Chapter III

PROCEDURE

In this chapter the selection of subjects, criterion measures, reliability of data, collection of data, administration of test, design of the study and statistical procedures employed for the study are described.

Selection of Subjects

Seventy two women soccer players who participated in the West Bengal State Championships for the year 2004-05 and 2005-06 were selected as subjects for this study. Out of these seventy two subjects eighteen players in each group like goalkeeper, defender, midfielder and forward. The players were selected according to their position in game during competition and were confirmed by asking them their respective field position. The age for the subjects ranged from 18 to 25 year and belonged to different districts of the state West Bengal.
Criterion Measures

The criterion measures selected for this study were:

Aerobic Fitness

Cooper’s 12-Minute Run/Walk Test was used and the distance covered was recorded in meter.

Anaerobic Fitness

50-meter dash Test was used and the time elapsed was recorded nearest to 1/10th of a second.

Haemoglobin Content

Haemoglobin content was measured by gm/100 ml. of blood.

R.B.C. Count

The method suggested by Chitra Brucha was adopted to count the R.B.C. and it was recorded in sq./m.

W.B.C. Count

The method suggested by Chitra Brucha was adopted to count the R.B.C. and it was recorded in sq./m.

Height

Height was measured by stadiometer marked in centimetres with the individual standing erect.
Weight

Weight was measured by weighing machine to the nearest kilogram.

Leg Length

Leg length was measured by steel measuring tape from floor to greater trochanter and was recorded to the nearest centimetre.

Thigh Length

Thigh length was measured by steel tape vertically from the protuberant part of the patellar bulge to the upper edge of the greater trochantor and was recorded to the nearest centimetre.

Reliability of Data

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

To ensure consistency of measurements and performance the tests were repeated on two days with an interval of one day. The score of the two days thus obtained were correlated and the coefficients of reliability obtained for each test of anthropometrical measurement, aerobic, anaerobic and selected haematological variables for goalkeeper, defenders, midfielders and forwards are shown in Table 1.
Table 1
COEFFICIENT OF RELIABILITY OF TEST RE-TEST SCORES OF ANTHROPOMETRICAL MEASUREMENTS, AEROBIC, ANAEROBIC AND HAEMATOLOGICAL VARIABLES OF WEST BENGAL WOMEN SOCCER PLAYERS AT DIFFERENT FIELD POSITIONS

<table>
<thead>
<tr>
<th>S/No.</th>
<th>Variables</th>
<th>Coefficient of Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Height</td>
<td>0.98</td>
</tr>
<tr>
<td>2</td>
<td>Weight</td>
<td>0.97</td>
</tr>
<tr>
<td>3</td>
<td>Leg Length</td>
<td>0.97</td>
</tr>
<tr>
<td>4</td>
<td>Thigh Length</td>
<td>0.96</td>
</tr>
<tr>
<td>5</td>
<td>12 min. Run/Walk</td>
<td>0.95</td>
</tr>
<tr>
<td>6</td>
<td>50 mt. Dash</td>
<td>0.90</td>
</tr>
<tr>
<td>7</td>
<td>Haemoglobin Content</td>
<td>0.92</td>
</tr>
<tr>
<td>8</td>
<td>R.B.C.</td>
<td>0.90</td>
</tr>
<tr>
<td>9</td>
<td>W.B.C.</td>
<td>0.91</td>
</tr>
</tbody>
</table>

Since very high correlations from 0.90 to 0.98 were obtained for the variables, the competency of the tester to administer the tests was accepted.

Instrument Reliability

The steel tape was used for measuring the height, leg length and thigh length.

Weighing machine was used for measuring the weight of the subjects.
The stop watch was used for taking performance of subjects in 12 minute Run/Walk Test and 50 meter dash which were all calibrated and approved for use by competent authority.

The haemoglobin was content measured by Sahil’s method in gm/100 ml of blood.

Red blood cell count was done by the method suggested by Chitra Brucha¹.

White blood cell count was measured by Pipette haemacytometer², which was calibrated and thus accepted and accurate enough for the purpose of the study.

**Tester Competency and Reliability of Test**

To ensure that the investigator was well versed with the technique of conducting the test, the investigator had a number of practice sessions in the testing procedure, under the guidance of an expert and guide. The research scholar took all the measurements with the assistance of football coaches - S.A.I. Eastern Centre, Master of Philosophy students, lecturers in physical education and pathologist.


Administration of Test

Anthropometric Measurements

Height

Purpose: To measure the standing height of the subject.
Equipment: Stadiometer.
Procedure: The height of the subjects were measured with subject standing erect without shoes on stadiometer. The subjects were instructed to keep the heels together, body touching the wall with heels, buttocks and back, head erect without lift and to take a and hold a full breath and standing erect while height measurement was taken.
Scoring: Height was recorded correct to the nearest half of a centimetre\(^3\).

Weight

Purpose: To measure the weight of the subject.
Equipment: Calibrated weighing machine.
Procedure: The weight of the subjects was taken with a lever tight laboratory anthropometric weighing machine. The subject wearing skirt 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\(^4\).

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\(^4\) Ibid.
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 outside edge of the centre of foot to the upper edge of the greater trochanter.
Scoring: Leg length was recorded correct to the nearest centimetre\(^5\).

Thigh Length

Purpose: To measure the thigh length of the subject.
Equipment: Flexible steel tape.
Procedure: Thigh length was measured with a flexible steel tape vertically from the most portubant part of the patella bulge to the upper edge of the greater trochantor.
Scoring: Thigh length was recorded to the nearest centimetre\(^6\).

Aerobic Capacity

*(Cooper’s 12-Minute Run/Walk)*

Purpose: To measure the aerobic capacity.
Equipment and Facilities Used: Stop watches, wooden clapper, whistles, score sheet, 400 mt. track.
Procedure: The 12-Minute Run/Walk test was conducted on the 400 meters track of Sports Authority of India, Eastern Centre, Salt Lake City at Kolkata (West Bengal). The 400 meters length of the track was divided into 16 equal parts of 25 meters each.


All subjects were assembled at the starting line before the test. They were instructed to run continuously for a duration of 12 minutes and if they felt tired they could walk instead; the aim was to cover the maximum distance within a period of 12 minutes. The tester had assistants to help him in conducting the test in an efficient manner. After the subject had run for a duration of 12 minutes, the whistle was blown and every subject came to stop.

Scoring: The distance covered during the 12 minutes was recorded in meters correct to 25 meters.

**Anaerobic Capacity**

**(50 Meter Dash)**

**Purpose:** To measure the anaerobic capacity.

**Equipment and Facilities Used:** Stop watches (one for each time keeper) accurately measured 50 meters straight line at S.A.I. Eastern Centre track; wooden clapper, finishing post.

**Procedure:** 50 meter dash was used to test the speed of each subject. Subjects were allowed to warm up on their own before the actual performance. On the signal "Take your mark" and "go" the subjects ran 50-meter distance as fast as possible.

**Scoring:** Duration of the time between the starter's signal and the instant the subject crossed the finishing line was recorded to the nearest $1/10^{th}$ of a second. The best time out of two trials was recorded as the final score of each subject.

**Haemoglobin Content**

**Purpose:** To measure the haemoglobin content in the blood.

**Equipment:** Haemoglobinometer was used to estimate the haemoglobin.
Procedure: Sahil’s\textsuperscript{7} method was used to estimate the haemoglobin through haemoglobinometer.

This was based on the conversion of haemoglobin into acid haematin, which has a brown colour. The haemoglobin tube was filled till 2 gram mark with N/10 Hcl (Ranbaxy). To this the blood sucked, was added till the specific mark (20 cumm) and kept for five minutes. During this time the mixture of acid and blood was stirred in the tube. Distilled water was added until a match was obtained with the comparator. The matching was made only against the natural light. The level of the fluid was recorded at its lower meniscus on the scale.

Scoring: Haemoglobin content was measured by one gram of haemoglobin per 100 ml of blood.

**Red Blood Cell**

Purpose: To measure the red blood cells in the blood.

Procedure: The method suggested by Chitra Barucha\textsuperscript{8} was adapted to count the red blood corpuscles. The Pipette with the large bulb was used for diluting the blood. It had two marks of 0.5 and 101. The blood was drawn up to 0.5 mark and then diluting fluid was drawn up to 101 mark. The Pipette was rotated rapidly to allow the fluid to mix well. Care was taken to avoid the fluid to runout of the Pipette while mixing. While rotating, care was taken to see that the Pipette was kept perfectly horizontal during mixing.

The dilution with this the blood contained in the Pipette was 1/200. This was because the fluid in the stem of the Pipette below the mark 1 did not mix with the drop of blood in the bulb. Hence this volume was discarded and not taken into account when calculating the dilution. The volume of bulb was 100. Hence 0.5 volume of

\textsuperscript{7} Sood, *Medical Laboratory Technology*, p. 104-105.

\textsuperscript{8} Chitra et al., *Handbook of Medical Laboratory Technology*, pp. 64-67.
blood was taken into this 100 volume, thus giving a dilution of 1/200. After thoroughly mixing, this diluted blood was charged to the counting chamber.

Scoring: \[ \text{Number of Cells Counted} \times \text{dilution factor} \times \text{depth factor} \]

\[ \frac{\text{Area counted}}{} \]

Dilution = one in two hundred

Depth = 1/10 m.m.

Area counted = 80/400 = 1/5 sq.mm.

R.B.C. count = \[ \frac{\text{number counted} \times 200 \times 10}{1/5} \]

\[ = \text{number counted} \times 10,000 \]

**White Blood Cell**

Purpose: To measure the white blood cells in the blood.

Procedure: White blood corpuscles diluting fluid contained a weak acid to lyse the red blood cells and to for stain the nucleus of white blood cells, example; Turkes, fluid.

The chamber used for cells count is the improved Neubauer chamber, which has an area of 9 sq. mm. and a depth of 0.1 mm.
Using a white blood cell Pipette haemacytometer\textsuperscript{9} drawn well mixed capillary blood and filled till the 0.5 marks then drawn white blood cell diluting fluid till the 11 mark. Mixed the fluid and blood mixture gently avoiding bubbling. Placed the cover slip of the counting chamber at the right place.

Shaked the fluid blood mixture and transferred the mixture using a five bore Pasteur Pipette on to the counting chamber, taking that the mixture does not over flow.

Allowed the cells to settle at the bottom of the chamber for 2 minutes. Care was taken to keep the fluid wet.

The chamber was cleaned and placed it on the stage of the microscope. Using 10 x the white blood cells were counted uniformly in the four larger corner square. The cells present on the outer most lines were counted on one side and those presented on the line opposite were not counted.

Score : Calculated the number of cells in 1 cubic millimetere of blood as follows:

\[
\text{Cells counted} \times \text{blood dilution} \times \text{depth chamber} \\
\text{Area of chamber counted}
\]

**Design of the Study**

To determine the significance of difference among the anthropometric measurements, aerobic, anaerobic and selected haematological variables of goalkeepers, defenders, midfielders and forwards of women soccer players, the random group design was used. Seventy two women soccer footballers were randomly selected from West Bengal.

\textsuperscript{9} Sood, *Medical Laboratory Technology*, p. 108.
**Statistical Technique Employed**

To determine the significance of the differences between the group means at different variables for the goalkeepers, defenders, midfielders and forwards of women soccer players One-Way Analysis of Variance (ANOVA) was employed.

The significance was set at .05 level of confidence.