

# Innovations

## Comparative Study of Antropometric Characteristics and Physical Fitness of Male Defensive and Offensive Soccer Project Player

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### Abstract

*The purpose of this study was to compare physical fitness and anthropometric characteristics of defensive and offensive soccer project players. To achieve the purpose of this study, we used stratified sampling technique to obtain a representative sample of 24 male defensive players and 24 male offensive players from four male soccer projects. Male defensive players included those playing as goal keeper, right full back, left fullback and Centre half back positions whereas male offensive soccer project players included those playing in right forward, left forward and Centre forward positions, including outside right and outside left. The height was measured while standing erect looking straight ahead and bare footed against the stadiometer. Body weight with minimal clothing (0.05kg) was measured with a spring balance. The height and weight measured were used to calculate the body mass index (BMI) dividing weight (in kg) by height (in meters) Squared ( $wt / Ht^2$ ). Cardiorespiratory Fitness was tested using 12-Minutes Run Test whereas Back and Hamstring Muscles Flexibility was measured using Sit and Reach Test. To measure Abdominal Muscles Strength and Endurance, Sit-Up Test was applied. Upper Muscles Strength and Endurance was measured by administering 90°-Pushup Test. Finally, to measure Lower Limb Explosive Power, Standing Broad Jump Test was applied. The results indicated that male offensive players demonstrated greater flexibility and explosive strength than male defensive players. Male defensive soccer project players were significantly taller and heavier than the male offensive players, depending on their playing experience. It was recommended that: taller and heavier male soccer project players should be selected for defensive positions. Male soccer project players with height and weight*

*but greater flexibility and explosive strength should be selected for offensive positions in soccer.*

**Key words:** *Anthropometric Characteristics, Physical Fitness, Defensive, Offensive, Soccer Player*

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**Introduction:** Morphological characteristics and physical, technical and tactical skills successfully discriminate soccer players by competitive level and field position (Rebelo A et al., 2012). Within the physical aspect, success in soccer has been associated with specific morphological characteristics and fitness-related parameters. Anthropometric measurements, body composition, and physical condition, including cardiorespiratory endurance, muscular strength, muscular endurance, and flexibility are key to successful performance (Toro-Román et. al, 2023). While aerobic fitness contributes up to 90% of energy utilization during football matches (Mc Mllian, Helgerud, Macdonard& Hoff, 2005), typically high intensity bouts of sprinting are necessary to score goals. Thus, acceleration, speed, and agility are determined by the athletes muscle strength and power (Wisloff, Catagna, Helgerud, Jones & Hoff, 2004) and can be effectively trained through a well-developed and structured program. These key components have been shown to differentiate performance of players independent of their football specific skills such as ball control, dribbling, and tackling. Success in sports has been associated with specific anthropometric characteristics, body composition and somato type (Duquet& Carter, 2001). During a soccer match (90 minutes), the players' movements are characterized by high intensity, short-term actions and pauses of varying length. To be successful in such a team sport, soccer project players need an optimal combination of technical, tactical, physical characteristics (e.g. somato type), and mental motivation (Bangsbo, 1994), among other sports characteristics. Some studies showed evidence for position-specific anthropometric characteristics in soccer project players (Rienzi, Drust, Reilly, Carter, & Martin, 2000; Gil, Gil, Ruiz, Irazusta&Irazusta, 2007). Goalkeepers are taller than central position players, (Tahara, Moji, Tsunawake, Fukwda, Nakayama & Nakagaichi, 2006; Gil etal., 2007). Similar studies on position-specific anthropometric profiles have been reported for Australian football (Young, Newton, Doyle, Chapman, Cormack & Stewart, 2005; Pyne et al., 2006), Gaelic soccer (McIntyre, 2005; McIntyre & Hall, 2005) and American football (McGee & Burkett, 2003; Garstecki, Latin, & Cuppett, 2004). Hence, this study was therefore conducted to compare anthropometric characteristics and physical fitness of male defensive and offensive soccer project players.

## Methods and Materials

For data collection first permission was taken from respective sources. All the necessary information about the study (purpose, procedures, etc.) was explained for the participants in advance. Consent was obtained from the participants by filling and returning back every requirement detailed in the Consent Form and Physical Activity Readiness Questionnaire (PAR-Q). All testing and measurements were conducted in accordance with the Fitness Testing Programs (ISAK, 2001; Wilmore & Costill, 2005; and by (Corbin, 1984) and (Dikki, 1992).

The players were stratified into two strata. One stratum was defensive players and second stratum was the offensive players then stratified sampling technique was applied so as to obtain a representative sample. Thus, 6 defensive and 6 offensive players from each of the four projects were picked, totaling 24 defensive and 24 offensive players using stratified random sampling.

The names of the defensive and offensive players from each project were randomly selected at the rate of 6 slips for defensive players and 6 slips for offensive players of each of the four male soccer projects. Thus, a total of 48 defensive players and offensive players were selected to constitute the sample for this study. To avoid the influence of fatigue on test results, the tests were conducted in the following sequence: 12-minutes run test, Sit and reach test, Sit ups test, Push-ups test, and Standing Broad Jump test. This sequence was arranged in order to ensure that the muscle group involved in one test was not involved in the test that was conducted immediately afterwards.

Physical fitness and anthropometric variables were measured accordingly. The height was measured while standing erect looking straight ahead and bare footed against the stadiometer. Body weight with minimal clothing (0.05kg) was measured with a spring balance. The height and weight measured were used to calculate the body mass index (BMI) dividing weight (in kg) by height (in meters) Squared ( $wt / Ht^2$ ). Cardiorespiratory Fitness was tested using 12-Minutes Run Test whereas Back and Hamstring Muscles Flexibility was measured using Sit and Reach Test. To measure Abdominal Muscles Strength and Endurance, Sit-Up Test was applied. Upper Muscles Strength and Endurance was measured by administering 90°-Pushup Test. Finally, to measure Lower Limb Explosive Power, Standing Broad Jump Test was applied.

Descriptive statistics of mean, standard deviation and standard error of estimate to determine the average performance of the subjects. Correlation coefficient was computed to determine the relationship between component of physical fitness and anthropometric characteristics among the groups or projects. T-Test was used to find the difference in the selected variables between defensive and offensive soccer

players. In any case the decision to reject or retain the null hypothesis was set at 0.05 alpha levels.

**Results and Discussion**

Information regarding the mean scores of the soccer male defensive and offensive players in their physical characteristics shown as follows.

**Table 1: Mean Scores Anthropometric Characteristic**

anthropometric characteristics	Position of player	Mean	Std. Deviation
age of player	Defensive	19.08	.717
	Offensive	18.79	.658
height (m)	Defensive	1.77	.065
	Offensive	1.72	.037
weight (kg)	Defensive	69.46	5.517
	Offensive	63.71	5.760
total arm length (m)	Defensive	.88	.037
	Offensive	.85	.027
total leg length (m)	Defensive	.84	.045
	Offensive	.87	.046

Table 1 shows the mean age, weight, total leg length and the total arm length of both male defensive and offensive project players. The mean ages were 19.08  $\pm$  .717 and 18.79  $\pm$  .658 years for defensive and offensive soccer project players respectively. The mean of height for respectively category of players were 1.77  $\pm$  .065m and 1.72  $\pm$  .037m. While the mean for weights were 69.46  $\pm$  5.517kg and 63.71  $\pm$  5.760kg. The mean for the total leg length .88  $\pm$  .037cm and .85  $\pm$  .027cm while that of total arm length, .84  $\pm$  .045cm and .87  $\pm$  .046cm respectively. However, the defensive players were taller (1.77m $\pm$  0.65) than other offensive players.

**Table 2: Mean Scores of Physical Fitness Performance**

physical fitness	Position of player	Mean	Std. Deviation
cardio respiratory endurance (12min run)	Defensive	2127.5000	119.70608
	Offensive	2169.9167	161.53100
muscular strength (push up)	Defensive	42.5833	5.03548
	Offensive	40.8333	3.71320
muscular strength (sit up)	Defensive	49.3333	3.82179
	Offensive	51.0833	3.31548

flexibility (sit and reach)	Defensive	1.2083	.26097
	Offensive	1.4917	.29987
explosive strength (standing broad jump)	Defensive	2.1308	.19612
	Offensive	2.1842	.22031

Examination of table 2 shows the mean scores of cardio-respiratory endurance, upper muscular strength (arm), lower muscular strength (leg), back and hamstring muscles flexibility, explosive power of lower limb of defensive and offensive player. The mean cardio-respiratory endurance were 2127.5m  $\pm$  119.7 and 2169.9m  $\pm$  161.5 for defensive and offensive players respectively. The mean of upper muscles endurance and strength for respectively category of player were 42.5  $\pm$  5.04 and 40.8  $\pm$  3.7 while the mean for lower muscles endurance and strength (leg) were 49.3  $\pm$  3.8 and 51.08  $\pm$  3.31. The mean for back and hamstring muscles flexibility were 1.2  $\pm$  .26 and 1.49  $\pm$  .29 respectively while that of lower limb power (explosive power) were 2.13cm  $\pm$  .19 and 2.18cm  $\pm$  .22 respectively. It was observed that male defensive player had higher mean scores in lower muscles endurance and strength (leg) whereas offensive players had greater mean scores in cardiovascular endurance and explosive power strength.

**Table 3: Two sample t-test for differences in height, weight, leg and arm length of Defensive and Offensive soccer players**

Variable position of players		P	T	Df	Mean	Std. Deviation
		height (m)	Defensive	.30	2.994	46
Offensive			2.994	36.703	1.72	.037
weight (kg)	Defensive	.411	3.532	46	69.46	5.517
	Offensive		3.532	45.915	63.71	5.760
total arm length (m)	Defensive	.252	2.811	46	.88	.037
	Offensive		2.811	41.896	.85	.027

total leg length (m)	Defensive	.200	-1.429	46	.88	.061
	Offensive		-1.429	36.826	.90	.035

t(46)=2.0, P<0.1

Table 3 reveals that the defensive and offensive players were not significantly different in any of the selected parameters in the test. This was indicated with an observed t value of 2.9 for height, 3.5 for weight, 2.8 for arm length and 2.19 for leg length respectively. The levels of significance observed for the tests were .30 for height, .411 for weight, .252 of arm length and .20 for leg length respectively which are all higher than 0.1(p>0.1).

**Table 4: Two Sample t-test for Differences on Cardio-respiratory Endurance**

Physical fitness of player Variable		position	P	T	df	Std.de	mean
cardio respiratory endurance (12 run)	Defensive		.0174	.731	22	119.70608	2127.5000
	Offensive				20.282	161.53100	2169.9167

(22)=2.0, p< 0.1

Table 4 shows that the male defensive and offensive soccer project players differ significantly in their cardio respiratory test. The observed t value (.731) in the table is higher than the critical value of 2.0 at the same degree of freedom where the observed level of significance is 0.0174 p<0.1. This means that offensive players demonstrated better results in their cardio respiratory endurance measured by 12 minute run test.

**Table 5: two sample t-tests for differences in upper muscles strength and endurance**

variable	position	mean	Std. deviation	P	t	df
muscular strength (push up)	Defensive	42.5833	5.03548	.171	.969	22
	Offensive	40.8333	3.71320		.969	20.233

t(22)=2.0, P<0.1

As shown on the Table 5, no significant difference in the upper muscles strength observed as measured by their push up test. The observed t value .969 is lower than

critical value of 2.0 at the same degree of freedom. The observed level of significance in the test is .171  $p > 0.1$ .

**Table 6: Two sample t-test for differences in back and hamstring muscles flexibility**

Variable position		p	T	df	Mean	Std. Deviation
		flexibility (sit and reach)	Defensive	.0612	2.469	22
Offensive			2.469	21.588	1.4917	.29987

$t(22) = 2.0, P < 0.1$

As indicated in table 6 that the offensive players demonstrated significant mean difference from their defensive counterpart in their back and hamstring muscles flexibility. The observed t-value for the test is 2.469 which was higher than the critical value of 2.0 at the same degree of freedom. The level of significance observed for the test is 0.0612 ( $< 0.1$ ). Therefore, better back and hamstring muscles flexibility results registered for offensive players.

**Table 7: Two sample t-test for differences in explosive power**

Variable	Position	P	T	Df	Mean Difference	Std. Error Difference
		Explosive power (standing broad jump)	Offensive	.0598	-.626	22
Defensive			-.626	21.709	-.05333	.08515

$T(22) = 2.0, P < 0.1$

Table 7 shows that the groups (defensive and offensive) demonstrated significantly different performance in broad jump as measured for their explosive power (speed + strength). This shows that the male offensive project players were better than their defensive counterparts on their explosive strength. The observed t-value for the test is -.626 compared with the critical value of 2.0 at the same degree of freedom. The level of significance for the test is 0.0598 ( $P < 0.1$ ).

**Discussion**

The purpose of this study was to compare physical fitness and anthropometric characteristics of male defensive and offensive soccer players. This study was based on the assumption that there might not be differences not only between sports groups but also within the same sport depending on the positions played. In soccer,

like any other team sport the demands made by different positions in the sport differ and therefore the physical and physiological characteristics with which either the players come to the sport or they develop while practicing the sport significantly differ. The finding of the study reported in this regard relating to soccer is explained in this section.

### **Anthropometric Characteristics**

The anthropometric variables included in the study were height, weight, total arm length and total leg length.

The results of this study indicated insignificant difference between male soccer defensive and offensive players in their slightly weight, total leg length and total arm length. This finding is contrary to the findings and observations of Sebastián-Rico, González-Gálvez, Martínez-Sanz, and Soriano, 2023; Kholsa 1983; Bale, 1986; Bompa, 1999; Burke, 1976 and Venkateswarlu, 1982), according to which height and weight play very significant role not only in sports like volleyball, basketball and events like throws and jumps in track and field athletics but also in different positions in each of these sports. On soccer these studies have reported that defensive players were heavier and taller than the offensive players because these measures are advantageous to perform fast movements for a short period of time that require taller and heavier players. In other words, these positions are advantageous to athletes who are heavy and tall.

Although the study showed insignificant differences between defensive and offensive male soccer project players in their height where the height of defensive players (1.77m) was slightly greater than the offensive players (1.72m). The absence of significance may be attributed either to the limited sample size involved in this study, to the relatively less professional experience of the players studied or to both. Similarly, this study showed insignificant differences between defensive and offensive soccer project players in their total arm length and leg length, which is contrary to the findings to (Gabbett 2001) and observation of (Bompa 1999), according to which defensive players have longer limbs in rugby and American football, which are close of soccer. The only explanation that can be provided is that the subjects they studied came to positions in the game with longer limbs whereas in this study the subjects did not seem to have come with relatively longer limbs.

### **Physical Fitness**

Differences between defensive and offensive male soccer project players in physical fitness characteristics are looked into in this study. Physical fitness characteristic investigated in the study were cardio respiratory endurance, muscular strength and endurance, flexibility and explosive power. The findings of the study showed insignificant difference between defensive and offensive male soccer



project players in cardio- respiratory endurance and uppermuscles strength and endurance. This finding is in agreement with those of (Bernal-Orozco Et. Al. 2020; Gabbett 2000) on rugby players, (Kenpen, 1996) on soccer players, (Acikada 1996) on soccer players, (Bompa 1999) on soccer, rugby and handball players, and (Venkateswarlu 1992) on speed and endurance sports, according to which there were no significant difference between defensive and offensive soccer project players in the cardio respiratory endurance and muscular strength and endurance. This was attributed mainly because of the fact that players playing different positions require a certain minimum level of cardio respiratory endurance and muscular strength and endurance, especially in the case of players with limited experience. Therefore, insignificant differences in these four physical fitness characteristics are justified. However, this study showed significant differences between defensive and offensive male soccer project players in their flexibility and explosive power (strength + speed) of the lower limbs.

This finding is in agreement with the observation of (Marques, 2016; Bompa 1999 and Venkateswarlu 1995), according to which offensive soccer project players have greater flexibility and explosive strength, because these positions involve fast movement with intermittent rest periods, the performance of which requires greater flexibility and explosive strength.

The findings of this study clearly indicated significant differences between offensive and defensive male soccer project players in flexibility and explosive strength because offensive players had greater amount of this particular characteristics than the defensive players. This finding justifies the assumption that the physical and physiological demands of positional play in soccer, as in many other team sports, are greater for particular physical fitness characteristics like speed, flexibility and strength which are more essential for playing forward position than defensive positions.

## **5.2 Conclusion**

Within the limitations of this study, the following conclusions were drawn.

Male offensive project players demonstrated greater flexibility and explosive strength than male defensive players.

Male defensive soccer project players were significantly taller and heavier than the male offensive players, depending on their playing experience.

There were no significant differences between male defensive and offensive soccer players in the total length of their limbs, cardio- respiratory endurance and muscular strength and endurance.

### 5.3 Recommendations

On the basis of the findings of the study, we recommended that;

Taller and heavier male soccer project players should be selected for defensive positions,

Male soccer project players with height and weight but greater flexibility and explosive strength should be selected for offensive positions in soccer,

Training programmes should be designed to develop more speed and cardio respiratory endurance for offensive male soccer players.

More flexibility and explosive strength should be encouraged in offensive players.

### Interest of Conflict

We do not have interest of conflict regarding the role of authorship.

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