Chapter -III

METHODOLOGY
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In this chapter the selection of subjects, criterion measures, reliability of data, administration of the test, collection of data, design of the study and statistical procedure used for analyzing the data have been described.

Selection of Subjects

The present study was conducted on 120 male subjects from selected four games namely Football, Basketball, Volleyball and Kabaddi. Thirty male players each from four selected team games who had participated in the Kuvempu University Intercollegiate tournaments during the year 2003-2004 and secured first three places were selected as subjects for this study. The age of the subjects were ranging from 19 to 24 years. The venues of data collection and the names of institutions are presented in Appendix I.

Selection of Variables

The research scholar had gone through the scientific literature pertaining to the analysis of anthropometric measurements, motor performance, physiological and psychological variables from different sources and also consulted the experts in these areas. Along with the
said literature and expert opinion, the administrative feasibility in terms of availability of instruments and expertise for measuring and recording of data was also given due consideration while selecting anthropometric measurements, motor performance, physiological and psychological variables. Based on the above mentioned criteria the following variables were selected.

### TABLE 3.1

**SELECTED VARIABLES AND TEST ITEMS**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anthropometric Variables</strong></td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td></td>
</tr>
<tr>
<td>Upper arm girth</td>
<td>Anthropometric measurements</td>
</tr>
<tr>
<td>Chest girth</td>
<td></td>
</tr>
<tr>
<td>Thigh girth</td>
<td></td>
</tr>
<tr>
<td>Calf girth</td>
<td></td>
</tr>
<tr>
<td><strong>Motor Performance Variables</strong></td>
<td></td>
</tr>
<tr>
<td>Strength</td>
<td>Pull ups</td>
</tr>
<tr>
<td>Speed</td>
<td>50 M. dash</td>
</tr>
<tr>
<td>Agility</td>
<td>4x10m. Shuttle run</td>
</tr>
<tr>
<td>Power</td>
<td>Standing broad jump</td>
</tr>
<tr>
<td>Endurance</td>
<td>600 yards run and walk test</td>
</tr>
<tr>
<td><strong>Physiological Variables</strong></td>
<td></td>
</tr>
<tr>
<td>Pulse rate</td>
<td>Resting pulse rate per minute</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>Systolic and Diastolic blood pressures using sphygmomanometer</td>
</tr>
<tr>
<td>Vital Capacity</td>
<td>Wet Spirometry test</td>
</tr>
<tr>
<td>Body fat percentage</td>
<td>Skin folds at four sites viz. biceps, triceps, sub-scapular and supra iliac</td>
</tr>
<tr>
<td><strong>Psychological variables</strong></td>
<td></td>
</tr>
<tr>
<td>Sports achievement motivation</td>
<td>SAMT questionnaire</td>
</tr>
<tr>
<td>Sports competition anxiety</td>
<td>SCAT questionnaire</td>
</tr>
</tbody>
</table>
**Criterion Measures**

**Anthropometric Variables:**

1. Weight of the subject recorded in kilograms with a standard weighing machine.

2. Standing height was recorded to the nearest half centimeter with the help of stadiometer.

3. Girth and length measurements were recorded in centimeters with the help of flexible steel tape.

**Motor performance variables**

1. Strength measured by pull up test.

2. Speed measured by 50 meters dash test in $1/100^{th}$ of a second.

3. Agility was measured by 4 x 10 meters shuttle run test in $1/100^{th}$ of a second.

4. Power measured by standing broad jump in nearest centimeter.

5. Endurance was measured by 600 yards run and walk.

**Physiological Variables:**

1. Number of pulse per minute during resting condition was taken as resting pulse rate.
2. Blood pressure (mm. of Hg) was recorded in terms of the pressure exerted on the walls of the arteries during systolic and diastolic phase (systolic and diastolic pressure).

3. Vital capacity was recorded with the help of wet Spirometer nearest to one tenth of a liter.

4. The thickness of four sites (biceps, triceps subscapular, superailiac) was added and the sum was converted into fat percentage.

**Psychological Variables:**

1. Sports achievement motivation was measured by using SAMT questionnaire and converting the responses into numbers by using answer keys.

2. Sports competition anxiety was measured by using SCAT questionnaire and converting the responses into numbers by using answer keys.

**Reliability of Data**

The reliability of data was ensured by estimating the instrument reliability, tester's competency and reliability of tests.

**Instrument Reliability**

To measure the time, an electronic digital manually operated stop watch was used after calibration for its accuracy. A steel measuring tape
was used for the measurement of distance, after calibration and acceptance of its accuracy. A digital weighing machine was used for measuring the body weight, after calibration. A calibrated steel stadiometer was used for measuring the standing height. In order to measure the body fat, skin fold caliper was used after calibration and found accurate.

In order to measure the physiological variables namely, blood pressure, a calibrated clinical sphygmomanometer was used. A standard wet spirometer was used to measure the vital capacity; it was calibrated after every subject was tested, for its accuracy.

**Tester Competency and Reliability of Test**

The tester competency was evaluated along with the reliability of the test. To determine the reliability of test 20 subjects were selected at random and the research scholar conducted the tests twice under identical conditions. The reliability coefficient was computed for two measures of each variable. The reliability coefficients obtained are presented in table 3.2.
TABLE: 3.2

RELIABILITY COEFFICIENT OF TEST RETEST SCORES OF SELECTED ANTHROPOMETRIC MEASUREMENTS, MOTOR PERFORMANCE, PHYSIOLOGICAL AND PSYCHOLOGICAL VARIABLES

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Test</th>
<th>‘r’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><em>Height</em></td>
<td>0.90</td>
</tr>
<tr>
<td>2.</td>
<td><em>Weight</em></td>
<td>0.93</td>
</tr>
<tr>
<td>3.</td>
<td><em>Upper arm girth</em></td>
<td>0.91</td>
</tr>
<tr>
<td>4.</td>
<td><em>Chest girth</em></td>
<td>0.89</td>
</tr>
<tr>
<td>5.</td>
<td><em>Thigh girth</em></td>
<td>0.92</td>
</tr>
<tr>
<td>6.</td>
<td><em>Calf girth</em></td>
<td>0.88</td>
</tr>
<tr>
<td>7.</td>
<td><em>Strength</em></td>
<td>0.83</td>
</tr>
<tr>
<td>8.</td>
<td><em>Speed</em></td>
<td>0.91</td>
</tr>
<tr>
<td>9.</td>
<td><em>Agility</em></td>
<td>0.83</td>
</tr>
<tr>
<td>10.</td>
<td><em>Power</em></td>
<td>0.90</td>
</tr>
<tr>
<td>11.</td>
<td><em>Endurance</em></td>
<td>0.82</td>
</tr>
<tr>
<td>12.</td>
<td><em>Resting Pulse rate</em></td>
<td>0.96</td>
</tr>
<tr>
<td>13.</td>
<td><em>Blood pressure</em></td>
<td>0.98</td>
</tr>
<tr>
<td>14.</td>
<td><em>Vital Capacity</em></td>
<td>0.93</td>
</tr>
<tr>
<td>15.</td>
<td><em>Body fat percentage</em></td>
<td>0.88</td>
</tr>
<tr>
<td>16.</td>
<td><em>Sports achievement motivation</em></td>
<td>0.91</td>
</tr>
<tr>
<td>17.</td>
<td><em>Sports competition anxiety</em></td>
<td>0.90</td>
</tr>
</tbody>
</table>

The test used to assess the anthropometric measurements, motor performance such as, strength, speed, power, agility and endurance; physiological variables such as, resting pulse rate, blood pressure, vital capacity and body fat percentage; and psychological variables such as sports achievement motivation and sports competition anxiety were all standard tests.
Administration of Tests

The tests for anthropometry, motor performance, physiological and psychological variables were conducted at the class rooms, college grounds, stadia, wherever adequate facilities to conduct the tests were found.

Before the conduct of every test, the subjects were assembled at the testing venue and the purpose of the test was explained to them. The investigator took the help of M.P.Ed. students and physical education directors for conducting the test. Demonstration of all the tests was given before the subjects and all sorts of efforts were made by the research scholar to ensure accuracy and uniformity in the administration of the test. A short warm up period of eight to ten minutes duration was given to the subjects before the conduct of the every motor performance test. All the tests were conducted on each subject.

Anthropometric Variables

1. **Height**

The standing height was measured with the subject standing erect without shoes and socks on the floor board of stadiometer (PLATE-I). The subject was asked to stand with heels together, buttocks and back touching the vertical scale of stadiometer and the head oriented in F.H.
PLATE –I. MEASURING THE HEIGHT USING STADIOMETER
plane. The subject was asked to take a deep breath and stand still, while the measurement was taken. A stiff wooden foot scale was held vertically on the landmark vertex, slightly pressing the subject's head and touching the stadiometer at a right angle. The subject was asked to step out from the stadiometer by lowering the head and the reading indicated by the lower end of the wooden scale on stadiometer graduations was recorded to the nearest centimeter.

2. **Body Weight**

The body weight of each subject was taken on a portable weighing machine (*PLATE-II*). The subject was asked to wear only under clothing and be barefooted. The accuracy of the weighing machine was checked at intervals with standard weights. Before taking the measurements, care was taken to see that the pointer of weighing machine stood at zero when there was no weight on it. The measurement of body weight was recorded to nearest half a kilogram.

3. **Upper arm Girth**

The measurement of upper arm girth was taken with a steel tape; it was measured at the thickest part above the elbow joint (*PLATE-III*). This level was marked on the skin first then tape was placed around the arm, so that it was in light contact with the skin all around. The arm was
PLATE - II. MEASURING THE BODY WEIGHT

PLATE -III. MEASURING THE UPPER ARM Girth
down loosely at the side relaxed. Measurement was recorded in nearest half centimeter (PLATE-III).

4. **Chest Girth**

   The subject slightly abducts his arms to permit the researcher facing to pass the tape around his chest; the tape and housing held in the right hand while the researcher's left hand adjusts the tape at the subject's back to the horizontal level of the marked mesosternale. The cross-handed technique is used to put the tape scale in juxtaposition with the zero on the stub and of the tape. The reading is obtained at the end tidal of a normal expiration. Chest girth was measured and recorded in nearest half a centimeter (PLATE-IV).

5. **Thigh Girth**

   It is the perimeter of the thigh with the subject standing erect, legs slightly apart with the body weight equally distributed on both feet. The tape is raised to the level one to two centimeters below the gluteal line, or the arbitrary join of the gluteal muscle protuberance with the thigh. A cross-handed technique is used to raise the tape to this level on the inner thigh, and then the tape is read when the stub end is brought in juxtaposition to the housing end. In this, tape is fixed to assure the
PLATE - IV. MEASURING THE CHEST Girth

PLATE - V. MEASURING THE THIGH Girth
measure is made perpendicular to the long axis of the femur. Thigh girth was measured and recorded in nearest half a centimeter. (PLATE-V)

6. **Calf Girth**

   It is the perimeter of the thigh with the subject standing erect, legs slightly apart with the body weight equally distributed on both feet. The tape is maneuvered to obtain the maximum perimeter of the calf. This measure is obtained by manipulation of the tape taking a series of girth measurements to assure the largest value. This is achieved by a relaxing and lightening of the tape. (PLATE-VI)

**Motor performance variables**

7. **Pull Ups (Test of Strength)**

   **Objective:** To measure the shoulder strength of the subjects.

   **Equipments:** Pull ups bar and Chair.

   **Procedure**

   The subject was made to hang on a horizontal bar with palms facing forward. The subject was asked to pull his body upward by bending the elbows until the chin reached the bar and then back to the
PLATE – VI. MEASURING THE CALF Girth
initial stage. This continued for a maximum number of times without swinging the body. The number of correctly done pull-ups was recorded as the score. (PLATE-VII)

8. Speed (50 Meter dash)

**Purpose:** To measure the speed of the performer in running.

**Equipments:** Stopwatch.

**Procedure**

The subjects were made to run a distance of 50 meters dash. On the command "on your mark", the subjects stood on the starting line and started, when the clapper sounded. Only one subject ran at a time. They run up to the finish line, which was marked 50 meters dash away and three timekeepers for each runner recorded the time by stopwatch (PLATE-VIII).

**Scoring**

The score for each performer is the length of time required to complete the course recorded in 1/100th of a second.
PLATE –VII. MEASURING THE STRENGTH (PULL-UPS TEST)

PLATE –VIII. MEASURING THE SPEED (50 METER DASH)
9. **Agility test: 4 x 10 meters Shuttle Run**

**Purpose:** To assess the agility of the subject

**Procedure:**

To conduct the test, at ten meters of distance two parallel lines of five meters width were marked. The subject was asked to stand behind the starting line. On getting the starting signal "Go", the subject run faster, goes nearer to the other line and touches it with the one hand, turns and came back to starting line and touches it by hand. The subjects were asked to do the shuttle run four times and finish across the starting line by run through (PLATE-IX).

**Scoring:**

The time elapsed between start signal "go" and four shuttle runs finishing has been recorded to nearest 1/100\(^\text{th}\) of a second. Two trials were given to the subject. The best performance was used as a score for the purpose of the study.

10. **Power test: Standing Broad Jump**

**Objective:** To measure the explosive strength of the legs.

**Equipment and Marking**

A long jump landing pit with sand, a measuring tape and a take off line was marked in front of the pit 50 centimeter away.
PLATE –IX. MEASURING THE AGILITY
Procedure

The subject stood behind the take off line with feet parallel to each other. The performer flexed his knees and took his arms backward, then with a vigorous forward swing of arms and extension of flexed knees he took off in one chance and jumped on the landing pit as forward as possible. These trials were given after adequate rest (PLATE-X).

Scoring

Best of the three trials in meters was considered as the performance of the subject in the tests

11. Endurance (600 yards Run and Walk Test)

Objective: To measure the endurance.

Equipment and Marking: Whistle, Stop watch and running track

Procedure

The subjects were asked to cover the distance of 600 yards on a standard track of 400/200 meters as fast as possible, with in their capacity either by walking or running or both. The timing was clocked and recorded in nearest full second (PLATE-XI).

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PLATE -X. MEASURING THE POWER (STANDING BROAD JUMP TEST)

PLATE -XI. MEASURING THE ENDURANCE
Physiological variables

12. Resting Pulse Rate

Objective: To measure the resting pulse rate.

Equipment: Stop Watch

Procedure

The resting pulse rate was taken early in the morning when the subjects were in a resting condition. Left-hand radial artery palpation was felt by pressing with the fingertips to count the pulse palpation per minute was counted by a stopwatch (PLATE-XII).

Scoring

The score was the number of beats in one minute was recorded as the final score.

13. Blood Pressure

To measure both systolic and diastolic blood pressure of the performer.

Equipments: Sphygmomanometer and stethoscope.

Procedure:

To measure both systolic and diastolic blood pressure of the performer, the subjects were put in supine lying position on the mat and cult of the manometer was tied on the left arms and gradually pumped to till the pressure reading showing about 200 mm/Hg. (PLATE-XIII).
PLATE – XII. MEASURING THE RESTING PULSE RATE

PLATE – XIII. MEASURING THE BLOOD PRESSURE
The diaphragm of the stethoscope was placed at the bend of the elbow to detect the pulsation of the brachial artery and the pressure was gradually reduced response. The point of appearance of the pulsation was noted as the systolic pressure and the point of disappearance of pulsation was noted as the diastolic pressure. The reading was recorded in mm/Hg.

**Scoring**

The point of appearance of the pulsation was noted as the systolic pressure and the point of disappearance of pulsation was noted as the diastolic pressure. The reading was recorded in mm/Hg.

14. **Vital Capacity**

**Objective:** To measure the lung capacity of the performer.

**Equipment:** Wet Spirometer, mouth pieces

**Procedure**

After a couple of normal breaths the subjects took a deep breath and exhale into wet spirometer (PLATE-XIV) as forcefully as possible. The ejection of air was read off the scale attached to wet spirometer. The care had been taken to prevent escaping air either through the nose or around the edge of the mouthpiece (PLATE-XV).
PLATE -XIV. WET SPIROMETER

PLATE -XV. MEASURING THE VITAL CAPACITY USING WET SPIROMETER
Scoring

The score was recorded in liters as indicate by the scale attached with the wet spirometer.

15. Fat Percentage (Skin fold Measurements)

Purpose

The purpose of the test was to measure the percentage of the body fat of the subjects. The right side of the body was used to determine the percentage of fat. The thickness of the skin and subcutaneous fat was grasped between the thumb and index finger and measurement was taken to the nearest millimeter and recorded. For the purpose of measuring the skin folds, a standard and calibrated skin fold calipers was used. (PLATE-XVI)

a. Biceps Skinfold

With the subject standing erect with arm hanging loosely, a fold was picked up on the anterior of the mid part of biceps and the skinfold thickness was taken. The position of the fold was vertical reading to the nearest half millimeter was recorded (PLATE -XVII).

b. Triceps Skinfold

The skinfold thickness was taken over the triceps muscle at a
PLATE –XVI. SKIN FOLD CALIPER

PLATE –XVII. MEASURING THE BICEPS SKIN FOLD
point half way between the tip of the shoulder (acromial process) and the tip of the elbow (alecranon process). The point was located with forearm flexed to 90 degrees, and while taking the measurement the arm was kept hanging free. The fold was lifted parallel to the long axis of the arm reading to the nearest half millimeter (PLATE - XVIII).

c. Subscapular Skin fold

The skin fold thickness was taken at the tip of the scapular (inferior angle) with the subject in a relaxed standing position. The fold was lifted in the diagonal plane at about 45 degree from vertical and horizontal planes reading to the nearest half millimeter (PLATE - XIX).

d. Supra Iliac Skin fold

The skin fold thickness was taken three to five centimeters above and anterior superior Iliac spine on diagonal line going downward and inward reading to the nearest half millimeter was recorded (PLATE - XX).

The sum of the skin fold thickness of four sites of the body was converted to percentage body fat with the help of standard table, suggested by Durnin and Rehman. From each subject body weight, the

PLATE – XVII. MEASURING THE TRICEPS SKIN FOLD
PLATE –XVIII. MEASURING THE SUB SCAPULAR SKIN FOLD

PLATE –XX. MEASURING THE SUPRA ILIAC SKIN FOLD
weight of the fat the possessed was calculated by using the following formula.

\[
\text{Fat Weight} = \frac{\text{Body Weight} \times \text{Percentage Value of Fat}}{100}
\]

**Psychological variables**

16. *Sports Achievement Motivation Test*\(^3\)

**Purpose**

The purpose of the test was to measure achievement motivation level of Kuvempu University Intercollegiate players who have secured first three places (PLATE-XXI).

**Procedure**

1. The sports achievement motivation test was administered before the competition.

2. Necessary instruction that required before answering the questionnaire was explained to the subjects.

3. The subjects were assembled in a group. The purpose of the study was clearly explained.

4. After making sure that subjects understood the instruction the questionnaire were distributed to groups. Enough time was given to answer the questionnaire. The questionnaires were taken back after it was duly completed.

PLATE –XXI. ADMINISTRATION OF QUESTIONNAIRES FOR THE ASSESSMENT OF PSYCHOLOGICAL VARIABLES
5. Thorough screening was done to check that no question was left unanswered.

**Scoring:**

1. The sports achievement test has twenty test items, response value of test extends from 0 to 40.

2. Each item carries a maximum score of two and the minimum of zero.

3. When the subject ticked the high pole part, he was given two points, when he ticked the low pole no score was awarded.

17. **Assessment of Sports Competition Anxiety**

**Administration of Questionnaire**

The scholar himself administered the SCAT Questionnaire to the players few hours prior to competition through personal contact at the time of Kuvempu University Intercollegiate tournaments. Each subject was asked to answer all the 15 items of tests and was instructed to express his choice most honestly. The method of answering was explained to them.

**Purpose:**

The purpose of test was to measure the sports competition anxiety level.
Procedure:

1. The sports competition anxiety test (SCAT) was administered few hours before the competition.

2. Instructions were given specially to answer all the items then questionnaire distributed to groups.

3. Sufficient time was given to answer the questions and instructed them not to take too much of time.

4. Questionnaire was taken back after it was duly completed.

Scoring:

1. The questionnaire has 15 items. For each item in the questionnaire, one of three responses are possible:

   a) Hardly Ever
   b) Some Times
   c) Often.

2. The 10 test items are 2, 3, 5, 6, 8, 9, 11, 13, 14 and 15. The spurious items: 1, 4, 7, 10 and 13 are not scored. Items 2, 3, 5, 8, 9, 12, 14 and 15 are worded and are scored as according to following key:

   a) Hardly Ever – 1
   b) Some Times – 2
   c) Often – 3
3. Items 6 and 11 are scored according following key:

a) Often – 1  
b) Some Time – 2  
c) Hardly Ever -3

**Statistical Techniques used for Analysis of Data**

To compare the data of selected Anthropometric measurements, Motor performance, physiological and Psychological variables among Kuvempu University Intercollegiate level Football, Basketball, Volleyball and Kabaddi players, One-way Analysis of Variance (ANOVA) was applied, followed by Least Significant Difference Post-hoc comparison to determine the significance of differences between paired means. The level of significance chosen was at 0.05.