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Difference between midfield and forward football players in active and passive Body Mass Index as well as in the aerobic capacity

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**Abstract**

The importance of body construction for peak sports is not fully defined as a precondition for achieving high results. The purpose of this paper is to determine the ratio of active and passive body mass index as well as maximum oxygen intake between midfield and forward football players of the Kosovo Super League. To accomplish this goal, the research has included 50 midfielder players and 50 forward players of 10 teams of the Kosovo Super League. A total of six anthropometric variables, a motoric variable of aerobic type (the Cooper test) have been applied as well. For processing results, basic statistical and asymmetry parameters have been applied as well as the T-test analysis for independent groups. The research results show that there is a difference between midfield and forward football players in the ratio of active and passive body mass index and aerobic capacity and this difference is statistically significant p<0.05. The research shows that the morphologic and functional characteristics of footballers mainly depend on the role they have in the field.

**Key words*:*** Active and passive body mass index, aerobic capacity, Cooper test.

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**1. Introduction**

The optimal morphological characteristics of athletes depend mainly on the type of sport. In general, the best results are achieved by those whose physical construction fits the specific requirements of the specific sports. Success in sports, however, also depends on the morphological characteristics of athletes, of which height and body weight are essential, which are valued considering the actual age of the athlete. Apti, A.(2010) The above mentioned data should be highly respected during the growth and development of athletes when chronological and biological ages are not often coordinated, and it is usually a period of time when prospective top athletes have been profiled (Joksimović, S. (1981).

Taking into consideration requirements of some sports, the life span is defined when higher sports results are expected to be achieved. Football is certainly one of the most massive and popular sports in the world and so far a lot of research has been done on players of different levels in terms of their quality. Thus, among the research to date, there are those whose purpose is to determine the morphological characteristics of football players. Such research has shown that the body composition of a footballer, besides depending on its individual characteristics, also depends on the specifics of the position they play on the field (Sutton, L., Scott, M., Wallace, J., & Reilly, T. (2009). Football is an anaerobic - aerobic sport with various stages of high loads such as sprint, changing speed, jumps, and sudden stops. Today's modern football requires players to be strong, consistent, good motor and functional skills (speed, explosive strength, coordination, flexibility, precision, aerobic and anaerobic capacity) and a sense of improvisation and collective play.

The term "aerobic capacity" means the total volume of aerobic metabolic processes in the human body and represents a large portion of the total human energy capacity. Unlike the term "aerobic capacity", the term "maximum oxygen intake" (VO2max) or according to some Anglo-Saxon authors "maximal aerobic power" refers to the intensity of aerobic processes and in fact represents the body's ability, , which in certain cases consumes the largest amount of oxygen Rashiti, V. Rashiti, N.(2013) A player without good functional skills cannot withstand the demands of high level football. Success in a football game depends on how the individual characteristics of a particular player fit into a whole and make a homogenous team (Verheijen, R. (1997).

**2. The purpose of this paper**

Knowledge of morphological and functional development among football players is one of the main concerns of coaches and management staff of football teams. The purpose of this paper is based on this fact. The purpose of this paper is to prove the difference between midfield and forward football players in active mass (muscular mass) and passive body mass (fatty mass) as well as in aerobic capacity.

**3. Working methods**

The research was conducted on a sample of 100 senior football players of the Kosovo Super League 2016/2017. From this sample 50 football players were midfielders and 50 were forward football players. The collection of information has been carried out by medical examination and player measurements at the National Center for Sports Medicine in Pristina. These anthropometric measurements have been carried out by the National Center for Sports Medicine in Prishtina: Body height (HEIG), Body weight (WEIG), Abdominal adipose tissue (ABAT), Body mass index (BMI), Muscle mass (MUMA), Body fat (BOFA) and Cooper Test (COOPT) - 12 minutes running to evaluate VO2max. Descriptive statistical analysis as well as t-test for independent groups was used to process the results.

**4. The results and discussion**

In Table 1 are presented the basic statistical parameters, arithmetic mean values, minimal result, maximal result, standard deviation, distribution or asymmetry parameters (Skewness) and the degree of extension of the curve peak of the distribution of results (Kurtosis) of the anthropometric variables and Cooper's test of midfield and forward football players.

**Table 1.** Basic statistical and asymmetry parameters of anthropometric variables, active and passive mass as well as Cooper's test on football players.

|  | forward players | | | | midfield players | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variables | N | Mean | Std. Dev | Skew | Kurt | Mean | Std. Dev | Skew | Kurt |
| HEIG | 50 | 1822.1800 | 51.06246 | -.187 | -.739 | 1779.6400 | 58.92429 | .839 | .743 |
| WEIG | 50 | 80.9220 | 5.66876 | .770 | -.034 | 68.6180 | 5.70090 | .291 | -.177 |
| ABAT | 50 | 13.4440 | 5.42711 | .756 | .868 | 7.4400 | 2.09840 | .969 | .325 |
| BMI | 50 | 24.3832 | 1.61580 | 1.472 | 2.979 | 21.6740 | 1.59796 | -.019 | -.492 |
| MUMA | 50 | 69.4649 | 3.84538 | .542 | -.041 | 61.9185 | 4.39329 | .250 | .027 |
| BOFA | 50 | 11.4571 | 2.79561 | .572 | -.295 | 6.6995 | 1.56221 | .653 | -.083 |
| COOPT | 50 | 45.5540 | 3.54788 | .066 | -.523 | 53.4260 | 4.85566 | -.238 | .079 |

Most of the Skewness and Kurtosis scores on the attacking player move from a distance of 1 to -1 and indicate a normal distribution of results. The largest asymmetry on the right relative to the normal distribution, which is shown with the positive sign of the asymmetry coefficient, is observed in the variable Body mass index (BMI), Skewness = 1.47. The raised value of the asymmetry test (Skewness) indicates the extension of the distribution to the highest values indicating that most of the values obtained in this variable tilt toward the lower values. The other positive values of asymmetry coefficients indicate a small and medium curve on the right, while variables with negative values of the Body Height (HEIG) asymmetry coefficient indicate a small to medium curve to the left.

All Skewness and Kurtosis scores in midfield players move from a distance of 0-1 and indicate a normal distribution of scores. Most of the variables applied in this paper do not have a large asymmetry where their values are positive and show a small to medium curve to the right (epicurtic), while the variable with negative values of the asymmetry coefficient Cooper's test (COOPT) shows a small to medium curve to the left (hypokurtic).

The inter-correlation coefficients of the anthropometric and functional variables of the attacking and midfield players are presented in Table 2. This table shows that the inter-correlation coefficients above the diagonal are the correlation coefficients of attacking players and below the diagonal midfielders. All two-star correlation coefficients are statistically significant at the p = 0.01 level. The correlation coefficients of most of the anthropometric and functional variables show that there is a high correlation between them. Body height (HEIG) stands in the correlation with variables: Body weight (WEIG) r=0.583, Muscle mass (MUMA)r=0.650, Body fat (BOFA) r=0.382 and Cooper Test (COOPT) r=0.485. Body weight variable (WEIG) stands in the correlation with variables: Abdominal adipose tissue (ABAT) r=0.659, Body mass index (BMI) r=0.816, Muscle mass (MUMA) r=0.968, Body fat (BOFA) r=0.904, Cooper Test (COOPT) r=0.799. Abdominal adipose tissue variable (ABAT) stands in the correlation with the variables: Body mass index (BMI) r=0.727, Muscle mass (MUMA) r=0.449, Body fat (BOFA) r=0.918, Cooper Test (COOPT) r= - 0.799. Body mass index variable (BMI) stands in the correlation with variables: Muscle mass (MUMA)r=0.726, Body fat(BOFA)r=0.845, and [Cooper Test (COOPT)r=0.753. Muscle mass variable (MUMA) stands in the correlation with variables: Body fat (BOFA) r=0.767 and Cooper Test (COOPT) r=0.753. Body fat variable (BOFA) stands in the correlation with the negative variables: Cooper Test (COOPT) r=-0.757.](https://www.brianmac.co.uk/gentest.htm)

**[Table 2.](https://www.brianmac.co.uk/gentest.htm)** [Inter-correlation of anthropometric and functional variables to midfield and forward football players](https://www.brianmac.co.uk/gentest.htm)

|  | [HEIG](https://www.brianmac.co.uk/gentest.htm) | [WEIG](https://www.brianmac.co.uk/gentest.htm) | [ABAT](https://www.brianmac.co.uk/gentest.htm) | [BMI](https://www.brianmac.co.uk/gentest.htm) | [MUMA](https://www.brianmac.co.uk/gentest.htm) | [BOFA](https://www.brianmac.co.uk/gentest.htm) | [COOPT](https://www.brianmac.co.uk/gentest.htm) |
| --- | --- | --- | --- | --- | --- | --- | --- |
| [HEIG](https://www.brianmac.co.uk/gentest.htm) | [1](https://www.brianmac.co.uk/gentest.htm) | [.583](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [.129](https://www.brianmac.co.uk/gentest.htm) | [.009](https://www.brianmac.co.uk/gentest.htm) | [.650](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [.382](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [.485](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) |
| [WEIG](https://www.brianmac.co.uk/gentest.htm) | [.583](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [1](https://www.brianmac.co.uk/gentest.htm) | [.659](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [.816](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [.968](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [.904](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [.799](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) |
| [ABAT](https://www.brianmac.co.uk/gentest.htm) | [.129](https://www.brianmac.co.uk/gentest.htm) | [.659](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [1](https://www.brianmac.co.uk/gentest.htm) | [.727](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [.449](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [.918](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [-.587](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) |
| [BMI](https://www.brianmac.co.uk/gentest.htm) | [.009](https://www.brianmac.co.uk/gentest.htm) | [.816](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [.727](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [1](https://www.brianmac.co.uk/gentest.htm) | [.726](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [.845](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [-.634](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) |
| [MUMA](https://www.brianmac.co.uk/gentest.htm) | [.650](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [.968](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [.449](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [.726](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [1](https://www.brianmac.co.uk/gentest.htm) | [.767](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [.753](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) |
| [BOFA](https://www.brianmac.co.uk/gentest.htm) | [.382](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [.904](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [.918](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [.845](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [.767](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [1](https://www.brianmac.co.uk/gentest.htm) | [-.757](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) |
| [COOPT](https://www.brianmac.co.uk/gentest.htm) | [-.485](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [-.799](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [-.587](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [-.634](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [-.753](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [-.757](https://www.brianmac.co.uk/gentest.htm)[\*\*](https://www.brianmac.co.uk/gentest.htm) | [1](https://www.brianmac.co.uk/gentest.htm) |

Table 3 shows the differences between midfield and forward football players in the anthropometric and functional variables. The acquired results show that statistically significant differences were obtained in all variables of active and passive and functional mass between midfield and forward football players. The coefficients of difference are: Body height (HEIG) sig=0.000, Mean Diff= 42.54mm; Body weight (WEIG), sig=0.000,Mean Diff= 12.30kg; Abdominal adipose tissue (ABAT) sig=0.000, Mean Diff= 6.00mm; Body mass index (BMI) sig=0.000, Mean Diff= 2.70; Muscle mass (MUMA), sig=0.000, Mean Diff= 7.54%; Body fat (BOFA) sig=0.000, Mean Diff= 4.75%; and Cooper Test (COOPT) sig=0.000, Mean Diff= 7.54%.

The results show that success in the game of football is not possible if we don't take into account the complex anthropological determinants: morphological construction of the football player and functional skills. Recognizing the interaction of the status of morphological dimensions, it is likely to determine the player's success in a football game. These are practical information that within appropriate thought processes allows the opportunity for the coach, in the aspect of needs, to design and form the current morphological dimensions. Thus, the essential knowledge of the morphological factor known through qualitative - quantitative traits represents an important signal of a concrete report football player - football game. Based on the linear logic of the Gauss-Raovit model, the obtained results are in agreement with the opinions of some authors who point out that morphological and functional dimensions significantly influence the racing results (Živanić and Stamenković, 1979). It can be said that the values of morphological characteristics are in proportion to the highest ranking in competition and the playing position in football game (Joksimović, 1981). In the game of football, muscle mass and fat mass are the best indicators to identify the player of the football game. Differences in active and passive mass are evident between midfield and forward football players, Sutton et al. (2009).

Midfield players have higher oxygen intake values (53.42 ± 4.85 ml / min / kg) compared to forward players (45.55 ± 3.54 ml / min / kg). The obtained values ​​of oxygen intake are lower than those obtained by other authors indicating that midfield players have higher oxygen intake values (65.82 ± 2.54 ml / min / kg) compared to forward players (63.26 ± 0.93 ml / min / kg). These results have also been confirmed from previous research by other authors on higher values ​​of oxygen intake in midfield players, which is consistent with the special duties and position of the midfielders, which are the link between attack and defense and cover most of the field.

**Table 3. Difference between midfield and forward football players in anthropometric and functional variables**

|  | F | Sig. | t | df | Sig.) | Mean Diff | Std. Error Diff | Lower | Upper |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| HEIG | .161 | .689 | 3.858 | 98 | .000 | 42.54000 | 11.02674 | 20.65780 | 64.42220 |
|  |  | 3.858 | 96.057 | .000 | 42.54000 | 11.02674 | 20.65226 | 64.42774 |
| WEIG | .011 | .916 | 10.822 | 98 | .000 | 12.30400 | 1.13697 | 10.04772 | 14.56028 |
|  |  | 10.822 | 97.997 | .000 | 12.30400 | 1.13697 | 10.04772 | 14.56028 |
| ABAT | 31.200 | .000 | 7.296 | 98 | .000 | 6.00400 | .82288 | 4.37102 | 7.63698 |
|  |  | 7.296 | 63.331 | .000 | 6.00400 | .82288 | 4.35977 | 7.64823 |
| BMI | .683 | .411 | 8.430 | 98 | .000 | 2.70923 | .32138 | 2.07146 | 3.34700 |
|  |  | 8.430 | 97.988 | .000 | 2.70923 | .32138 | 2.07146 | 3.34700 |
| MUMA | .967 | .328 | 9.139 | 98 | .000 | 7.54631 | .82569 | 5.90776 | 9.18486 |
|  |  | 9.139 | 96.311 | .000 | 7.54631 | .82569 | 5.90740 | 9.18522 |
| BOFA | 17.123 | .000 | 10.505 | 98 | .000 | 4.75769 | .45290 | 3.85892 | 5.65646 |
|  |  | 10.505 | 76.883 | .000 | 4.75769 | .45290 | 3.85583 | 5.65955 |
| COOPT | 2.721 | .102 | -9.256 | 98 | .000 | -7.87200 | .85047 | -9.55973 | -6.18427 |
|  |  | -9.256 | 89.715 | .000 | -7.87200 | .85047 | -9.56168 | -6.18232 |

**5. Conclusion**

The characteristics of the football game according to the position of the players are important factors indicating what anthropological characteristics a football player must have in order to perform good results in game. According to the results obtained, in anthropological terms the players playing in central positions are of lower body height, whereas players who play forward, in morphological view have higher body height than midfield players. We can also say that active and passive bodily mass in footballers, besides depending on their individual characteristics, also depends on the specifics of the position in which they play on the field. According to current practice a difference in body height between forward and midfield players lies in the coaching system's setting of the game. Requests that appear during the game require forward players to have a higher body height compared to midfield players because practice has shown that the morphological characteristics of football players can have effect on the success of achieving sports results because such characteristics are very important in the performance of motor duties. In terms of their role on the field, midfield players from an anthropological point of view, playing in midfield positions are of lower body height morphologically, more loads per game than forward players and this causes midfielders to have higher aerobic capacity and lower passive mass (fatty mass). The general conclusion may be that the footballers are distinguished in the anthropological aspect considering the position of the game.

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