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Association of Anthropometric Profile to speed and agility performance in male soccer players

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Abstract

The purpose of this study was to examine the relationship between anthropometric, sprint and agility performance in soccer players. Descriptive cross-sectional study was employed on purposely selected 25 soccer players from Sidama Coffee and Hawassa City soccer clubs in southern part of Ethiopian premier league male soccer players. To serve these purpose basic anthropometric parameters (Body mass, height, body mass index), girth anthropometric (upper arm, waist, thigh and calf circumference) were measured. Performance measures of 30 meter speed test and Illinois agility tests also were measured on each subject. The obtained quantitative data was analyzed by one-way analysis of variance (ANOVA) to examine the difference in performance between playing position and Pearson correlation ($p<0.05$, 0.01) was used to see the relationship between all measured variable with the help of SPSS version 20.00 software. The result of the study revealed that strikers were the heaviest and tallest in contrasts with defenders and midfielders. They also had the larger upper arm, waist, thigh and calf circumference. There was significant differences of waist circumstance between playing position in score of $F = 4.555$, $P < 0.05$ (0.022). Body mass was correlated in body mass index ($r=.676$; $p<0.05$) in midfielder and ($r=.947$; $p<0.05$) in striker playing position. Arm circumference correlated with waist ($r=.642$; $p<0.01$) and thigh circumference ($r=.840$; $p<0.01$) in midfield positional players. Arm circumference correlated with thigh circumference ($r=.911$; $p<0.05$) in striker position. 30m speed correlated with only arm circumference ($r=-.666$; $p<0.05$) in midfielder position. Based on the result of the study researchers concluded that arm circumference was significantly correlated with waist and thigh circumference in midfield positional players. Similarly in striker position arm circumference was significantly correlated with thigh circumference. But there are no significant correlation with positional differences in speed performance with both basic and girth anthropometric variable except arm circumference in midfielder position. Agility was negatively correlated with all measured anthropometric variable in all playing position and statically no significant difference were observed. The obtained results can serve as normative anthropometric values for regular sport medical examinations of footballers in Ethiopia country

Key words: Girth anthropometric, speed performance, agility performance

INTRODUCTION

Soccer is an intermittent, high-intensity sport requiring a broad range of physical abilities in order to achieve competitive success (28). The game comprises activities like sprint and jumps in attack and defense. It also requires aerobic capacity as the game lasts one and half hour, sometimes even longer than the official time. These short and long lasting activities were performed over the entire game (31). To succeed in a team sport, soccer players need the optimal combination of technical, tactical, physical characteristics (like somatotype) and mental motivation (4). Besides fitness and the technical skills of the footballers, anthropometric indicators and body composition play an important role in successful performance (2). Morphological characteristics successfully discriminate soccer players by competitive level and field position (24). This evidence suggests that specific physiological demands and anthropometrical prerequisites exist for different playing positions and result in the selection of young players based on superior physiological performances and anthropometrical

advantage (13). There are many practical implications of studying anthropometry among sports participants. For soccer managers, coaches, and physiotherapists, an understanding of the optimal anthropometric characteristics of players can help to develop squad members to their full potential. Additionally, physiological testing is of great importance for monitoring fitness, strength, agility, and skill, and should be examined according to the different positional roles within the team (27). Indeed, it has been reported that there are anthropometric predispositions for positional roles within soccer; with taller players being the most suitable for central defensive positions, goalkeeping, and central attack (23).

Specific playing position may have unique physical and physiological requirements. Attackers appear to be the fastest players in the team. The greatest overall distances appear to be covered by midfield players who act as links between defense and attack. Defenders perform more backward movement than attackers (33). Sprint, acceleration, and agility are among the most important performance variables in youth soccer (12). High-speed actions are known to impact soccer performance and can be categorized into actions requiring maximal speed, acceleration or agility (19). Agility is one of the main determinants of performance in soccer. It can be successfully developed if the training is based on the changes of direction, which are done quickly and easily. By working on agility and improving the balance and coordination, soccer players will be able to move faster and change directions more quickly while maintaining control (27). Assessment of agility is easy to administer and could be performed in conjunction with sprint tests throughout the season following periods of specific sprint training (30].

Correlations of anthropometric characteristics and speed and agility performance of soccer player in different playing position remained less reported, especially in Ethiopian context. Therefore, this study attempts to fill the gap in the literature to gain more insight regarding anthropometric, speed and agility performance among some selected southern part of Ethiopian premier league male soccer payers according to different playing positions.

The purpose of the present study is to analyze the anthropometrical related to speed and agility performance in male soccer players in some selected southern part of Ethiopian premier league male soccer players, and to determine how closely these emulate previous findings.

Material and Methods

Participants:

The research was conducted on a sample of twenty five male soccer players purposely selected who play in the top clubs Southern part of Ethiopian premier league male soccer club players (N=13, Hawassa City and N=12, Sidama Coffee) to participate in this study. The sample included players aged between 20-27 years. The selection criteria included: (1) they have been members of the club and best players from (defender, midfielder, and striker) position. (2) all players participated in at least 75% training sessions per week. (3) the physicians of the outpatient hospitals evaluated the physical performance of all participants, and sport injury rates and incidence were recorded. The study was conducted in the final stage of the season, but the players were still in a competitive phase.

Research design. Descriptive cross sectional research design study was implemented. The study was undertaken in compliance with the Arba Minch University Medical School and approved by Arba Minch University Ethical Committee (No, RCP/1234/09 and date 2/23/2018). The soccer players gave written informed consent after having been explained the procedures, benefits and possible risks of participation in the study. All tests have been performed during the period of 1st may 2018 during a final competitive season, over a three-month period (March, April and May). During the study, the soccer players were engaged in their designed training programme that consisted of 7–8 training sessions per week and a weekly match.

Procedures

Anthropometric Measures

Anthropometric measures included three types of measurements: basic (body mass, standing height, body mass index), Girths (upper arm, waist, thigh and calf circumference). Each subject was measured in accordance with the standard methods of kinanthropometry (25). Height and body mass were measured using calibrated digital stadiometer and weighing machine, body mass was measured to the nearest 0.1 kilogram and height was measured to the nearest of 0.001 meter. Body mass index is calculated using body mass index formula, i.e. weight (kg) divided by height (m2). All data were

collected by the author who had experienced in taking body circumference.

30 Meter Dash Test

Before the start trials, standard warming up exercise was given for 15 minutes. Selected participants have knowledge and experience with various test protocol. In order to keep the test accurate and worthwhile, all tests have been performed during the period of 1st may 2018 under condition of temperature(15ºC to 25ºC) in the same moment of day at 10h am after getting balanced meal.

The test involved running a single maximum sprint over 30 meters, with the time recorded. Start from a stationary position, with one foot in front of the other. The front foot must be behind the starting line. This starting position should hold for 2 seconds prior to starting, and no rocking movement allowed. The tester should encouraged to continue running hard through the finish line. There were two trials in total, and a 3-minute recovery allowed between each trial. The best (fastest) 30m sprint time selected for analysis. The timing starts from the first movement and then the timing system triggered, and finishes when the chest crosses the finish line and/or the finishing timing gate triggered. The time was recorded using standardize stopwatch. All methods and procedures in accordance with 30-meter dash test standard made by Davis B, (10)

Illinois's Agility Test

The athlete started on standing start at the starting cone. The athlete started on a "ready-set-go" countdown. The researcher started the watch when he says goes. The athlete then must sprint as fast as possible around all the cones without knocking them down. The stopwatch stopped when the athlete crossed the finish line. Test each athlete 2 times and rest fully in between each repetition. Agility measured by using the stopwatch and the best times of three successful trials (to the nearest 0.1 second) were recorded in accordance with Illinois's Agility test standard made by McKenzie, B (22).

Statistical Analysis

The data was carried out using Statistical Package for Social Sciences (SPSS) version 20.0 for IBM. One-way analysis of variance (ANOVA) was undertaken to evaluate the differences in the basic and girth anthropometric with performance (speed and agility) measures based on playing positions. Statistical significance was set at $p<0.05$. Pairwise comparisons were made using the Bonferroni test. (When F ratios were significant, If the result was significant, Tukey HSD post hoc analysis was carried out to determine specific substantial differences among the groups. A probability level of 0.05 or less was taken to indicate statistical significance). Descriptive statistics are mean ± standard deviations. The relationships between anthropometric variables related to speed and agility variable according to their playing position were determined using Pearson product moment correlation coefficient. The following corresponding criteria were used for interpreting the magnitude of the correlation between measures was high when $r >0.70$, moderate when $r <0.50$-0.70, low when $r<0.30$- 0.50 and very low when $r<0.30$.

Results

Descriptive statistics (mean, ± standard deviation) in some selected Anthropometric parameters with speed and agility performance variables of participants grouped by in to three playing position summarized in table 1. In table 1, shows the mean values and standard deviations of male football players of different playing positions i.e. defenders, midfielders and attackers with regard to the some selected basic anthropometric (height, body mass and body mass index) and girth anthropometric (waist, upper arm, thigh and calf circumference) and performance variables of speed and agility. When comparing with age midfielders are younger than their counterparts; defender and stickers. The mean value of all measured basic anthropometry variable (height, Body mass, Body mass index) and girth anthropometric (waist, arm, thigh and calf circumference) of sticker had greater mean value than their counterparts; defender and midfielders. While comparing the mean of speed revealed that all positional players had almost the same performance. But, strikers had shown better agility than their counterparts; defender and midfielders. It is also observed that midfielder had little bit better in agility than defenders.

As illustrated in table 2, the ANOVA revealed that there were no significant differences of basic anthropometric variables(height, body mass and body mass index) between playing position. Similarly there is no significant difference girth anthropometric (waist, upper arm, thigh and calf circumference) between playing position except waist circumference in score of F = 4.555, sign= P< 0.05(0.022)

Table 3, shows height was moderately correlated with body mass(r=.568) in the midfielder position and (r=.682) in strikers position. Height also moderately correlated with agility(r=.646) in midfield position. Body mass was significantly correlated in body mass index(r=.676) in midfielder and (r=.947) in striker playing position. Height did not show any significant correlation to speed and agility performance in all playing position. Similarly there was no significant correlation between speed and agility in all playing position.

Correlations between some selected girth anthropometric variables with speed and agility performances are presented in Table 4. Arm circumference was significantly correlated with waist (r=.642; p<0.05) and arm circumference significantly correlated with thigh circumference (r=.840; p<0.01) in midfield positional players. Similarly in striker position arm circumference was highly correlated with thigh circumference (r=.911, P<005). Speed was significantly negative correlated with arm circumference(r=-.666; P<0.05) in mid fielder position. But speed was negatively correlated in majority measured girth anthropometric variable in midfielder and striker playing position. Similarly agility also negatively correlated with all measured girth anthropometric and speed performance variable in all playing position. However in defensive position agility was moderately correlated with calf circumference.

Table 1. Descriptive statistics of anthropometric profile, speed and agility performance in three playing position

Variables	DF			MD			SK			Total		
	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Age(years)	9	23.555	3.844	10	22.300	3.093	6	24.333	5.785	25	23.240	4.023
Height (cm)	9	176.277	4.309	10	173.060	4.599	6	178.161	3.828	25	175.442	4.653
Body mass (kg)	9	68.300	6.064	10	66.680	4.449	6	74.650	8.609	25	69.176	6.745
BMI	9	21.672	1.783	10	22.279	1.530	6	23.483	2.172	25	22.350	1.848
WC	9	79.888	2.666	10	80.300	2.626	6	84.000	3.162	25	81.040	3.155
AC	9	30.555	2.297	10	30.100	1.100	6	31.666	1.966	25	30.640	1.845
TC	9	57.444	3.844	10	57.000	2.403	6	59.833	3.868	25	57.840	3.399
CC	9	38.888	1.166	10	38.800	1.686	6	41.166	3.868	25	39.400	2.380
Speed (30m)	9	4.346	.094	10	4.338	.186	6	4.325	.242	25	4.338	.168
Illinois agility	9	16.326	.489	10	16.260	.419	6	15.911	.535	25	16.200	.483

DF-defender, MD-midfielder, SK-striker, BMI-body mass index, WC-waist circumference, AC-arm circumference, TC- thigh circumference, CC-calf circumference, SD-standard deviation, N-number of respondents

Table 2. ANOVA results obtained from three playing position of selected Ethiopian soccer players

Variables		Sum of Squares	Df	Mean Square	F	Sig.
Age(years)	Between Groups	16.904	2	8.452	.500	.613
	Within Groups	371.656	22	16.893		
	Total	388.560	24			
Height (cm)	Between Groups	107.400	2	53.700	2.865	.078
	Within Groups	412.293	22	18.741		
	Total	519.693	24			
Body mass (kg)	Between Groups	248.995	2	124.497	3.249	.058
	Within Groups	843.011	22	38.319		
	Total	1092.006	24			
BMI	Between Groups	11.886	2	5.943	1.865	.179
	Within Groups	70.110	22	3.187		
	Total	81.997	24			
WC	Between Groups	69.971	2	34.986	4.555	**.022**
	Within Groups	168.989	22	7.681		
	Total	238.960	24			
AC	Between Groups	9.304	2	4.652	1.413	.265
	Within Groups	72.456	22	3.293		
	Total	81.760	24			
TC	Between Groups	32.304	2	16.152	1.450	.256
	Within Groups	245.056	22	11.139		
	Total	277.360	24			
CC	Between Groups	24.678	2	12.339	2.438	.111
	Within Groups	111.322	22	5.060		
	Total	136.000	24			
Speed (30m)	Between Groups	.002	2	.001	.027	.973
	Within Groups	.677	22	.031		
	Total	.679	24			
Illinois agility	Between Groups	.679	2	.340	1.514	.242
	Within Groups	4.934	22	.224		
	Total	5.614	24			

AC-Arm Circumference, WC-Waist Circumference, TC-Thigh circumference, CC- Calf circumference

Table 3 Correlations[a,c,e] matrix between basic anthropometric variable with speed and agility between different playing position

Variables		Playing Position														
		DF(N=9)					MD(N=10)					SK(N=6)				
		Ht	BM	BMI	Speed	agility	Ht	BM	BMI	speed	agility	Ht	BM	BMI	speed	agility
Ht	Pearson Correlation	1	.568	-.207	.455	.646	1	.389	-.415	-.409	.307	1	.682	.412	-.700	.182
	Sig. (2-tailed)		.111	.592	.218	.060		.266	.234	.240	.388		.135	.417	.121	.730
BM	Pearson Correlation	.568	1	.600	.525	.136	.389	1	.676*	-.579	-.108	.682	1	.947**	-.392	-.106
	Sig. (2-tailed)	.111		.088	.146	.726	.266		.032	.080	.767	.135		.004	.442	.842
BMI	Pearson Correlation	-.207	.600	1	.250	-.324	-.415	.676*	1	-.247	-.353	.412	.947**	1	-.173	-.204
	Sig. (2-tailed)	.592	.088		.517	.395	.234	.032		.491	.317	.417	.004		.744	.699
Speed	Pearson Correlation	.455	.525	.250	1	.307	-.409	-.579	-.247	1	-.027	-.700	-.392	-.173	1	.468
	Sig. (2-tailed)	.218	.146	.517		.422	.240	.080	.491		.940	.121	.442	.744		.350
Agility	Pearson Correlation	.646	.136	-.324	.307	1	.307	-.108	-.353	-.027	1	.182	-.106	-.204	.468	1
	Sig. (2-tailed)	.060	.726	.395	.422		.388	.767	.317	.940		.730	.842	.699	.350	

*. Correlation is significant at the 0.05 level (2-tailed). Ht-Height, BM-Body mass, BMI-Body mass index, DF- Defender, MD-Midfielders, SK-Striker

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4. Correlations[a,d,e] matrix between anthropometric with speed and agility according to different playing position

Variables		Playing Position																	
		DF(N=9)						MD(N=10)						SK(N=6)					
		AC	WC	TC	CC	Speed	Agility	AC	WC	TC	CC	Speed	agility	AC	WC	TC	CC	Speed	agility
AC	Pearson Correlation	1	.297	.535	.399	.322	-.357	1	.642*	.840**	.251	-.666*	-.258	1	.418	.911*	.167	-.369	-.290
	Sig. (2-tailed)		.438	.138	.287	.398	.345		.045	.002	.483	.036	.472		.409	.011	.753	.471	.578
WC	Pearson Correlation	.297	1	.542	.558	.233	.144	.642*	1	.528	.492	-.491	-.071	.418	1	.687	-.458	-.193	-.120
	Sig. (2-tailed)	.438		.132	.118	.547	.711	.045		.117	.149	.149	.846	.409		.132	.361	.714	.820
TC	Pearson Correlation	.535	.542	1	.263	.036	-.108	.840**	.528	1	.192	-.424	-.483	.911*	.687	1	-.185	-.344	-.133
	Sig. (2-tailed)	.138	.132		.494	.927	.782	.002	.117		.595	.222	.158	.011	.132		.726	.504	.802
CC	Pearson Correlation	.399	.558	.263	1	.634	.553	.251	.492	.192	1	-.182	-.489	.167	-.458	-.185	1	.436	-.149
	Sig. (2-tailed)	.287	.118	.494		.067	.122	.483	.149	.595		.615	.152	.753	.361	.726		.387	.779
Speed	Pearson Correlation	.322	.233	.036	.634	1	.307	-.666*	-.491	-.424	-.182	1	-.027	-.369	-.193	-.344	.436	1	.468
	Sig. (2-tailed)	.398	.547	.927	.067		.422	.036	.149	.222	.615		.940	.471	.714	.504	.387		.350
Agility	Pearson Correlation	-.357	.144	-.108	.553	.307	1	-.258	-.071	-.483	-.489	-.027	1	-.290	-.120	-.133	-.149	.468	1
	Sig. (2-tailed)	.345	.711	.782	.122	.422		.472	.846	.158	.152	.940		.578	.820	.802	.779	.350	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

AC-Arm Circumference, WC-Waist Circumference, TC-Thigh circumference, CC-Calf circumference DF-Defender, MD-midfielders, SK-Striker

DISCUSSION

In the present study the participants (N=25) were grouped into three different playing positional groups: defense, midfield and striker position. The finding of the present study revealed that striker had greater mean value of basic anthropometric measurements (body mass, height and body mass index) than their counterparts; defender and midfielders. But statically no significant differences were observed. This is in line with the previous report of Kemal Goral (18) in terms of height, body mass and body mass index values, no difference were detected between positions. The comparison of our result with professional and / or top football players in Europe, the Middle East and South America have an approximate body height varying from 176.0 – 183.0 cm, and body weight generally less than 80 kg (within the span of 65.6 – 78.7 kg), and BMI index varying between 23.00 – 24.45 kg/m2 (6). Some former researches also establish that the height can have an impact on the game position of the football player in the team, so the higher players are mostly placed as goalkeepers and in the defense, where the height is advantage (5). But the more studies revealed that defenders are taller and heavier than other positional players Carlos Lago et al., (7, 8). In another literature, the analysis of body composition and fat mass showed that strikers were leaner than midfielders, defenders, and goalkeepers Gil SM, (14).

The mean value of girth anthropometric (waist, arm, thigh and calf circumference) also statistically no significance differences were observed according to positional difference in the current study. Reports regarding certain anthropometric parameters (diameters, circumferences and skinfolds) in adult footballers are rare in the literature. Macedonian national league club footballers showed similar result in arm, thigh and calf circumference in related to the present study Jasmina Pluncevic-Gl et al., (17). The comparison of our results with the data of F. Javier Nu et al., (11) regarding anthropometric parameters of senior national Serie A Italia soccer players had lower waist (76.6+2.4 cm), lower thigh (53.9+1.5 cm) circumferences than our footballers at the relative age up to 29. The relative of fat free mass circumference value in the lower limbs, trunk, and upper limbs in soccer players, are very important to execute the loco motor activities, jumps, kicks and flight that the game demands. Considering the fact that lower extremity and the middle part of the body of soccer players are more affected than their upper extremity in their training programs in addition to the type of power training in soccer players, bone density and muscle sizes increase more in these locations. Nonetheless, we postulate that anthropometry contributes to success in specific playing positions at a senior level. For example, taller and heavier players are more suitable to be goalkeepers and defenders and shorter and lighter players are more suitable to be midfielder (32).

Speed and agility are integral aspects of almost every defensive and offensive maneuver performed by soccer players in practices and games (26). Speed in the soccer depends on prediction of game, reaction, reaction time choice and movements (29). The results of this study shows no significant difference was found in 30-m sprint times in different playing position. The strikers were faster than defenders and midfielders. These results are similar to those provided by Carlos Lago et al., (7). In another study, Gil, S.M., et al., (15) it was found that forwards were the fastest group and goalkeepers are the slowest.

Agility training is an important part of any soccer player's regimen because it replicates the various motions players will experience during the run of play. Soccer is a game full of direction and speed changes with and without the ball, and agility training helps players become more agile and improves coordination (20). However, the result showed strikers had shown little better agility than their counterparts; defender and midfielders. It is also observed that midfielder had little bit better in agility than defenders but statically no significant differences were observed. The greater values of Illinois agility result found in strikers compared with defenders, and midfielders are consistent with those of previous studies Alliance K et al., (1). The reason strikers were agile could be due to the fact that they always run and turn at high intensity Clark JR (9). However, our results did not conform to the study of Kemal Goral, (18) which has shown that the Illinois agility test was significantly lower in the midfielders compared with strikers.

In the present study we did not find any significant correlation between the playing position and speed performance with basic anthropometric variables. This finding is supported by Arjan Hyka et al (3); however another study Wong PL, (30) found a significant correlation between of weight and height with speed. Body mass is the most

significant predictor of 30 m sprint time. Indeed, a negative parallelism found in our study between body weight and sprint time in different playing position is in agreement with the results of Malina et al. (21) who found that body mass is the most significant predictor of 30 m sprint time. Speed was negatively correlated in majority measured girth anthropometric variable in midfielder and striker playing position. But it was significantly negative correlated with arm circumference in midfielder position. Similarly agility was negatively correlated with all measured girth anthropometric variable in all playing position except in calf circumference in midfield position. Agility is a key requirement of optimal performance in many sports and one of the most discriminating factors among soccer players (16). The present study agility was no significantly correlated with all basic anthropometric variables in all playing position except high correction in height in defensive players. To measure and report the agility performances of players at regular intervals can provide significant benefits in the process of training to improve the performance levels of athletes playing in different positions.

The data in the present study carry considerable practical applications for coaches and soccer player. Anthropometric variables and performance variable like speed and agility studied can be used as a predictor of performance in national club soccer players. It should be useful in future investigation on player selection, talent identification, and training program development. Future longitudinal studies should be carried out in all soccer players throughout the country with various anthropometric and performance parameters.

CONCLUSION

The result of the study shows striker players taller and heavier and performed better speed agility performance than other positional players. This may attributed to nature of position. The speed and agility performance related to height and body mass was insignificant within the groups. Similarly speed and agility performance was negatively in low correlated in majority of anthropometric variables.

Measurements of anthropometric profile and know its correlation with speed and agility performance can serve as normative anthropometric values for regular sport medical examinations of footballers in our country. These results could also be used as a template for the purpose of comparison of anthropometric and functional features between adult footballers of similar level from different countries. Because soccer players different playing positions have different anthropometric characteristics and speed and agility performance variables, and could help coaches to select players for the professional level according with the playing position. It should be also useful too talent identification and training program development in soccer players.

REFERENCES

1. Alliance K, Yvonne P, Prescott M, Abel T. Physical Performance and Anthropometric Characteristics of Male South African University Soccer Players Journal of Human Kinetics. 2017; 60: 153-158 DOI: 10.1515/hukin-2017-0098
2. Amarpreet Singh, Baljinder Singh. Comparative study of selected anthropometric variables between defenders and midfielders in football. International Journal of Applied research. 2015; 1(12): 91-93.
3. Arjan Hyka, Edmond Bicoku and Ali Mysliu: The Association of Sprint Performance with Anthropometric Parameters in Youth Soccer Players. Sport Mont. 2001; 1: 31–33.
4. Bangsbo J, Michalsik L. (2002). Assessment and physiological capacity of elite soccer players. In:T. Reilly A, Murphy editors. Science and football IV. Cambridge UK: Routledge. 2002. pp. 53-62.
5. Bangsbo, J. The physiology of soccer with special reference to intense intermittent exercise. Acta Physiol. Scand. Suppl. 1994a; 619:1-155.
6. Blerim Sylejmani, Arben Maliqi, Serjozha Gontarev, et al. Anthropometric Characteristics and Physical Performance of Young Elite Kosovo Soccer Players Int. J. Morphol. 2019; 37(4):1429-1436.
7. Carlos Lago-penas, Luis casais, Alexandre dellal, Ezequiel Rey, Eduardo Domi Nguez. Anthropometric and physiological characteristics of young soccer players according to their playing positions: relevance for competition success. Journal of Strength and Conditioning Research. 2011; 0(0): 1-10.
8. Clare Hencken , Colin White. Anthropometric assessment of Premiership soccer players in relation to playing position. European Journal of Sport Science. 2006; 6(4): 205-211.
9. Clark JR. Positional assessment and physical fitness characteristics of male professional soccer players in South Africa. Afri J Phys Health Educ Recreat Dance. 2007; 13(4): 453-46.
10. Davis Bob. Physical education and the study of sport. 4th ed. Edinburgh:Mosby; 2000.
11. F. Javier Nu, F. Javier Nunez, Diego Munguia-Izquierdo et al. Field Methods to Estimate Fat-free Mass in International Soccer Players. Int J Sports Med 2019; 40: 619–624.).
12. Gil S, Ruiz F, Irazusta A, Gil J, Irazusta J. Selection of young soccer players in terms of anthropometric and physiological factors. J Sports Med Physical Fitness. 2007; 47:25–32.
13. Gil SM, Gil J, Ruiz F, Irazusta A, and Irazusta J. Physiological and anthropometric characteristics of young soccer players according to their playing position: Relevance for the selection process. J Strength Cond Res. 2007; 21: 438–445.
14. Gil SM, Gil J, Ruiz F, Irazusta A, Irazusta J. Physiological and anthropometric characteristics of young soccer players according to their playing position: Relevance for the selection process. J Strength Cond Res. 2007; 21:438-445.

15. Gil, S.M., Gil, J., Ruiz, F., Irazusta, A., & Irazusta, J. Physiological and anthropometric characteristics of young soccer players according to their playing position: relevance for the selection process. J Strength Cond Res. 2007; 21(2): 438-445.
16. Hopkins WG, Marshall SW, Batterham AM, Hanin J. Progressive statistics for studies in sport medicine and exercise science. Med Sci Sports Exerc. 2009; 41:3–13.
17. Jasmina Pl, Lidija T, Beti D, Vesela M, Sanja M, Slobodan N. Anthropometric parameters in national footballers in the republic of Macedonia. med. Sci. 2014; XXXV 2.
18. Kemal Goral. Examination of agility performances of soccer players according to their playing positions. The sport journal. 2015; 1-11.
19. Little T, Williams AG. Specificity of acceleration, maximum speed, and agility in professional soccer players. J Strength Cond. Res. 2005; 19(1):76–78.
20. Malina, R. M., Cumming, S. P., Kontos, A. P., Eisenmann, et al. Maturity-associated variation in sport-specific skills of youth soccer players aged 13-15 years. Journal of Sports Science, 2005; 23:515-522. doi:10.1080/02640410410001729928.
21. Malina, R. M., Eisenmann, J. C., Cumming, S. P., Ribeiro, B., & Aroso, J. Maturity-associated variation in the growth and functional capacities of youth football (soccer) players 13-15 years. European Journal of Applied Physiology, 2004; 91:555-562. doi:10.1007/s00421-003-0995-z.
22. McKenzie B. 101 Performance Evaluation Tests. London: Electric Word plc; 2005.
23. Reeves S. L, Poh BK, Brown M, Tizzard NH, Ismail MN. Anthropometric measurements and body composition of English and Malaysian footballers. Malaysian Journal of nutrition. 1999; 5:79-86.
24. Reilly T, Bangsbo J, Franks A. Anthropometric and physiological predispositions for elite Soccer. J Sports Science. 2000; 18: 669 – 683.
25. Ross WD, Marfell-Jonsen MJ. Kinanthropometry, Physiological Testing of the High-Performance Athlete.in: MacDougall. JD, Wenger HA, Green. H.J. Editors. Human kinetics Books. Champain: Illnois; 1991.
26. Slimani M, Chamari K, Miarka B, Del et al. Effects of plyometric training on physical fitness in team sport athletes: a systematic review. J Hum Kinetics 2016; 53:231-24.
27. Sporis G, Jukic I, Milanovic L, Vucetic V. Reliability and factorial validity of agility tests for soccer players. J Strength Cond Res. 2010; 24(3): 679–686.
28. Stolen T, Chamari K, Castagna C, Wisloff U. Physiology of soccer: An update. Sports Medicine. 2005; 35(6): 501–536.
29. Stolen T, Chamari K, Wisloff J,. Physiology of soccer: An update. Sports Med; 2005; 35 (6):501-536.
30. Svensson M, Drust B. Testing soccer players. Journal of Sports Sciences. 2005; 23(6): 601-618.
31. Swapan K Dey, Nabanita Kar, Parthasarthi Debray. Anthropometric, motor ability and physiological profiles of Indian national club footballers: A comparative study. South African Journal for Research in Sport, Physical Education and Recreation. 2010; 32(1):43-56.
32. Tumilty, D. Physiological characteristics of elite Soccer players. J sport Med.1993; 16(2): 80-96.
33. Vishaw GAURAV, Amandeep SINGH, Sukhdev SINGH. Comparison of selected physical fitness components among male football players of different playing positions. Turkish Journal of Sport and Exercise. 2015; 17 (2) : 22-25.
34. Wong PL, Chamari K, Dellal A, Wisloff U. Relationship between anthropometric and physiological characteristics in youth soccer players. J Strength Cond Res. 2009; 23:1204-1210.