  |  |
| Thigh in in | 24.705 | 3 | 8.235 | 1.16 | 0.352 |
|  | 127.75 | 18 | 7.097 |  |  |
|  | 152.455 | 21 |  |  |  |
| Waist in in | 200.781 | 3 | 66.927 | 17.751 | 0 |
|  | 67.867 | 18 | 3.77 |  |  |
|  | 268.648 | 21 |  |  |  |
| BMI in kg/m2 | 348.836 | 3 | 116.279 | 17.636 | 0 |
|  | 118.678 | 18 | 6.593 |  |  |
|  | 467.515 | 21 |  |  |  |

**4.0 Conclusions**

In this study, the anthropometric of male hockey players playing at different positions in Obafemi Awolowo University, Ile- Ife has been examined using an experimental survey design. The result revealed significant differences among hockey players from each position. There was significant positional difference in anthropometry such as weight and height, specifically as goalkeepers are the tallest and heaviest of all players while the defenders are the shortest. The forwards are the fastest while the goalkeepers are the slowest than other players’ positions. The finding differs significantly from the profile of elite hockey players reposted in the literature which reported that less than half of the purposeful movements are performed in a forward direction. Players performed the different types of movement with a range of intensities and play positions. Significant differences exist between forward, midfield, and defending players with defenders spending significantly less time running and sprinting than other positions. Defenders also spend a significantly greater time moving backward than the other two positions. Midfielders perform more turns during match play than forwards and defenders. The researcher is of the opinion that since hockey is a team sport that is largely dependent on eleven distinct individuals who uniquely belong to four playing positions with specialized skills and duties coming together to play as a team, it is expected that hockey players in Obafemi Awolowo University should exhibit differences in the anthropometric characteristics.

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