CHAPTER-III
PROCEDURE

This chapter consists of procedure adopted with selection of subjects, selection of variables, selection of tests, orientation to the subjects, collection of data, administration of the tests and statistical procedure used for analyzing the data are discussed.

SELECTION OF SUBJECTS

The purpose of the study was to compare the anthropometric characteristics, body composition and physical fitness between cricketers and non cricketers. For this purpose, 330 male subjects comprising of 165 cricketers and 165 non cricketers were selected. The purpose of this study was made clear to the subjects by explanation in order to ascertain that there was no ambiguity among the subjects regarding the efforts, which they had to put in the successful completion of investigation.

SELECTION OF VARIABLES

A feasibility analysis as to which of the variables could be taken up for the investigation, keeping in view the availability of equipment, acceptability to the subjects and the legitimate time that could be devoted for tests and to keep the entire study unitary and integrated was made in consultation with experts. With the above criteria’s in mind, the following anthropometric characteristics, body composition and physical fitness parameters were selected.

I. Anthropometric Characteristics:
   i. Standing height
   ii. Body weight
   iii. Leg length
   iv. Upper leg length
   v. Lower leg length
   vi. Arm length
   vii. Upper arm length
   viii. Lower arm length
   ix. Hip width (bitrochantric diameter)
   x. Shoulder width (biacromial diameter)
   xi. Chest width
   xii. Calf girth
xiii. Thigh girth
xiv. Chest girth
xv. Upper arm girth
xvi. Lower arm girth

II. Body Composition

III. Physical Fitness Parameters:
   i. Speed
   ii. Strength
   iii. Agility
   iv. Flexibility

SELECTION OF TESTS

As per the available literature, the following standardized tests were used to collect relevant data for the purpose of the study.

**Anthropometric Characteristics:**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Test Items</th>
<th>Unit of Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standing Height</td>
<td>Stadiometer</td>
<td>in centimeters</td>
</tr>
<tr>
<td>Weight</td>
<td>Weighing machine</td>
<td>in kilogram</td>
</tr>
<tr>
<td>Leg Length</td>
<td>Flexible steel tape</td>
<td>in centimeters</td>
</tr>
<tr>
<td>Upper Leg Length</td>
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<td>in centimeters</td>
</tr>
<tr>
<td>Lower Leg Length</td>
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<tr>
<td>Arm Length</td>
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<td>in centimeters</td>
</tr>
<tr>
<td>Upper Arm Length</td>
<td>Flexible steel tape</td>
<td>in centimeters</td>
</tr>
<tr>
<td>Lower Arm Length</td>
<td>Flexible steel tape</td>
<td>in centimeters</td>
</tr>
<tr>
<td>Hip Width</td>
<td>Sliding calipers</td>
<td>in centimeters</td>
</tr>
<tr>
<td>Shoulder Width</td>
<td>Sliding calipers</td>
<td>in centimeters</td>
</tr>
<tr>
<td>Chest Width</td>
<td>Sliding calipers</td>
<td>in centimeters</td>
</tr>
<tr>
<td>Calf Girth</td>
<td>Flexible steel tapes</td>
<td>in centimeters</td>
</tr>
<tr>
<td>Thigh Girth</td>
<td>Flexible steel tapes</td>
<td>in centimeters</td>
</tr>
<tr>
<td>Chest Girth</td>
<td>Flexible steel tapes</td>
<td>in centimeters</td>
</tr>
<tr>
<td>Upper Arm Girth</td>
<td>Flexible steel tapes</td>
<td>in centimeters</td>
</tr>
<tr>
<td>Body Composition</td>
<td>Skinfold calipers</td>
<td>in millimeters</td>
</tr>
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</table>
Body Composition:

<table>
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<th>Test Items</th>
<th>Unit of Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body composition</td>
<td>Skin fold caliper</td>
<td>in nearest millimeter</td>
</tr>
</tbody>
</table>

Physical Fitness Parameters:

<table>
<thead>
<tr>
<th>Variables</th>
<th>Test Items</th>
<th>Unit of Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>50 yards run</td>
<td>in 1/10th of sec</td>
</tr>
<tr>
<td>Strength</td>
<td>Pull-ups</td>
<td>number</td>
</tr>
<tr>
<td>Agility</td>
<td>Shuttle run</td>
<td>in 1/10th of a sec</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Sit and Reach test</td>
<td>in centimeters</td>
</tr>
</tbody>
</table>

**ORIENTATION TO THE SUBJECTS**

Before the collection of the data, through administering the tests, the subjects were given orientation about the purpose of the study that is, to compare the anthropometric characteristics, body composition and physical fitness between cricketers and non cricketers. The investigator had explained about the test procedures to be adopted by them for measuring the selected variables. Subjects had one preliminary visit to the human performance laboratory and athletic ground for the familiarization with the test procedures.

**COLLECTION OF DATA**

For the purpose of the study, the necessary data was collected by administering various tests for the chosen variables.

**ADMINISTRATION OF THE TESTS**

I. ANTHROPOMETRIC MEASUREMENTS

**Standing Height**

*Objective:* To measure the height of the subjects.

*Equipment:* Stadiometer.

*Procedure:* The subject was asked to stand erect, bare footed on a plane horizontal surface against a wall with his heel, back of the shoulder and head touching the wall. He was asked to stretch the body upwards as much as possible without his heels leaving the ground. The head and face was checked for its being in frontal horizontal plane. To get it easily, the subject was asked to see towards an object in front of him
approximately at a height of his eyes, and then the investigator adjusts the tracheon and infraorbitale points in a horizontal line. The anthropometer rod was kept in front of the subject and the cross bar of the anthropometer were adjusted so that its lower edge touches the highest point of the subject’s head (i.e. point vertex). The measurement was recorded from the anthropometers eye correct up to 0.1 cm.

**Weight**

**Objective:** To measure the weight of the subjects.

**Equipment:** Weighing machine.

**Procedure:** The measurement were taken in a laboratory, lever balanced is preferred. The subject was asked to take off his shoes and clothes except brief and under garments. The subject stands erect on the platform and balance with equal weight on both feet. The weight was recorded accurate up to 0.01 kg.

**Leg Length**

**Objective:** To measure the leg length of the subjects.

**Equipment:** Flexible steel tape.

**Procedure:** Leg length was measured vertically from the bottom outside edge of the foot in the center of the instep to a line draws horizontally through the mid gluteus bulge at the point tendency to a vertical line contracting the buttocks. The tape was placed at the center of the instep and measured to tip of iliac. Leg length was recorded correct to the nearest half centimeters.

**Upper Leg Length**

**Objective:** To measure the upper leg length of the subjects.

**Equipment:** Flexible steel tape.

**Procedure:** Subject stands erect in standing position. The upper leg length was measured with the help of flexible steel tape from the distance from the iliospinale to tibiae. The upper leg length was recorded correct to the nearest half a centimeter.

**Lower Leg Length**

**Objective:** To measure the lower leg length of the subjects.

**Equipment:** Flexible steel tape.

**Procedure:** Subject stand erect with his feet placed 6 to 8 inches apart and the body weight evenly distributed on both the feet using the anthropometer, measure the distance from tibiae to the floor. The lower leg length was recorded correct to the nearest half a centimeter.
Arm Length

Objective: To measure the arm length of the subjects.

Equipment: Flexible steel tape.

Procedure: Arm length was taken from the acromion process to the tip of the third finger. The arm length was measured with a flexible steel tape. It is recorded to the nearest half a centimeter.

Upper Arm Length

Objective: To measure the upper arm length of the subjects.

Equipment: Flexible steel tape.

Procedure: The subject stood erect by keeping his arms along with his body. Upper arm length was measured with the flexible steel tape. The tip of the tape was placed at the upper edge of the head of acromiale to the tip of the point of radiale. The upper arm length was recorded correct to the nearest half of a centimeter.

Lower Arm Length

Objective: To measure the lower arm length of the subjects.

Equipment: Flexible steel tape.

Procedure: The subjects were instructed to stand erects and relaxed. Fore arm length was measured with the flexible steel tape. The tip of the tape was placed at the upper edge of the head of the radius to the tip of the middle finger. The fore arm length was recorded correct to the nearest half a centimeter.

Hip Width (Bitrochantric Diameter)

Objective: To measure the hip width of the subjects.

Equipment: Sliding calipers.

Procedure: The subject was asked to stand erect with heels together and arms about six inches away from the body. The tester standing behind the subject, applies the inner sides of the sliding calipers to the left and right trochanterion points on the two femur and presses the two cross bars hard so to minimize the soft tissue width. Hip width was recorded correct to the nearest half centimeter.

Shoulder Width (Biacromial Diameter)

Objective: To measure the shoulder width of the subjects.

Equipment: Sliding calipers, skin marking pencil.

Procedure: The subject was asked to stand erect with shoulder dropping a little forward. The investigator marks the acromiale points with a skin marking pencil. While standing at a back of the subject, the tips of the two cross-bars of the sliding
calipers are made to touch the acromiale points on both the shoulders along with the
tips of fore fingers of the investigator so as to ensure firm grip of compass on the
outer border of the acromian process with a mild pressure. Shoulder width was
recorded correct to the nearest half centimeter.

Chest Width

Objective: To measure the chest width of the subjects.

Equipment: Sliding calipers.

Procedure: The subject was asked to stand erect with heels together and arms about
six inches away from the body. The investigator stands in front of the subject and
applies the tips of the two cross-bar to the lateral most points (Iliocristale) of the Iliac
crests pressing hard the over lying subcutaneous fat. Chest width was recorded correct
to the nearest half centimeter.

Calf Girth

Objective: To measure the calf girth of the subjects.

Equipment: A flexible steel tape.

Procedure: The flexible steel tape was wrapped horizontally around the marked lower
leg of the subject at the maximal bulge of the calf muscle with slight up and down
movements of the steel tape keeping it in a horizontal direction. The maximal girth
measurement gives the value of calf girth. The measurement was recorded nearest of a
centimeter.

Thigh Girth

Objective: To measure the thigh girth of the subjects.

Equipment: Flexible steel tape and skin marking pencil

Procedure: The subject wearing only under wear was asked to stand at ease with
equal weight on both the feet. The middle of the thigh was marked by a horizontal
line dividing the distance between the trochanterion and the lateral and lower most
point on the lateral condyle of femur, in two equal parts. The steel tape was wrapped
around the thigh at the level of the horizontal line and the girth was measured by
keeping the steel tape in a horizontal direction and touching gently thigh surface all
around. The measurement was recorded nearest of a centimeter.

Chest Girth

Objective: To measure the chest girth of the subjects.

Equipment: Flexible steel tape and skin marking pencil.
Procedure: The subject was asked to take off the clothes from his upper body. A steel tape was wrapped round his chest in such a way that it touches the body all around lightly. The tape should lie over the nipples in front and should pass just below the inferior borders of the scapulae at the back. To note the normal chest girth, the subject was asked to breath normal and the measurement is taken at the end of the normal expiration. Then the subject were instructed to inhale as deep as possible and a maximum value was achieved from the expanded chest at the end of the best effort inspiration after a good deal of motivation. The measurement was recorded nearest of a centimeter.

Upper Arm Girth

Objective: To measure the upper arm girth of the subjects.

Equipment: Flexible steel tape and marking pencil.

Procedure: The subject was asked to stand at ease with equal weight on both the feet and with hands hanging freely. The upper-arm girth was usually measured on the left naked upper arm. Locating the point’s acromiale and radial the midpoint of these two points was marked with a skin marking pencil by a horizontal line. The flexible steel tape was wrapped around the upper-arm at the marked level keeping the tape horizontal and touching lightly to the skin all around. The measurement was recorded nearest of centimeter.

Lower Arm Girth

Objective: To measure the lower arm girth of the subjects.

Equipment: Flexible steel tape

Procedure: The subject was asked to stand as in the case of upper-arm girth with naked forearm. The steel tape was wrapped around the fore-arm just below the elbow point and the maximal measurement were recorded by moving the steel tape slightly up and down keeping the circle of tape in horizontal direction and touching all around. The measurement was recorded nearest of a centimeter.

II. BODY COMPOSITION

Purpose: To measure the fat percentage of the body.

Equipment: Skin fold caliper.

Triceps: The subject stood with the arm by the side and the elbow extended but in relaxed position. A double layer of skin subcutaneous tissue were grasped with the thumb and forefinger or the left hand over the triceps muscle on the back of the right back over the triceps muscle on the back of the right upper arm, half way between the
acromion and the elbow, where the skin fold run parallel to the long axis of arm. The skin fold caliper was generally placed to grasp the skin without removing the fingers and thickens of the skin was recorded form the indicator needle of the dial. It was measured to the nearest millimeter.

**Biceps:** The subject stood with the arm by the side and the elbow extended but in relaxed position. A double layer of skin subcutaneous tissue was grasped with the thumb and forefinger or the left hand over the biceps muscle, where the skin fold run parallel to the long axis of arm. The skin fold caliper was generally placed to grasp the skin without removing the fingers and thickens of the skin was recorded form the indicator needle of the dial. It was measured to the nearest millimeter.

**Sub-scapula:** The subject stood with the shoulder exact but relaxed. A double layer of skin and subcutaneous tissue were grasped with the thumb and forefinger of the left hand lateral to inferior angle of the right scapula were the skin fold runs downward and outward in the direction of ribs. The skin fold caliper was placed gently to grasp the skin without removing the fingers. The thickness of the skin was recorded form the indicator needle of the dial. It was measured to the nearest millimeter.

**Suprailium:** Pinched a fold at the top front of the right hipbone. The skin fold there was taken slightly diagonally due to the natural fold tendency of the skin. It was measured to the nearest millimeter.

**III. PHYSICAL FITNESS PARAMETERS**

**50 Yards run for Speed:**

*Objective:* To measure the maximum speed of subjects in a straight path.

*Equipments:* Two parallel lines, 50 yards run were drawn on the standard track. A stopwatch with calibration of 1/10th of a second and a clapper were used for administering the test.

*Procedure:* The subjects were asked to stand behind the starting line and were also instructed to start with standing start. The subject was asked to start on hearing ‘clapper sound’ and so cover the fifty yards with maximum effort. The time elapsed from the ‘clap’ to the runner crossing the finish line was taken as the test score. The fractions were rounded to the next largest one tenth of a second.

*Scoring:* Two trials were conducted. The better of the two trials were recorded to the longest of the 1/10th of a second.

**Pull-Ups for Muscular Strength:**

*Objective:* To measure the muscular strength of the subjects.
**Equipment:** A metal bar approximately 1.5 inches in diameter and stopwatch.

**Procedure:** The height of the bar was adjusted in such a way that the subject hangs from it with fully extended arms; his feet do not touch the ground. The subject was asked to use an over hand grasp with the palm facing away from the body. From the hanging position the subject raises the body by the arms until the chin be placed over the bar and then lowers the body to full extension hang and repeats the pull-ups as many times as possible. Only one trial was given and neither swinging, nor kicking the legs nor knee rising was allowed.

**Scoring:** The maximum number of completed pull-ups was the score.

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**Sit and Reach test for Flexibility:**

**Objective:** To measure the flexibility of the lower back and posterior thighs of the subjects.

**Equipments:** A testing box and a measuring scale in centimeters were used.

**Procedure:** The subject was asked to remove shoes and place his feet against the testing box while sitting on the floor with straight knees. The subject was asked to place one hand on top of the other so that the middle fingers of both hands are together at the same length. The tester keeps his hands on the knees of the subjects to keep them straight not allowing any bending of the knees. The subject was instructed to lean forward and place his hands over the measuring scale three times, and holds the position of maximum reach on the third trial on the testing box. The subject was asked to slide his hands along the measuring scale as far as possible and to hold the farthest position for at least one second.

**Scoring:** The score is the furthest point reached, measured to the nearest centimeter, on the third trial. The investigator should remain close to the scale and note the most distance touched by the fingertips of both hands.

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**4x10 Yards Shuttle run for Agility:**

**Objective:** To measure the agility of the subjects.

**Equipments:** Two parallel lines 10yards apart were drawn on the ground. A stopwatch with calibration of 1/10th of a second, a whistle and two blocks of wood (2"x2"x4") were used for administering the test.

**Procedure:** The two wooden blocks were kept behind one of the lines. The subject was instructed to start from behind the other line. To start the shuttle run, a whistle was blown and the subject ran to the blocks, picked one block up, ran back to the starting line and placed the block on the ground beyond the line. Then the subject ran
back and picked the other block and ran across the starting line as fast as possible. The stopwatch was started on the whistle and stopped when the subject crossed the starting line.

**Scoring:** Two trials are allowed to each subject with some rest in between. The time of the better of the two trials was recorded to the nearest 1/10th of a second.

**STATISTICAL PROCEDURE USED**

Unpaired t-test was used in data analyses. In all the analyses, the 5% critical level (p≤0.05) was considered to indicate statistical significance. The data was further subjected to one way analysis of variance (ANOVA).