Chapter-III
PROCEDURE

In this chapter the procedure adopted for selection of subjects, selection of variables, criterion measures, reliability of data, collection of data, administration of tests, design of the study and statistical procedure used for analyzing data are presented.

SELECTION OF SUBJECTS

Sixty male football players were selected as subject for this study. The subjects were selected from West Bengal and Orissa, who had participated in the National level football tournament. Subjects were divided into three groups (each group consists of twenty players) on the basis of their position of play.

1. Defenders-20
2. Midfielders-20
3. Attackers-20

The age level of the subjects were ranged from 23 years to 28 years. All the subjects belong to different socio-economic conditions.
SELECTION OF VARIABLES

The following anthropometric measurements and motor fitness components were selected for the purpose of the study.

**Anthropometric measurements**

1. Body weight
2. Standing height
3. Arm length
4. Leg length
5. Fore-leg length
6. Thigh girth
7. Calf girth
8. Foot length

**Motor Fitness Components**

1. Speed-50 meter dash
2. Agility-4x10 meter shuttle run
3. Power- Vertical jump
4. Cardio-respiratory endurance
Critetion Measures

The following criterion measures chosen for testing the hypothesis were:

Anthropometric

1. **Body weight**: It was recorded correct to nearest half kilograms with the help of the weighing machine.

2. **Standing height**: Standing height was recorded to the nearest half centimeter, with the help of wall scale.

3. **Arm length**: It was recorded correct to the nearest half centimeter, with the help of flexible steel tape.

4. **Leg length**: Leg length was recorded correct to the nearest half centimeter with the help of flexible steel tape.

5. **Fore-leg length**: It was recorded correct to the nearest half centimeter, with the help of flexible steel tape.

6. **Thigh girth**: Thigh girth was recorded correct to the nearest half centimeter with the help of flexible steel tape.

7. **Calf girth**: Calf girth was recorded correct to the nearest half centimeter, with the help of flexible steel tape.

8. **Foot length**: It was recorded correct to the nearest half centimeter, with the help of flexible steel tape.
Motor Fitness Components

1. **Speed**: It was measured by administering 50 meters dash to the nearest 1/100th of a second.

2. **Agility**: Agility was measured by administering 4x 10 meters shuttle run to nearest 1/100th of a second.

3. **Power**: It was measured by administering the sergeant vertical jump and was recorded to the nearest in centimeter.

4. **Cardio-respiratory endurance**: It was measured by administering 600 meter run to the nearest 1/100th of a second.

**RELIABILITY OF DATA**

The reliability of the data was insured by establishing the tester competency, subject reliability and instrument reliability.

**Tester competency**

To ensure that the investigator was well versed with the techniques of conducting the tests and taking the measurements, the investigator had a number of practice session in testing procedures under the guidance of an expert. All the measurements and tests were conducted by the investigator with the assistance of football coaches who were also well acquainted with the tests and measurements.
Tester reliability in conducting anthropometric measurement and motor fitness components were established by test retest process thereby consistencies of results were obtained by product moment correlation of 15 subjects. The coefficients are presented in Table-I.

### TABLE-I
RELIABILITY COEFFICIENTS OF TESTS RETEST SCORES

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Variables</th>
<th>Coefficient of Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Weight</td>
<td>0.98</td>
</tr>
<tr>
<td>2.</td>
<td>Standing height</td>
<td>0.97</td>
</tr>
<tr>
<td>3.</td>
<td>Arm Length</td>
<td>0.97</td>
</tr>
<tr>
<td>4.</td>
<td>Leg length</td>
<td>0.96</td>
</tr>
<tr>
<td>5.</td>
<td>Fore-leg length</td>
<td>0.96</td>
</tr>
<tr>
<td>6.</td>
<td>Thigh girth</td>
<td>0.98</td>
</tr>
<tr>
<td>7.</td>
<td>Calf girth</td>
<td>0.97</td>
</tr>
<tr>
<td>8.</td>
<td>Foot length</td>
<td>0.96</td>
</tr>
<tr>
<td>9.</td>
<td>Speed</td>
<td>0.85</td>
</tr>
<tr>
<td>10.</td>
<td>Agility</td>
<td>0.94</td>
</tr>
<tr>
<td>11.</td>
<td>Muscular Power</td>
<td>0.95</td>
</tr>
<tr>
<td>12.</td>
<td>Cardio-respiratory endurance</td>
<td>0.94</td>
</tr>
</tbody>
</table>
From the test, retest coefficients of correlation (Table-I) it is obvious that the tester reliability was significantly high establishing the competency of the scholar to administer the tests. The Coefficients of correlation also indicated the reliability of the tests selected, as very high correlations were obtained when the tests were repeated.

**Instrument Reliability**

The Steel tape and calipers used for anthropometric measurements namely, standing height, arm length, leg length, fore-leg length, thigh girth, Calf girth, foot length and also to measure the performance of the subjects in vertical jumps was non-elastic and flexible which was calibrated and approved for use by competent authority.

The stop watches were all calibrated which was used for measuring performance of subjects in shuttle run, 50 meter dash and 600 meter run.

*All the instruments were calibrated and thus accepted and accurate enough for the purpose of study.*

**Collection of Data**

Before the administration of tests the research scholar personally meet the football players and they were advised to assemble at Satyabrata Stadium in Orissa and Bata Sports Club ground, Moidan, Kolkata in
West Bengal respectively for conducting the tests at different specific dates. The research scholar briefly explained the test items. There was no ambiguity regarding tests all the subjects cooperated voluntarily. The test was conducted for two days in each places and it was conducted only in the morning session between 6.30 A.M. to 8.30 A.M. The relevant data regarding anthropometric measurements and motor fitness components of football players were collected personally and with the help of other experts.

**Administration of Test**

**Anthropometric Measurements**

**Weight**

**Purpose:**
To measure the weight of the subject

**Equipments:**
Calibrated weighing machine

**Procedure:**
The weight of the subject was taken with a lever tight laboratory anthropometric weighing machine. The subject wearing shorts and vest only stood at the centre of the machine and the weight was recorded from the indicator needle of the dial.
Scoring:

The weight was read and recorded correct to a half of a kilogram.¹

Standing Height

Purpose:

To measure the standing height of the subject.

Equipment:

Wall scale, hard board.

Procedure:

The height of the subject were measured with subject standing erect without shoes against a wall marked scale. The subjects were instructed to keep the heels together body touching the wall with heels, buttocks and back, head erect without tilt and to take and hold a full breath and standing erect while height measurement was taken. A stiff hard board was held horizontally on his head, slightly pressing the head and touching the scale marked on the wall, at right angle. The subject was asked to step out by lowering the head and reading indicated by the lower end of the hard board was taken.

Scoring:

Height was recorded correct to the nearest half of a centimeter.²

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² Ibid.
Arm length

Purpose:
To measure the arm length of the subject.

Equipment:
Flexible steel tape.

Procedure:
The arm length was measured by using flexible steel tape. The subject stood in a side view and arm length measured putting the steel tape from acromion process above the shoulder joint to the tip of the middle finger.

Scoring:
The arm length was recorded correct to the nearest half centimeters.  \(^3\)

Leg length

Purpose:
To measure the leg length of the subject.

Equipment:
Flexible Steel tape.

Procedure:
Leg length of the subject was measured with flexible steel tape from the bottom out side edge of the centre of foot to the upper edge of the greater trochanter.

3. Ibid, P. 28
Scoring:

*Leg length was recorded correct to the nearest centimeter.*

**Fore-Leg Length**

**Purpose:**

To measure the fore-leg length of the subject.

**Equipment:**

Flexible Steel tape.

**Procedure:**

The fore-leg length was measured vertically from the bottom outside edge of the foot in centre of the instep to a line drawn horizontally through the most protuberant part of the patella bulge coinciding with the centre of the knee bend to the buttock.

**Scoring:**

The fore-leg length was measured to the nearest centimeter.

**Thigh girth**

**Purpose:**

To measure the thigh girth of the subject.

**Equipment:**

Flexible Steel tape

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5. Ibid, p. 178
Procedure:

Thigh girth was measured with a steel tape placed around the thigh horizontally with its top edge under the fold of the buttocks.

The subject were asked to stand with his weight equally distributed on both feet. A cross handed technique was used to raise the tape to this level on the inner thigh.

Scoring:

It was recorded to the nearest half centimeters.6

Calf girth

Purpose:

To measure the calf girth of the subject.

Equipment:

Flexible steel tape.

Procedure:

Calf girth was taken with flexible steel tape at the maximum circumference of calf in a plane at right angle to its long axis. The leg was held hanging over the table top so that tape measure were in horizontal plane in this position the calf muscle is quite relaxed.

Scoring:

The measurement was taken to the nearest centimeters.7

6. Ibid
7. Tanner, The Physique of the Olympic Athlete, P. 26
Foot length

Purpose:

To measure the foot length of the subject.

Equipment:

Calipers.

Procedure:

With the subject standing the distance between the most posterior point at the heel and tip of the longest toe was measured with the spreading calipers. The inside edge of the fixed arm of the calipers was kept resting on the most posterior point of the heel and the moving arm of the calipers was brought in ward until inside edge of the moving arm rest on the tip of longest toe.

Scoring:

The foot length was recorded correct to the nearest half centimeter.8

Motor fitness components

Speed (50 meter dash)

Purpose:

The 50 meter dash has been considered to be the best measured of running speed.9

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8. J. Carter, Physical Structure of Olympic Athletes, P. 152
Equipment:

Stop watch and clapper

Procedure:

The subject started together to have the competitive performance. The subjects were asked to stand on the starting line and take a standing start. The clapper was clapped after the caution “Ready.” The starter stood in such a position so that the ‘V’ of the clapper was visible to the time keeper. As the ‘V’ of the clapper was closed, the time keepers started their stop watches at the finish line. The subject ran as fast as they could and stop watches stopped as soon as torso touch the finish line.

Scoring:

The time taken by the subjects from starting line to finish line was recorded to the nearest 1/100th of a second as the running speed score.

Agility (4 x 10 Meter Shuttle Run)

Purpose:

The purpose of the shuttle run was to measure the agility of the performer in running and changing direction.10

Equipment:

Measuring tape, stop watches and wooden blocks.

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10. Ibid, P. 115.
Procedure:

Each subject was asked to start behind the starting line after the signal 'go'.

The subject ran from starting line to blocks which were placed at distance of 10 meters from starting line and pick one of the block, returned to the starting line and placed the block behind the line. The same process was repeated in the second block. Two trials were permitted for each subject.

Scoring:

The score for each subject was the time taken to complete the distance of 4 x 10 meter shuttle run measured in the nearest 1/100th of a second. Two trials were given, the best out of the two recorded times was taken as subjects score.

Muscular Power (Vertical Jump)

Purpose:

The purpose of the vertical jump was to measure the power of legs in jumping vertically upward.\(^{11}\)

Equipment:

A smooth wall surface of at least 5 meters height from the floor was chosen. Markings were distinctly made on the wall starting from

1.50 meters and above the ground level. A measuring tape, scale and several chalk pieces were used.

**Procedure:**

The subject stood with one side of the wall with heels together with a piece of chalk in hand. In this position the subject extended his arm upward as high as possible without raising heel and a mark was made on the wall with the chalk. Then the subject was asked to follow the instructions and jump as high as possible. The second mark was made on the wall with the chalk piece on the maximum height of his jump. Two trials were given.

**Scoring:**

The distance between the normal reach mark (standing reach) and the maximum jump mark was measured to the nearest centimeter as the score. Two trials were given and the better distance was recorded as subject’s score.

**Cardio-Respiratory Endurance (600 Meter Run)**

**Purpose:**

To measure the endurance of the subject in running.

**Equipment:**

Stopwatch, 400 meter track.
Procedure:

To measure the endurance (Cardio-respiratory endurance), the 600 meter run was used. The test was conducted on a 400 meter track and the same regulation were followed as to conducted 600 meter run on the track. The subjects ran one and half rounds of the track and time was recorded in minute and seconds. Subjects were given a standing start from a common curved line.

Scoring:

The score was recorded in minute and seconds.\textsuperscript{12}

\textbf{Design of the Study}

To determined the significance of difference between the anthropometric measurements and motor fitness components of defenders, mid-fielders, and attacker of among football players, the random group design was used. Sixty male national level football players were randomly selected from West Bengal and Orissa (30 each).

\textbf{Statistical Techniques Employed}

To determined the significance of the differences between the group means in different variables for the defenders, mid-fielders and attackers of football players, the one way analysis of variance (F ratio) was used. The significant was set at .05 level of confident.

\textsuperscript{12} Donald K. Mathews, Measurement in Physical Education, P. 119.