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# Relationship of Physical Fitness Parameters with Performance among the College Level Football Players

**Kanwar Mandeep Singh[1], Karanjit Singh[2], Satinder Kumar[3], Sartaj Singh Chhina[4]**

[1]Assistant Director, Department of Physical Education (AT), Guru Nanak Dev University, Amritsar, Punjab, India; [2]Assistant Professor, Baba Budha College, Bir Sahib, Tarntaran, Punjab, India; [3]Director of Physical Education, Guru Nanak Nav Bharat College, Narur-Panchhat, Kapurthala, Punjab, India; [4]Assistant Professor, Sri Guru Angad Dev College, Khadur Sahib, Tarn Taran, Punjab, India.

## ABSTRACT

**Aim:** The purpose of this study was to ascertain relationship of physical fitness parameters with performance among college level football players and also to predict football performance on the basis of physical fitness parameters.

**Methodology:** Total two hundred and fifty male football players, aged 18-25 years, from the colleges of Punjab were selected to participate in the study. Body weight of the subjects was measured with a portable weighing machine. Height measurements were taken using the standard anthropometric rod. Power was measured by applying standard test of Standing Broad Jump. Agility was measured by applying standard test of zig-zag run. Strength was measured by applying standard test of Medicine Ball Put. Speed was measured by applying standard test of 50 yard dash. Endurance was measured by applying standard test of 600-yard run-walk. The performance of the college football players was measured with the help of Dr. J.P. Thomas soccer skill test.

**Results:** Karl Pearson's product moment co-efficient of correlation revealed that the time of the speed ($p<0.01$), endurance and agility ($p<0.01$) parameters demonstrated a significantly negative correlation with the performance. The strength ability ($p<0.01$) and power ($p<0.01$) showed a significant positive correlation with the football performance. Regression analyses showed that for football performance, 28% of the variance was accounted for by speed, 4% was explained by strength, 1% was explained by agility and an additional 1% of the variance was explained by endurance.

**Conclusion:** In conclusion all the physical fitness components were significantly correlated with football performance and speed was the main predictor of the football performance.

**Key Words:** Physical Fitness, Football, Performance, Speed

## INTRODUCTION

At competitive, organized levels, football is an endurance sports that incorporates periods of intense exercise interspersed with lower levels of activity over a 90-minute period (Reilly, 1996). In recent years, the performance and standard of football have also increased which led the sports scientists and coaches to think and to find out the various possible ways for further improvement in the field of performance. The sports performance depends on many factors such as motor abilities, physiological variables, techno-tactical abilities, psychological maturity, kinanthropometric characteristics, socio economic status and some external factors. The motor abilities along with technical abilities have been considered as most important prerequisite for all sportsmen to secure the top level performance in the game. A close connection is existed amongst physical, technical, conditional and tactical components. The contribution of various performance factors is a very complex combination and they superseded each other. In order to improve performance in sports, motor fitness preparation of the players play an important role and lays a strong foundation for all other aspects of sports performance. The fitness of a player is the sum total of several motor abilities namely; strength, speed, endurance, flexibil-

**Corresponding Author:**
**Kanwar Mandeep Singh,** Assistant Director, Department of Physical Education (AT), Guru Nanak Dev University, Amritsar, Punjab, India

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ity, agility and coordination. These motor abilities and their complex form i.e. strength endurance, speed endurance, explosive strength etc, are the basic prerequisites for human motion. Motor fitness as a term refers to the total dynamic physiological state of the individual. Motor fitness is to be measured by performance and this performance is based on a composition of many factors. Some of these factors evidently more dominant than others and thus have a higher relation with physical fitness. Most sports, of course, require a contribution from a number of components of fitness in varying degrees. Speed, power, balance, agility, strength, reaction time and kinesthetic perception are the traits of motor performance, and these traits plays major role in enhancing the performance of any game's skills. With a good and well efficient combination of all these motor performance traits a player can give all his/her utmost throughout the most strenuous of competitive matches (Nabhendra Singh, 2010).

In football, speed of the movement of various body segments, speed for a very short distance, is of great importance. Speed is the ability to perform a movement within a short period of time (Neiman, 1995). In court, proper movements of the body parts both in offensive and defensive moves of the game are very essential. On the other hand, strength further increases the performance of a sportsperson. In case of football, it helps in powerful shooting into the opponent's goal and covering a longer distance with the kicks. Strength in lower limbs is an obvious concern in football, the quadriceps and hamstring group of muscles should generate high force for jumping and kicking. Though the strength is its prerequisite, which is to be developed in the beginning, it is later to be transferred directly into explosive strength.

Muscular power, often referred to as explosive power, is a combination of speed and strength an important in vigorous performance because it determines how hard a person can hit, jump and push etc. There are various means and method to increase power by increasing strength without sacrificing speed, by increasing speed of movement without sacrificing strength and by increasing both can be stressed by applying strong force through rapid motion (Nabhendra Singh, 2010). Agility is the ability to change the direction of body or its parts rapidly' is dependent on strength, reaction time, speed of movement and muscular coordination. Quick start and stops and quick changes in direction are fundamental to good performance in Football (Nabhendra Singh, 2010). In the present times, competitions at the top ranking level are very tough and closely contested. So for attaining top position in high level competition, an athlete has to tolerate the high pressure training load every day. Tolerance of high pressure training-load depends on the ability of any athlete to recover quickly. Therefore, better the fitness, quicker will be the recovery ability. Hence, the motor fitness is directed towards the perfection of technique, tactics and its effective use during trainings as well as competition. Therefore, the abilities of physical performance specific to football determining the fitness are very important.

In team games, the performance of the players is dependent upon a complex combination of factors, which are difficult to objectively measure. Such is the case in football, in which player performance relies on interplay of individuals of in tactical moves, the competence of players in the basic skills of passing, dribbling, kicking, tackling and shooting and in the more specific skills associated with particular playing positions. In such contexts, the assessment of player performance must consider the physical attributes, as well as the tactical and technical aspects of performance. Prediction tests are as important in the field of physical education as in other fields of education. These tests have been fairly well developed in some branches of athletics and team sports such as basketball (Hoare, 2000) using physical performance variables while in other areas, such as football, very little has been done. Most football coaches still rely on the subjective observation method for predicting football ability. The present study, therefore, aims to find out the relationship in physical fitness parameters and football performance among college level football players and also to predict the performance on the basis of physical fitness parameters of football players.

## METHODOLOGY

The subjects of the present study were purposively selected from the college level male football players. A total two hundred and fifty male football players, aged 18-25 years, from the colleges affiliated to Guru Nanak Dev University, Amritsar, Panjab Universiy, Chandigarh and Punjabi University, Patiala were selected to participate in the study. Body weight of the subjects was measured with a portable weighing machine to the nearest 0.5 kg. Height measurements were taken using the standard anthropometric rod to the nearest 0.5 cm (HG-72, Nexgen ergonomics, Canada). Power was measured by applying standard test of Standing Broad Jump. Agility was measured by applying standard test of zig-zag run. Strength was measured by applying standard test of Medicine Ball Put (Barrow and McGee, 1979). Speed was measured by applying standard test of 50 yard dash. Endurance was measured by applying standard test of 600-yard run-walk (AAPHER Youth Fitness Test, 1976).

### Football Playing Ability

The performance of the college football players was measured with the help of Dr. J.P. Thomas soccer skill test. This test includes following items

1. Soccer dribble test
2. Soccer kick for distance

3. Soccer place-kick for accuracy
4. Soccer throw-in for distance
5. Throw-in for accuracy
6. Shooting at the goal from the penalty point

### Statistical analysis

Statistical analysis was performed using SPSS version 16.0 for windows (SPSS Inc, Chicago, IL, USA). The data was presented as descriptive statistics such as mean, standard deviation, minimum value, maximum value etc. Karl Pearson's product moment co-efficient of correlation was computed to assess the relationship between physical fitness parameters and performance among the football players. To predict the performance in football from physical fitness parameters, multiple regression analysis was applied. Significance levels were set at $p<0.05$.

## RESULTS

**Table 1: Descriptive statistics for age, weight and height of the college level football players.**

| Variables | N | Mean | SD | Minimum | Maximum |
|---|---|---|---|---|---|
| Age (yrs) | 250 | 20.89 | 1.54 | 17.82 | 24.66 |
| Weight (kg) | 250 | 63.85 | 6.82 | 49.00 | 84.00 |
| Height (cm) | 250 | 171.23 | 5.69 | 153.50 | 189.20 |

The descriptive data of the age, weight and height of the college level football players are presented in table 1. The mean age of the players was 20.89 years with standard deviation of 1.54. The mean weight of the players was 63.85 kg, whereas, the standard deviation of weight was 6.82. The average height of the players was 171.23 cm with 5.69 of standard deviation.

**Table 2: Descriptive statistics for various physical fitness parameters of the college level football players.**

| Variables | N | Mean | SD | Minimum | Maximum |
|---|---|---|---|---|---|
| Speed (sec) | 250 | 6.32 | 0.09 | 6.00 | 6.50 |
| Strength (m) | 250 | 15.25 | 0.74 | 13.11 | 18.29 |
| Endurance (min) | 250 | 1.38 | 0.03 | 1.33 | 1.45 |
| Agility (sec) | 250 | 24.25 | 0.53 | 22.10 | 24.90 |
| Power (cm) | 250 | 231.04 | 5.01 | 215.90 | 236.22 |

The descriptive data of the various physical fitness parameters of the college level football players is shown in table 2. The average time in 50 m dash (speed) of the players was 6.32 seconds with standard deviation of 0.09. The mean distance in medicine ball put (strength) of the players was 15.25 m, whereas, the standard deviation was 0.74. The average time in 600 yard run/walk (endurance) of the players was 1.38 minutes with 0.03 of standard deviation. The mean time in zig-zag run (agility) of the players was 24.25 seconds, whereas, the standard deviation was 0.53. The football players had 231.04 cm mean value in standing broad jump (power) and standard deviation 5.01.

**Table 3: Correlations between various physical fitness parameters and the football performance of the football players.**

| Variables | N | Pearson Correlation | Sig. (2-tailed) |
|---|---|---|---|
| Speed (sec) | 250 | -0.53** | 0.000 |
| Strength (m) | 250 | 0.44** | 0.000 |
| Endurance (min) | 250 | -0.43** | 0.000 |
| Agility (sec) | 250 | -0.31** | 0.000 |
| Power (cm) | 250 | 0.33** | 0.000 |

** indicates $p<0.01$

Table 3 presents the correlation coefficient between the football performance and various physical fitness parameters of the college level football players. The statistical results showed that the time of the speed demonstrated a significantly negative correlation ($r = -0.53$, $p<0.01$) with the football playing ability. The strength ($r = 0.44$, $p<0.01$) showed a significant correlation with the football performance. The time of the endurance showed a significantly negative correlation ($r = -0.43$, $p<0.01$) with the football performance. The time of agility also demonstrated a significantly negative correlation ($r = -0.31$, $p<0.01$) with football performance. The power demonstrated a significant correlation ($r = 0.33$, $p<0.01$) with football performance.

### Regression Prediction of football performance based on physical fitness parameters

The scores obtained from the various physical fitness parameters of this study were correlated with the composite mean score of football performance using the step-wise regression technique.

**Table 4: Summary of regression prediction of football performance with physical fitness parameters**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | 0.539[a] | 0.290 | 0.288 | 28.23749 |
| 2 | 0.572[b] | 0.328 | 0.322 | 27.54330 |
| 3 | 0.582[c] | 0.339 | 0.331 | 27.36284 |
| 4 | 0.592[d] | 0.351 | 0.340 | 27.17229 |

a. Predictors: (Constant), Speed
b. Predictors: (Constant), Speed, Strength
c. Predictors: (Constant), Speed, Strength, Agility
d. Predictors: (Constant), Speed, Strength, Agility, Endurance

**Table 5: Coefficients[a] of regression prediction of football performance with physical fitness parameters**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | sig. |
| 1 | (Constant) | 1461.601 | 115.2600 | | 12.681 | 0.000 |
| | Speed | -183.648 | 18.227 | -0.539 | -10.076 | 0.000 |
| 2 | (Constant) | 1062.545 | 155.881 | | 6.816 | 0.000 |
| | Speed | -144.879 | 20.643 | -0.425 | -7.018 | 0.000 |
| | Strength | 10.091 | 2.731 | 0.224 | 3.696 | 0.000 |
| 3 | (Constant) | 1110.583 | 156.595 | | 7.092 | 0.000 |
| | Speed | -124.552 | 22.746 | -0.366 | -5.476 | 0.000 |
| | Strength | 10.651 | 2.726 | 0.236 | 3.907 | 0.000 |
| | Agility | -7.632 | 3.694 | -0.120 | -2.066 | 0.040 |
| 4 | (Constant) | 1198.632 | 160.994 | | 7.445 | 0.000 |
| | Speed | -93.149 | 27.040 | -0.273 | -3.445 | 0.001 |
| | Strength | 9.823 | 2.735 | 0.218 | 3.591 | 0.000 |
| | Agility | -8.816 | 3.711 | -0.139 | -2.376 | 0.018 |
| | Endurance | -177.621 | 84.084 | -0.145 | -2.112 | 0.036 |

a. Dependent variable: football performance

The physical fitness predictors of football performance were entered into a stepwise regression model. Using the stepwise method, a significant model emerged ($F_{4,245}$ =33.114, P<0.0001). Adjusted R square value is 0.340 which tells that our model accounts for 34% of variance in the football performance. For football performance, 28% of the variance was accounted for by speed, 4% was explained by strength, 1% was explained by agility, and an additional 1% of the variance was explained by endurance. The regression equation for football performance on the basis of physical fitness parameters is as following

**Football Performance** = 1198.63-0.273 (speed) + 0.218 (strength)-0.139 (agility)-0.145(endurance)

## DISCUSSION

The discussion focused on the correlations of the physical fitness parameters with the football performance. It is established that body build plays an important role in achievements in many sport since it provides a basis for the formation and improvement of movement techniques, specific physical performance. Furthermore, the combination of somatometry and physical abilities of a football player partly determines successful competition in football. These two features are basic factors, which can limit the technical and tactical level of an opponent team during the game. The players in the present study have lower height and weight than their international counterparts reported in various studies (Rogan et al., 2011; Revees et al., 1999; Meckel et al., 2009; Orhan et al., 2010; Joksimovic et al., 2009; Nikolaidis and Karydis, 2012) but comparable with football players from West Bengal and Indian club footballers (Dey et al., 2010; Bandyopadhyay, 2007).

All the physical fitness parameters were significantly correlated and contributing to the football performance. The time of the speed, endurance, agility abilities negatively correlated with the football playing ability. With the increase in the times of the speed, endurance and agility abilities, the performance in these abilities decreases. The negative correlation means with the increase in the time of these abilities, the football performance decreases. The better performance in these abilities leads to better performance in the football. The speed, endurance and agility are contributing significantly in the football performance. The power and strength also play significant role in football performance as shown by positively significant correlation coefficients. Physical fitness is a major component in the playing ability and performance in any game. In the present study we find the association between physical fitness and football performance. It showed from the results that physical fitness components play a major part to enhance the playing ability. To further understand the relationships of the physical fitness components with the football performance of the college level football players, we conducted stepwise regression analyses. The regression analyses between football performance and physical fitness components showed that football performance is determined by the speed, strength agility and endurance. Speed was the prime predictor variable in the equation for predicting football performance as 28% variance was accounted for by speed ability. These findings are in contrast to those reported by Sawyer et al. (2002). They predicted the football performance on the basis of anthropometric and performance measures and reported vertical jump as prime predictor variable for football performance.

## CONCLUSIONS

In conclusion, the obtained results show that the physical fitness components i.e. speed, strength, endurance, power and agility were significantly correlated with football performance among the college level football players. The regression analyses revealed that for football performance, 28% of the variance was accounted for by speed, 4% was explained by strength, 1% was explained by agility and an additional 1% of the variance was explained by endurance. It is concluded that speed was the major predictor of football performance among the college level football players.

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