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Study on physical and physiological status of Bhaichung Bhutia football school players

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Abstract

The study was conducted to determine the physical and physiological status of Bhaichung Bhutia football school players of Rohini centre, New Delhi. For the purpose of the study a total of 20 male soccer players were selected from Bhaichung Bhutia football school players of Rohini centre, New Delhi. The purposive sampling method was adopted to select the subjects for the study. All the subjects were in the age category of 14-17 years and was considered in only one group. The physical and physiological variables selected for the study was Height, Weight, Body composition (Fat mass, Fat %, Lean body mass), Vital capacity, VO_{2max} . A descriptive statistic was used to determine the physical and physiological status of young soccer players. The equipment's or test used for the collection of data were stadiometer, electronic weighing machine, skin fold calliper, dry spirometer and cooper 12-minute walk/run test. The result of the study revealed that the average fat percentage of the players was 10.03% it may be due to the nature of the game as a soccer player require low fat percentage to perform a sharp and quick movement to beat an opponent or the difference may be because of the vigorous training program the soccer players went through. The average height and weight of players was 162 cm and 52 kg respectively which brings a conclusion that the average BMI of players falls in the normal category in the BMI chart. The average vital capacity of the players was 2.34 L which indicates that the players are falling below average lungs capacity. The maximal oxygen uptake (VO_{2max}) of the players was 40.37 ml/kg/min, which indicates an average cardio respiratory fitness and endurance capacity of players.

Keywords: physical and physiological status, Soccer, Soccer players

Introduction

The game of soccer requires tremendous physical fitness as the duration of the game is Ninety-minutes. Soccer is the most popular sport in the world and is performed by men and women, children and adults with different level of expertise. Soccer performance depends upon a myriad of factors such as technical/biomechanical, tactical, mental, and physiological areas. One of the reasons that soccer is so popular worldwide is that players may not need to have extraordinary capacity within any of this performance areas, but possess a reasonable level with all areas. However, there are trends towards more systematic training and selection influencing the anthropometric status of players who compete at the highest level. As with other activities, soccer is not a science, but science may help improve performance. Efforts to improve soccer performance often focus on technique and tactics at the expense of physical fitness. During a 90 minutes game, elite level players run about 10 km at an average intensity close to the anaerobic threshold (80-90% of maximal heart rate). Within this endurance context, numerous explosive bursts of activity are required, including jumping, kicking, tackling, turning, sprinting, changing pace, and sustaining forceful contraction to maintain balance and control of the ball against defensive pressure.

Identifying players with potential to become high level professionals has become a major issue for professional soccer clubs that had invested in developing structured talent development programs. Providing a complete anthropometrical and physical profile of the young soccer players may help the selection of young soccer players. Most of the talent identification programs are conducted throughout the adolescence. During adolescence players suffer a considerable variable in body size and biological maturation that can confound prediction of future performance.

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Identification and selection of talented soccer player are not straight forward operations. Detection and identification of talent are more difficult in team games than individual sports, where predictors of sports are more scientifically prescribed. Long term success in soccer is dependent on a host of personal and circumstantial factors, not least of which is the coherence of the team as a whole and the availability of good coaching. These factors make it difficult to predict ultimate performance potential in soccer players at an early age with a high degree of probability.

A starting point in the search for outstanding talent is the use of status established for those who have already been successful. The multi factorial status is sketched from observations on anthropometric, physiological and performance measures. Knowledge of these characteristics can give clues as to the existence of biological prerequisite of playing the highest level.

Soccer players have higher percentage of muscle in comparison to the sedentary population, being as high as 62%. Fat percentages are lower than in sedentary people but higher than in endurance runners. Soccer players have a fat percentage ranging from 7%-19%. There are many formulae to estimate fat percentage.

The maximal oxygen uptake (VO_{2max}) of elite soccer players ranges between 55-70ml.kg⁻¹.min⁻¹ a value which is higher than that of the general population, but lower than that of elite endurance runners. An adequate VO_{2max} for field soccer players can be considered to be between 60-65ml.kg⁻¹.min⁻¹.

Methodology

Selection of Subjects

To achieve this aim, a total of 20 male soccer players having age group of 14 to 17 years were purposively selected from Bhaichung Bhutia football school players of Rohini centre, New Delhi. The selected subjects were considered in only one group.

Selection of Variables

Physical & Physiological Variables

Body Composition

Body composition is the proportion of fat and fat-free mass in human body. A healthy body composition is one that includes a lower percentage of body fat and a higher percentage of fat-free mass, which includes muscle, bones, and organs.

Purpose: To measure the body fat percentage

Equipment: Skin fold calliper

Procedure: To obtain the percentage of fat, each subject's skin fold measurements were taken at seven sites in the body. The sites are:

Biceps: The skin was lifted over the Biceps muscles at a point half way between the fore-arm and tip of the elbow.

Triceps: A vertical pinch between halfway between the shoulder and the elbow.

Supra-iliac: A diagonal pinch just above the front forward protrusion of the hip bone.

Subscapular: The skinfold was lifted at the tip of the right scapula on a diagonal plane at about 45 degree from the horizontal when the subject remained at a relaxed standing

position. The measurement was taken about 1 centimetre laterally below this site.

Lean Body Mass

Lean body mass (LBM) is a component of body composition, calculated by subtracting body fat weight from total body weight: total body weight is lean plus fat.

Vital Capacity

Vital capacity (VC) is the maximum amount of air a person can expel from the lungs after a maximum inhalation. It is equal to the sum of inspiratory reserve volume, tidal volume, and expiratory reserve volume.

Purpose: To measure the efficiency of lungs

Equipment: Dry Spirometer

Procedure: Vital capacity was measured by dry spirometer in litres. First the instrument was set at "0" point and then after the fullest position inhalation, the subject was asked to exhale slowly and steadily into the mouthpiece. Care was taken to prevent air from escaping either through the nose or around the edges of the mouthpiece and also it was ensured that a second breath was not taken by the subject during the test.

Scoring: The amount of expired air was read directly from the calibrated scale and that was the score of vital capacity in litres.

VO_{2max}

It is the maximum rate of oxygen consumption measured during incremental exercise. It is also known as maximal oxygen uptake. VO_{2max} , also known as maximal oxygen uptake, is the measurement of the maximum amount of oxygen a person can utilize during intense exercise.

(Cooper 12-minute run and walk test)

Purpose: To measure the cardiovascular efficiency

Equipment: Stopwatch, whistle, markers

Procedure: The 400-meter track was marked into divisions of 50 meters by marker and the subjects were asked to run for 12 minutes continuously. If the subjects cannot continue then they were allowed to walk. Subjects were instructed not to take rest. Six volunteers were assigned to each spotter who recorded the laps completed. When 12 minutes were over, a whistle was blown and subjects stood where they were at the time when the whistle was blown. The distance covered was recorded nearest to 50 meters, then the following formula was applied;

$$VO_{2max} = (\text{distance covered in meters} - 504.9) / 44.73$$

Scoring: Total distance covered in 12 minutes was converted by the above formula and was recorded in (ml/kg/min) VO_{2max}

Height

Human height or stature is the distance from the bottom of the feet to the top of the head in a human body, standing erect. It is measured using a stadiometer, usually in centimetres when using the metric system, or feet and inches when using the imperial system.

In order to measure the standing height of subject stadiometer

was used. The subjects were asked to remove their shoes. The back of the head, back, buttocks, calves and heels should touch the upright scale of stadiometer, feet together. The top of the external auditory meatus (ear canal) should in level with the inferior margin of the bony orbit (cheek bone), and the feet were placed together outward at a 60° angle. The head- piece of the stadiometer is lowered so that the hair is pressed flat. Height was recorded to the resolution of the height rule.

Weight

A body's relative mass or the quantity of matter contained by it, giving rise to a downward force; the heaviness of a person or thing.

To measure the weight of subjects weighing machine were used. The subject was asked to remove his shoes and heavy outer garments (upper, sweatshirts, trouser, etc.). He stands in the centre of platform, weight distributed equally to both feet. Standing off-centre may affect measurement. The weight is recorded to the resolution of the scale.

Administration of the test & Collection of data

Administration of the test

The test was administered to the subjects of Bhaichung Bhutia Football School, Rohini centre, New Delhi. Prior to the actual administration of the testing program all the subjects were properly instructed regarding the procedure of the test. All the subjects had been also informed about the objective of the study.

Collection of data

For the collection of data 20 players were purposively selected from Bhaichung Bhutia Football School, Rohini centre, New Delhi. The data was collected for each variable by administering their respective tests. The test was administered for physical & physiological variables at football field with proper equipment & supervision of experts.

Table 1: Physical and Physiological Variables with the Units and methods/devices used for collecting data

Variables	Unit	Instruments used
Fat%	%	Skinfold caliper
Fat Mass	Kilogram(kg)	Skin fold caliper
Lean Body Weight	Kilogram(kg)	Skin fold caliper
Vital Capacity	Liters (L)	Dry Spirometer
VO ₂ max	ml/kg/min	Cooper's 12-min run/walk test
Height	Centimeter(cm)	Stadiometer
Weight	Kilogram(kg)	Electronic weighing machine

Analysis of Data

Descriptive statistic technique was used to analyse Physical and Physiological Status of Bhaichung Bhutia Football School Players of Rohini centre, New Delhi.

Table 2: Selected Statistics of Physical and Physiological Variables of Bhaichung Bhutia Football School Players

Variables	Mean	SD	Minimum	Maximum
Fat% (in %)	10.03	1.97	6.97	13.99
Fat Mass (in kg)	5.27	1.82	2.69	9.79
Lean body weight (in kg)	46.64	9.43	33.68	61.90
Vital Capacity (in liters)	2.34	0.93	1	4.20
VO ₂ max (ml/kg/min)	40.37	4.24	33.86	48.4
Height (in cm)	162	10.38	146	181
Weight (in kg)	52.00	10.80	37	70

Table 2 describes the descriptive data of the physical and physiological variables of soccer players. The minimum and maximum of the variables were respectively: Fat percentage (6.97 and 13.99), fat mass (2.69 and 9.79), lean body weight (33.68 and 61.90), vital capacity (1 and 4.2), aerobic power (33.86 and 48.4), height (146 and 181), weight (37 and 70).

The mean and standard deviation of the variables were:

Fat percentage (10.03±1.96), fat mass (5.26±1.80), lean body weight (46.64±9.43), vital capacity (2.33±0.93), aerobic power (40.37± 4.24), height (162±10.38), weight (52±10.80).

Table 3: Standard Score of physical and physiological variables of Bhaichung Bhutia Football School Players

Variables	Minimum	Mean	Maximum
Fat% (in %)	-1.56	0	2.01
Fat Mass (in kg)	-1.42	0	2.50
Lean body weight (in kg)	-1.37	0	1.61
Vital Capacity (in liters)	-1.43	0	2.00
VO ₂ max (ml/kg/min)	-1.53	0	1.89
Height (in cm)	-1.54	0	1.83
Weight (in kg)	-1.38	0	1.67

Table 3 reveals the standard scores of minimum, maximum and average of all the physical and physiological variables of all the players. The minimum, average and maximum score of fat% are -1.6, 0 and 2.59 respectively. Similarly, for fat mass it was -1.41, 0 and 1.85 respectively. For lean body mass it was -2.76, 0 and 1.37 respectively. For vital capacity it was -1.43, 0 and 2 respectively, for aerobic power it was -1.53, 0 and 1.89 respectively. For height it was -1.54, 0 and 1.83 respectively and for weight it was -1.38, 0 and 1.67 respectively.

Table 4: Transformed Standard Score of Physical and Physiological Variables of Bhaichung Bhutia Football School Players

Variables	Minimum	Mean	Maximum
Fat (in %)	28.6	50	78.14
Fat Mass (in kg)	30.12	50	85
Lean body weight (in kg)	30.82	50	72.54
Vital Capacity (in liters)	35.7	50	70
VO ₂ max (ml/kg/min)	34.7	50	68.9
Height (in cm)	34.6	50	68.3
Weight (in kg)	36.2	50	66.7

Table 4 describes the transformed scores of minimum, maximum and average of all physical and physiological variables of soccer players. The minimum, average and maximum score of fat% are 28.6, 50 and 78.14 respectively. Similarly, for fat mass it was 30.12, 50 and 85 respectively. For lean body mass it was 30.82, 50 and 72.54 respectively. For vital capacity it was 35.7, 50 and 70 respectively. For aerobic power it was 34.7, 50 and 68.9 respectively, for height it was 34.6, 50 and 68.3 respectively and for weight it was 36.2, 50 and 66.7 respectively.

Results and Finding

The purpose of the study was to study the status of physical and physiological variables of the 20 players of Bhaichung Bhutia Football School Players of Rohini centre, New Delhi. Further studying the data collected from the sample following discussions were made:

Since the average fat percentage of the players was 10.03, it indicates that the general soccer players had a good fat percentage than that of the normal individuals of the same age category. The reason of the difference may be because of the

vigorous training program the soccer players went through. Further, looking to the maximal oxygen uptake ($VO_2\max$) of the players the average score of the players was 40.37 ml/kg/min, it indicates that the players have good cardio respiratory fitness and endurance capacity. The players have a good cardio respiratory fitness than the normal individuals of the same age group.

The average vital capacity of the players was 2.34 L which indicates that the players have average lungs capacity.

The average height of the player was 162 cm and the average weight of the players was 52 kg which brings us to the conclusion that the average BMI of the players of the academy falls in the normal category in the BMI chart. The maximum and the minimum height of the players were 181 and 146. The maximum and minimum weight of the players were 70 and 37. The average BMI of the players was 19.84 which fall under the normal category. The range of the normal category in the chart is 18.5-25.

The purpose of the study was to construct the profiles of the selected physical and physiological variables such as height, weight, vital capacity, aerobic power, fat percentage, fat mass and lean body weight of Bhaichung Bhutia soccer school players. 20 players were selected from the BBFS Rohini centre, New Delhi as the subject of the study. The average age range of the players was 14 to 17 years.

The study shows a significant role of percentage of fat, the players had a good percentage of body fat, which a soccer player tend to have and with the proper training program the players can maintain the fat percentage of their body. The vital capacity which determines the lungs capacity of the players had an average score which is below average of soccer players. The score gives an idea that the players have a low vital capacity for the game demand. The players can improve the capacity through specific training for the improvement of the vital capacity like interval training. The maximal oxygen uptake ($VO_2\max$) of the players showed an average score which is a good score for the players of the age group. The players can improve the ability through endurance run, aerobic high intensity interval run, anaerobic interval training, repetition etc. The average height of the player and the average weight of the players bring us to the conclusion that the average BMI of the players of the academy falls in the healthy group in the BMI chart. The result shows that the students have a good health in comparison to the student of the same age group.

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