

Comparison of Selected Anthropometric Characteristics Between Point Guards and Shooting Guard/Small Forward (Wing) Positions of U18 Basketball Players

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ABSTRACT

The purpose of the study was to record and compare selected anthropometric characteristics between the PG and SG/SF positions in the U18 age category. The sample size consisted of 20 young male basketball players who participated in this study (mean weight 77.7 kg, mean height 1.91.6 cm, mean age 16.6 years). Players were classified according to their positions in PG: (n = 10) and in SG/SF (Wings) (n = 10). The players participated in the Development Program of the Hellenic Basketball Federation. To determine and compare the anthropometric profile of the players, the following anthropometric characteristics were measured at each position: height, weight, body fat percentage, lean body mass and body mass index (BMI). The sample was studied separately for the two different player positions on the field, PGs and SGs/SFs (wings). In the inductive analysis, possible differences between the different positions of the players were examined. Due to limited sample size (N = 20), tests were performed with the non-parametric Mann-Whitney test for two independent samples. This test compares the average values of the ranks (Ranks) between two groups, where the ranks are the position of each measurement in the ordered set of measurements. The main findings of the study suggest that height, weight and lean body mass are the anthropometric characteristics that separate PGs from SGs/SFs (wings), with the latter prevailing in all three aforementioned variables. More specifically, the SGs/SFs (wings) of this study recorded averages of 1.93.8 cm height, 81.4 kg weight, 73.59 kg FFM while the PGs (organizers) recorded averages of 1.89.4 cm height, 75.1 kg weight, 66.27 kg FFM. In the measurements of body fat percentages (%) and body mass index (BMI), no differences were observed between the examined positions.

Keywords : U18; basketball players, anthropometric characteristics, PG, SG/SF (Wings)

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INTRODUCTION

The sport of basketball is a multifactorial team sport, in which success is the result of the combination of both the technical and tactical skills of the players as well as their anthropometric and physiological characteristics. Traditionally, anthropometric characteristics are the main factors according to which players are selected and categorized in the positions they play, while in the developmental ages it has been reported that height, weight, jumping ability and agility play a primary role in the selection for participation in basketball teams (Blantas et al., 2021; Trunić & Mladenović, 2014). Thus, as is natural, the sport of basketball requires a particularly tall frame in all positions as well as an ideal weight and fat percentage so that offensive and defensive efforts can be carried out smoothly during games. Previous studies in both developmental age and professional men's basketball confirmed that heavier and taller players score and rebound by playing closer to the basket, usually covering the CENTERS and FORWARDS positions, with the shorter, lighter, and more agile players that tend to move and shoot more on the perimeter covering respectively the positions of the Guards (Blantas et al., 2022; Hoare, 2000; Ostojic et al., 2006; Pojskic et al., 2014). However, in recent years and especially after the change of the regulations in the sport in 2000, it is observed that the categorization of players is done in five different positions (PG, SG, SF, PF, C). Usually, this differentiation is the result of the anthropometric characteristics of each athlete, with the height variable being the one that most of the time has the dominant role (Abdelkrim et al., 2010; Altavilla et al., 2018). Each position, therefore, is usually characterized by specific anthropometric profiles, with PGs generally being the shortest and lightest players followed in order by SGs, SFs, PFs and Cs, who are considerably taller and heavier than the rest of the positions (Abdelkrim et al., 2010; Boone & Bourgois, 2013; Pion et al., 2018). In fact, the importance of anthropometric characteristics per playing position becomes even more evident in the selection of players in the world's leading basketball league, the NBA, where the tallest and strongest players per playing position are selected more frequently than their shorter counterparts (Cui et al., 2019).

Variations in the anthropometric characteristics of basketball players are not only present between the different positions, but are also the result of other factors. Several studies in many European and non-European countries have reported differences in the height of basketball players, as well as in other physiological parameters between different categories and different levels of players (Masanovic, 2019; Sallet et al., 2005). The majority of these studies reported significant differences in favor of players in the top professional ranks or those selected for first-team squads, although there were some exceptions in countries such as Spain (Ramos et al., 2019; Vaquera et al., 2015). In addition, significant differences in anthropometric characteristics are also observed between basketball players of different ages. Male basketball players, especially professional ones, are significantly taller and heavier, with a higher percentage of body fat and BODY MASS INDEX (BMI) index than corresponding teenagers and even young "elite" basketball players (Abdelkrim et al., 2010; Gryko et al., 2018). An exception of that is the top teams of teenagers and youth basketball players (U18/U20) of some countries, which have in their ranks players who present similar anthropometric characteristics to those of men in almost all positions (Borovi & Garafoli, 2016; Vaquera et al., 2015; Apostolidis et al., 2004).

However, success in basketball does not depend exclusively on the anthropometric characteristics of the players as basketball is a game of movements that differ between the competing positions. Ferioli et al. (2020) in their study, stated that players covering the Guard

positions have possession of the ball for longer and make twice as many moves per minute as the other positions. In addition, because each playing position is tasked with performing specific actions during the games, it seems that the position of Guards is the one with the most increased load in terms of physiological requirements. More specifically at the U18 level, the Guards cover the longest distances during the matches, mainly in the 1st and 3rd period performing the highest intensity decelerations/accelerations followed in order by the Forwards and Centers (Vázquez-Guerrero, Fernández-Valdés, et al., 2019; Vázquez-Guerrero, Jones, et al., 2019). Similar findings are also observed at the professional level of male athletes, while the heart rate does not show differences between the competing positions.

It is certain that a competent anthropometric or physiological profile alone never ensures success in basketball. The performance in basketball depends on the physical stature, the level of physical condition as well as a number of technical and psychological factors different for each playing position. Given that according to recent studies by Zarić et al. (2020) and Zarić, Ivan et al. (2020) which reported that the height and anthropometric profile of each position play a leading role in the ranking of teams, arises the possibility of in-depth analysis of the anthropometric profile of each position separately. Some previous studies, in the world of basketball, have recorded and determined the anthropometric profiles of U18 players, but surprisingly there is none that has tried to exclusively compare the anthropometric profile between the position of the PGs (organizer) and that of the players playing in the perimeter away from the ball (wings) at this level, showing that there is a lack of data in this particular scientific field. A recent study by Kryeziu & Iseni (2023) in U18 players revealed non-significant anthropometric differences between the PG and SG/SF positions. Therefore, the aim of the study was to record and compare selected anthropometric characteristics between the PG and SG/SF positions in the U18 age category.

METHODS

Participants

The sample size consisted of 20 young male basketball players who participated in this study (mean weight 77.7 kg, mean height 1.91.6 cm, mean age 16.6 years). Players were classified according to their positions in PG: (n = 10) and in SG/SF (Wings) (n = 10). As PGs in this study, players were categorized based on whether they performed the task of organizing the game and had the ball in their hands for most of the live time while as Wings were categorized the players who played in the perimeter off-ball positions. The categorization was based and checked by two experienced and qualified coaches, who were responsible for the training programs of the athletes. The players participated in the Development Program of the Hellenic Basketball Federation and were training in a summer camp exclusively for Guards/Wings where the measurements were carried out. Upon arrival at the training facilities, the players and their parents were thoroughly informed about the procedures and content of the study, the risks and the benefits that the players would have from the results obtained. Then the written consent form was obtained from the parents or legal guardians for the participation of their children in the study procedures, while the study was reviewed and approved by the ethics committee of the University of Peloponnese, School of Human Movement and Quality of Life, Department of Sports Organization and Administration, University of Peloponnese, Sparta Laconia and was in accordance with the Principles of the Declaration of Helsinki (2008).

Procedures

The anthropometric measurements were taken on the first day of the players' presence at the National U18 Training camp. Before the measurements were carried out, all the examinees

filled out a questionnaire regarding their health status and signed a consent form that allowed the examinations to be carried out. In order to minimize omissions as much as possible and to ensure optimal conditions for the measurement of the anthropometric characteristics, they were carried out at the same time before the players' breakfast (08.30-10.00 a.m.), with the assessment being done in a closed basketball court with a wooden floor-parquet- with the temperature inside being controlled (25°C-27°C). The players were divided into PGs and SGs/SFs(wings), with each group being analyzed separately. In order to determine and compare the anthropometric profile of the players in the study, the following anthropometric characteristics were measured at each position: height, weight, body fat percentage, lean body mass, and body mass index (BODY MASS INDEX (BMI)). All measurements were performed according to the standards of the International Society for the Advancement of Kinanthropometry Protocol (ISAK) by the same two (2) certified experienced examiners, who have performed these measurements many times either at the national team level or at domestic level.

Anthropometric measurements

Each player was weighed in light training clothes using a precision electronic scale with a deviation of 0.1 kg (Model UC-231, A&D Mercury Pty. Ltd., Tokyo, Japan), and their standing height was recorded with a portable stadiometer without shoes with a deviation of 0.1 cm (SECA 242, Hamburg, Germany). Body Mass Index (BODY MASS INDEX (BMI)) was then calculated using the formula $(\text{kg})/(\text{height}^2 \text{ (m)}^2)$. Then, body fat percentage was assessed using skinfold measurements taken from four sites namely biceps, triceps, subscapula and gastrocnemius using a portable Harpenden skinfold caliper (Holtain Ltd, Crosswell, Crymych, UK) with an accuracy of 0.2mm and using the Durnin equation and Womersley [(1974). Finally, the percentage of lean body mass was calculated by subtracting the percentage of body fat from 100.

Statistical Analysis

Initially, data were recorded and categorized using the Microsoft Excel program. They were then transferred and all statistical analyzes were performed using the Social Science Statistical Package (SPSS version 24.0, IBMSPSS, Chicago, IL). Descriptive data analysis was performed using mean values and standard deviations ($M \pm SD$). The sample was studied separately for the two different player positions on the field, PG and SG/SF (wings). In the inductive analysis, possible differences between the different positions of the players were examined. Due to limited sample number ($N = 20$), tests were performed with the non-parametric Mann-Whitney test for two independent samples. This test compares the average values of the ranks (Ranks) between two groups, where the ranks are the position of each measurement in the ordered set of measurements. The null hypothesis of the test is that there is no difference in the population from which the sample was drawn. The test assumes that the null hypothesis is valid and based on this it calculates the probability that the observed difference exists. If this probability is calculated to be less than $\alpha = 0.05$, the null hypothesis is rejected and the difference between the two groups is statistically significant.

RESULT

The descriptive statistics of all measurements of the anthropometric variables between the two examined positions are presented in Table 1.

Table 1. Mean values \pm standard deviations of anthropometrics per position

Variables	Point guards (n = 10)	Average \pm s.d. Shooting guards/ small forwards (wings)	P-Value
Height (cm)	189.4 (\pm 2.757)	193.8 (\pm 2.394)	0.002
Body weight (kg)	75.1 (\pm 5.992)	81.4 (\pm 8.595)	0.041
Body fat %	0.12 (\pm 0.056)	0.11 (\pm 0.029)	0.704
Body mass index (bmi)	21 (\pm 1.928)	21.43 (\pm 2.15)	0.705
Αλιπη μάζα ffm(kg)	66.27 (\pm 8.09)	73.59 (\pm 9.18)	0.041

Statistical analysis of the results with the Mann-Whitney Test revealed statistically significant differences in three (3) of the five (5) anthropometric characteristics measured. More specifically, the players of the SG/SF position (wings) showed a higher height (W 193.8 cm vs PG 189.4 cm) (p-value < 0.05), quite a higher weight (W 81.4 kg vs PG 75.1 kg) (p-value < 0.05) and significantly higher lean body mass (W 73.59 kg vs PG 66.27 kg) (p-value < 0.05) compared to the players competing in the position of PG. In the remaining two measurements, those of body fat percentage (%) and also in Body Mass Index (BODY MASS INDEX (BMI)), no statistically significant differences were observed between the two examined positions. The above differences are presented in Figures 1-3.

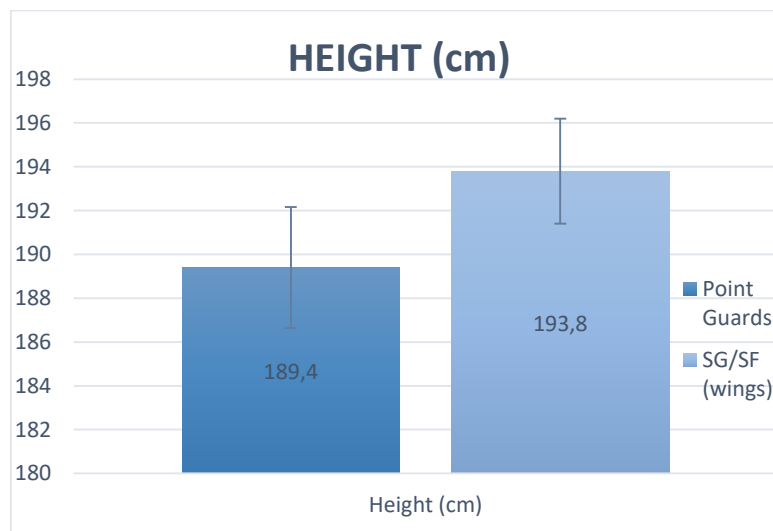


Figure 1. Height difference between the positions

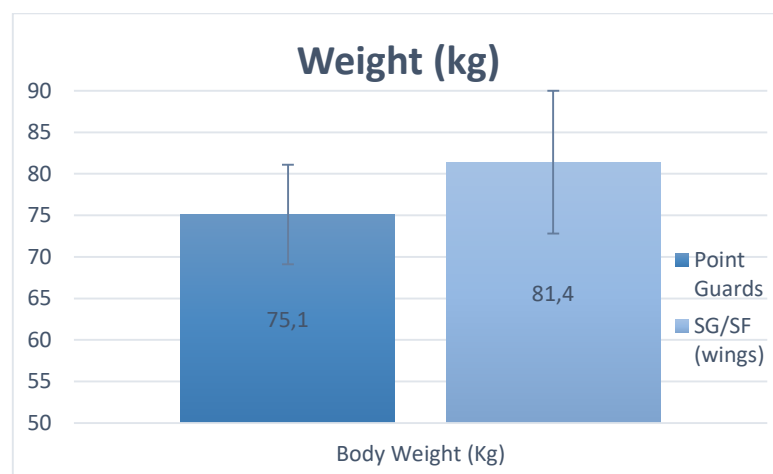


Figure 2. Weight difference between the positions

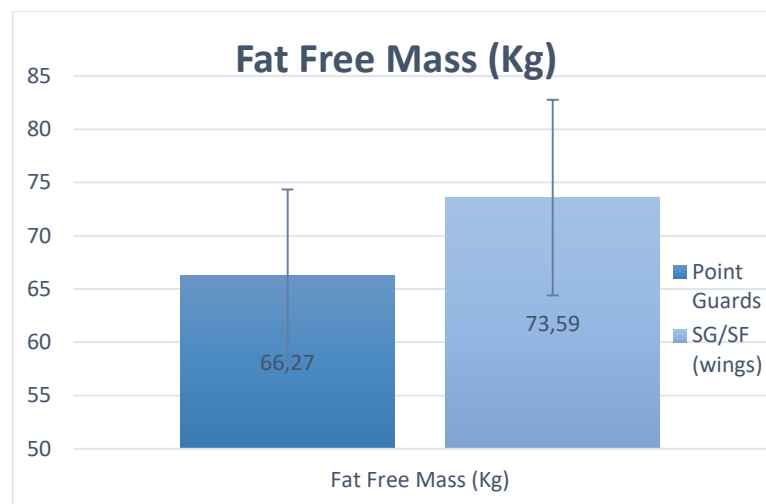


Figure 3. FFM difference between the positions

DISCUSSION

This study is one of the first attempts to record and compare the differences between the anthropometric characteristics of the PG (organizer) and SG/SF (wings) positions, at the age group of U18 male basketball players. The main findings of the study suggest that height, weight and lean body mass are the anthropometric characteristics that separate PGs from SGs/SFs (wings), with the latter position prevailing in all three aforementioned variables. More specifically, the SGs/SFs (wings) of this study recorded averages of 1.93.8 cm height, 81.4 kg weight, 73.59 kg FFM while the PGs (organizers) recorded averages of 1.89.4 cm height, 75.1 kg weight, 66.27 kg FFM. In the measurements of body fat percentage (%) and Body Mass Index (BODY MASS INDEX (BMI)), no differences were observed between the examined positions. The aforementioned results contradict those obtained from the study of Kryeziu & Iseni (2023) who did not record anthropometric differences between the PG-SG-SF positions in players of the same age. The differences found in the present study can perhaps be attributed to the difference in level, as the players who took part in this study participated in a selection camp for the subsequent staffing of the National U18 Men's Basketball Team of Greece. Also, compared to the amateur players of the study by Kostopoulos (2015), which was conducted on players of the same age in the same country (Greece), the players of the present study presented much higher values of anthropometric characteristics in each examined variable.

Furthermore, the results of the players in the present study are better in terms of height and weight measurements compared to Turkish players of similar ages and almost similar to elite Croatian U16 players and also players of an earlier study from the same country (Greece) (Borovi & Garafoli, 2016; Cengizel & Cengizel, 2022). Boone & Bourgois (2013) and Pion et al. (2018) in their studies at the male professional level, reported that the height of PGs ranges from 1.87-1.90 cm and that of SGs from 1.93-1.98. The players of the present study recorded heights almost similar for both positions to the above, showing that the Greek U18 basketball players have a fairly high anthropometric profile especially regarding the height of the two positions. On the contrary, regarding the anthropometric variable of weight, Cui et al. (2019) and Altavilla et al. (2018) in their studies on professional male basketball players recorded weights for PGs from 80-85 kg and for SGs from 87-91 kg. These numbers in both positions are considerably higher than the weight recorded by the young players of the study thus highlighting that the factor of strength and weight is important for success at the top professional levels of male basketball.

The results of the present study regarding body fat percentages and Body Mass Index (BODY MASS INDEX (BMI)) measurements are consistent with other studies in basketball players

of the same age group. Viviani (2020) recorded values of 12.9 (%) body fat percentage and 21.21 BODY MASS INDEX (BMI) values in U-17 elite basketball players, values that were quite close to those of the players in the present study. In addition, the relatively low-body fat percentages (11-12%) and BODY MASS INDEX (BMI) ratings (21-22) demonstrated by the study participants are similar to those of Spanish and Australian U17/18 national team level players and are even better with a lower body fat percentage than their amateur counterparts (Calleja González et al., 2018; Gryko et al., 2018; Hoare, 2000; Kostopoulos, 2015). Although the BODY MASS INDEX (BMI) variable does not appear to be an important success criterion in the sport of basketball, the low body fat percentages recorded in the study allow players of both positions to perform a large number of quick and intense movements as required by perimeter players, both in the Defensive phase as well as in the Attacking phase of a basketball game, while numerous studies associate the excess of adipose tissue with possible negative effects on the performance of speed, agility and endurance in basketball. Finally, the present study recorded lean body mass values of 66.27 kg for the PGs and 73.59 kg for the SGs. These results are inferior compared to the elite U18 players of the study by Gerodimos et al. (2004). However, the two studies used different ways of measuring and calculating the specific variable. Therefore, based on the fact that few studies at the U18 level have dealt with this specific measurement, further evaluation is needed to draw safer conclusions.

The present study has encountered some limitations. Firstly, the size of the sample could be larger and players from previous years could be included in it, which was not possible. Secondly, there could not be a separate categorization of the athletes of the SF position and therefore a comparison of PGs vs SGs/SFs was made as the specific position of SFs, especially at the U18 level, is not encountered often so the athletes were selected and categorized as off-ball SGs/SFs (wings). Thirdly, the study did not take into account the biological maturation of the players who were the research sample. The researchers were not able to know the biological maturation of the players of each position separately but only their biological age.

CONCLUSION

Height, weight and lean body mass are the main anthropometric characteristics that separate U18 basketball players between the PG and SG/SF (wings) positions. Body fat percentages and BODY MASS INDEX (BMI) ratings do not appear to be a distinguishing criterion. The anthropometric profile of U18 male basketball players of the PG and SG/SF (wings) positions in terms of height, weight, body fat percentage and BODY MASS INDEX (BMI) was found to be at a fairly high level and close to the level of other U18 National Teams as well as male basketball players from other countries. The obtained results can be used by coaches and all those involved in the field of basketball for the optimal selection and distribution of the players who cover the competitive positions of the perimeter in basketball games.

CONFLICT OF INTEREST

All the authors state that there is no conflict of interest.

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