Chapter Three

Procedure
PROCEDURE

In this chapter the selection of subjects, selection of variables, criterion measures, reliability of data, collection of data, administration of tests and statistical analysis have been described.

SELECTION OF SUBJECTS

The sprinters (100m, 200m, 400m) of North and South Indian Universities participating in All-India Inter University Athletic Championship were selected as subjects. Total eighty five sprinters (North Indian athletes = 37 and South Indian athletes = 48) were taken as subjects. Their age ranged from 18 to 24 years.

SELECTION OF VARIABLES

Following nutritional components and kinanthropometrical measures were selected for the present study:

A. **Nutritional Components:**

   I. Carbohydrate
   II. Protein
   III. Fat
   IV. Mineral
   V. Iron
   VI. Total Calorie Intake

Modified nutritional status survey questionnaire (24 hour food intake recall method) was administered to the subjects.
B. Kinanthropometric Variables

1. Height
   I. Standing
   II. Sitting

2. Weight

3. Lengths
   I. Upper arm
   II. Fore arm
   III. Upper leg
   IV. Lower leg
   V. Foot

4. Girths (Circumferences)
   I. Upper arm
   II. Fore arm
   III. Chest
   IV. Waist
   V. Thigh
   VI. Calf

5. Body composition
   I. Skin-fold Measurements:
      (a) Biceps
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(b) Triceps
(c) Sub-scapular
(d) Supra-iliac

II. Body Density
III. Lean Body Mass
IV. Fat Weight
V. Fat Percentage

CRITERION MEASURES

Height: Height was measured with the help of measuring tape to the nearest of half centimeter.

Weight: Weight was taken with the help of weighing machine to a quarter of a kilogram.

Lengths: Lengths were measured with the help of measuring tape to the nearest of half centimeter.

Girths: The girths were measured with the help of measuring tape to the nearest of half centimeter.

Body composition: The Lange’s Skin-fold caliper was used to assess the body fat. Measurement at four sites namely Biceps, Triceps, Subscapular and Supra-iliac were measured in millimeter.
**TABLE - 1**

**RATING SCALE FOR ATHLETE’S PERFORMANCE IN ALL INDIA INTER UNIVERSITY ATHLETICS CHAMPIONSHIP**

<table>
<thead>
<tr>
<th>Performance in Championship</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Position</td>
<td>20</td>
</tr>
<tr>
<td>Second Position</td>
<td>16</td>
</tr>
<tr>
<td>Third Position</td>
<td>12</td>
</tr>
<tr>
<td>Fourth Position</td>
<td>10</td>
</tr>
<tr>
<td>Fifth Position</td>
<td>8</td>
</tr>
<tr>
<td>Sixth Position</td>
<td>6</td>
</tr>
<tr>
<td>Seventh Position</td>
<td>4</td>
</tr>
<tr>
<td>Eighth Position</td>
<td>2</td>
</tr>
<tr>
<td>Participation</td>
<td>1</td>
</tr>
</tbody>
</table>
RELIABILITY OF DATA

By establishing the instruments’ reliability, tester’s competency, reliability of the tests and the subject’s reliability, the reliability of data was ensured:

Reliability of Instrument

The weighing machine, measuring tape, stadiometer and Lange’s skinfold caliper were obtained from standard firms which cater to the needs of various research laboratories in India and abroad. Thus all the instruments used in present study to measure the performance of the subjects on different variables were calibrated and precise.

Tester’s Competency and Reliability of Tests

To ensure that the investigator was well versed with the techniques of conducting the tests, the research scholar had a numbers of practice session in testing procedures under the supervision of Dr. (Mrs.) Sushma Ghildyal, in department of Physical Education, Banaras Hindu University, Varanasi.

The tester’s competency was evaluated together with the reliability of the tests. The scholar recorded the performance of 10 subjects selected at random on the selected variables twice under identical conditions. Pearson's product moment correlation was computed between the two measures of each variable and their reliability coefficients are shown in Table-2. The test retest coefficient of correlation was significantly high, establishing the competency of the scholar to administer the tests.
The correlation coefficient also indicated the reliability of the tests selected, as very high correlations were obtained, when the tests were repeated.
<table>
<thead>
<tr>
<th>Variables</th>
<th>( r )</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Nutritional Components:</td>
<td></td>
</tr>
<tr>
<td>(1) Carbohydrates</td>
<td>0.85</td>
</tr>
<tr>
<td>(2) Proteins</td>
<td>0.83</td>
</tr>
<tr>
<td>(3) Fat</td>
<td>0.85</td>
</tr>
<tr>
<td>(4) Minerals</td>
<td>0.86</td>
</tr>
<tr>
<td>(5) Iron</td>
<td>0.89</td>
</tr>
<tr>
<td>(6) Calories</td>
<td>0.81</td>
</tr>
<tr>
<td>(B) Kinanthropometrical measures</td>
<td></td>
</tr>
<tr>
<td>(1) Height A) Standing</td>
<td>0.99</td>
</tr>
<tr>
<td>B) Sitting</td>
<td>0.98</td>
</tr>
<tr>
<td>(2) Weight</td>
<td>0.98</td>
</tr>
<tr>
<td>(3) Length A) Upper Arm</td>
<td>0.97</td>
</tr>
<tr>
<td>B) Fore Arm</td>
<td>0.98</td>
</tr>
<tr>
<td>C) Upper Leg</td>
<td>0.98</td>
</tr>
<tr>
<td>D) Lower Leg</td>
<td>0.98</td>
</tr>
<tr>
<td>E) Foot</td>
<td>0.97</td>
</tr>
<tr>
<td>(4) Girths A) Upper Arm</td>
<td>0.96</td>
</tr>
<tr>
<td>B) Fore Arm</td>
<td>0.98</td>
</tr>
<tr>
<td>C) Chest</td>
<td>0.97</td>
</tr>
<tr>
<td>D) Waist</td>
<td>0.97</td>
</tr>
<tr>
<td>E) Thigh</td>
<td>0.98</td>
</tr>
<tr>
<td>F) Calf</td>
<td>0.99</td>
</tr>
<tr>
<td>(5) Body Density</td>
<td>0.92</td>
</tr>
<tr>
<td>(6) Lean Body Mass</td>
<td>0.91</td>
</tr>
<tr>
<td>(7) Fat Weight</td>
<td>0.93</td>
</tr>
<tr>
<td>(8) Fat Percentage</td>
<td>0.91</td>
</tr>
</tbody>
</table>
Subjects' Reliability

The above test-retest coefficient of correlation method also established that subjects' reliability that is significant at 0.01 level, because the same subjects were used under similar conditions by the tester and no motivational techniques were used nor any training was given to them.

COLLECTION OF DATA

The data was collected by contacting eighty five athletes of North and South Indian Universities during All India Inter-university Athletic Meet held at Gwalior in January 2000. To collect the data, selected kinanthropometric measures, were taken on each subject individually during resting hours.

The judgment of the performance of each subject was based on the rating scale according to the athlete's achievement in the championship. Further, they were divided into two groups, first group represented the North Indian Universities and the second group represented the South Indian Universities.

Before the administration of the test, the use of equipments were explained and clearly demonstrated by the tester to the subjects, so as to become familiar with various test items. To ensure the uniform testing conditions the kinanthropometrical measurements were taken only in evening session.
ADMINISTRATION OF TESTS

Standing Height

Purpose: To measure the standing height of the athlete.

Equipment: Steel measuring tape.

Description: The subject was bare foot, stood erect with heels together and the arms hanging naturally by the sides. The heels, buttocks, upper part of back and the back of the head were in contact with the vertical wall. Head piece was kept firmly down in contact with the vertex and pencil mark was made on the paper tape level with the underside of the head. Then the subject moved forward and the vertical distance from the floor to the pencil mark was measured with the steel measuring tape to the nearest of half centimeter.

Sitting Height

Purpose: To measure the sitting height of the athlete.

Equipment: Steel Measuring Tape.

Description: The subject sat in long sitting position keeping his legs straight. The back and back of head were in contact with the vertical wall. Head-piece was kept firmly down in contact with the vertex and a pencil mark was made on the paper tape level with the underside of the head. Then the subject moved and the vertical distance from the sitting floor to the pencil mark was measured with the steel measuring tape to the nearest of half centimeter.
Weight

Purpose: To measure the weight of the athlete.

Equipment: Standard weighing machine.

Description: The subject stood at the center of the weighing machine with minimum clothing and bare foot. The weight was recorded correct to a quarter of a kilogram.

Upper Arm Length

Purpose: To measure the upper arm length of the athlete.

Equipment: Steel measuring tape.

Description: The subject was asked to stand with arms hanging down freely. The tape was placed at the distance from to the acromiale to the olecranon. The measurement was taken without shifting the tape nearest half of a centimeter.

Fore Arm Length

Purpose: To measure the fore arm length of the athlete.

Equipment: Steel measuring tape.

Description: The subject was asked to stand with arms hanging down the freely. The tape was placed at the distance from radiale to the styliion. The measurement was taken without shifting the tape nearest half of a centimeter.
Upper Leg Length

Purpose: To measure the upper leg length of the athlete.

Equipment: Steel measuring tape.

Description: The subject stood erect without stretching and his feet placed slightly apart. The tape was placed at the distance from Trochanter to the Proximate lateral Tibial border. The measurement was taken without shifting the tape nearest half of a centimeter.

Lower Leg Length

Purpose: To measure the lower leg length of the athlete.

Equipment: Steel measuring tape.

Description: The subject stood erect without stretching and his feet placed slightly apart. The tape was placed at the distance from the knee joint line and the tip of the medial malleolus. The measurement was taken without shifting the tape nearest half of a centimeter.

Foot Length

Purpose: To measure the foot length of the athlete.

Equipment: Steel measuring tape.

Description: The subject stood erect without stretching and his feet placed slightly apart. The tape was placed at the distance from medial malleolus to the
flanges. The measurement was taken without shifting the tape nearest half of a centimeter.

**Upper Arm Girth**

**Purpose**: To measure the upper arm girth (circumference) of the athlete.

**Equipment**: Steel measuring tape.

**Description**: The subject was asked to stand with arms hanging down freely. A circumferential point half a distance between the tip of the acromiale and radial was located and marked. The tape was placed around that point in the horizontal plane. The measurement was taken without pressing the skin surface with no air space underneath to the nearest half of a centimeter.

**Fore-Arm Girth**

**Purpose**: To measure the circumference of the fore arm of the athlete.

**Equipment**: Steel measuring tape.

**Description**: The subject was asked to stand with the arms hanging down freely. A circumferential point at the greater bulge of the forearm muscles is located and marked. The tape was placed around it and measurement was taken without pressing the skin surface to the nearest half of a centimeter with no air underneath.

**Chest Girth**

**Purpose**: To measure the circumference of the chest of the athlete.
Equipment: Steel measuring tape.

Description: The subject stood in erect position with the arms hanging down freely. The measuring tape was placed around the chest. Tape was adjusted at the back of the subject to the horizontal level of marked mesosternal at the level of nipples. The reading was obtained at the end tidal of a normal expiration to the nearest half of centimeter.

**Waist Girth**

Purpose: To measure the horizontal circumference of the waist of the athlete.

Equipment: Steel measuring tape.

Description: The subject stood erect with both arms hanging down freely. The measuring tape was put horizontally on the waist of the level of umblicus. The measurement was taken without pressing the skin surface to the nearest half of a centimeter with no air space underneath.

**Thigh Girth**

Purpose: To measure the horizontal circumference of thigh of the athlete.

Equipment: Steel measuring tape.

Description: The subject stood erect without stretching and his feet placed slightly apart. The measuring tape was placed as high as possible in the gluteal fold transversely. The measurement was taken without pressing the skin surface to the nearest half of a centimeter with no air space underneath.
Calf Girth

Purpose: To measure the horizontal circumference of calf of the athlete.

Equipment: Steel Measuring tape.

Description: The subject stood erect with his feet placed slightly apart. The measuring tape was kept horizontally on the lower leg at the level of the great bulge of calf muscle. The measurement was taken without pressing the skin surface to the nearest half of a centimeter with no air space underneath.

Body Composition

Purpose: To measure the body fat of the subject.

Equipment: Lange's skin fold caliper.

Description: The two component model is used commonly divides the body into a fat portion and fat free body weight (lean body weight mass).

Skin-fold measurement method is probably the most widely used of all and it is based on the fact that about one half of the total adipose tissue is kept in specialized cells within the subcutaneous areas beneath the skin. The fold involving two layers of skin and subcutaneous area beneath the skin. The fold involving two layer of skin and subcutaneous structures can be held between the thumb and index finger while the Skin-fold calipers are being applied. The right side of the body is used to determine the percentage. It is recorded in millimeter.
Measurement was taken at four sites i.e. biceps, triceps, subscapular and suprailiac. Body fat was calculated with the help of the Durnin and Womersley formula (1974).

**Lean Body Mass**

By subtracting body fat weight, from the total body weight lean body mass was calculated for each of the athlete.

**Skin-folds**

**Biceps**: The skin-fold was measured by raising a vertical at the marked mid-acromiale-radiale line on the anterior surface of the arm. The subject stood with the arm hanging down freely.

**Triceps**: It was taken over the triceps muscle at a point half way between the tip of the shoulder acromian process and process of the elbow. The spot was located with the forearm flexed to 90°. However during test the arm was allowed to hang freely.

**Sub-scapular**: This skin fold was taken at the tip of the scapular (Interior angle) of the left scapula with the subject in the relaxed standing position. The fold was lifted into the diagonal plane about 45° from the vertical and horizontal plane.

**Supra-iliac**: The subject was asked to stand erect and relaxed. The skin was lifted one centimeter above the superior margin of the iliac crest, the point where
it is cut by an imaginary vertical line drawn about 2-3 cms. from the axillary fossa. The measurement was taken vertically.

Caution: To eliminate error, the reading is made in three to four seconds, when essentially all compression has taken place. If this precaution is not taken, the Skin-fold will gradually decrease because the tissue is required to take out from the jaws of the caliper.

**STATISTICAL ANALYSIS**

To compare nutritional status and kinanthropometrical measures of North and South Indian athletes. Event wise (100m., 200m., 400m.) and selected variables wise (nutritional and kinanthropometrical) comparison was made and to test the significant difference 't' test was employed. The relationship between dependent variable (performance) and independent variable (nutritional components and kinanthropometrical measures) was established by using Pearson's product moment correlation. Most contributing nutritional components and kinanthropometrical measures were selected through regression equation. For testing the hypothesis the level of significance was set at 0.05 level.