Chapter – III

PROCEDURE

In this chapter, the selection of subjects, selection of variables, Selection of Test/Questionnaire, Testers reliability, instruments reliability selection and administration of tests/questionnaires and statistical technique used for analysis of data have been described.

Selection of Subjects

The present study was conducted on three hundred and seventy five athletes from All India Inter varsity Athletic championship 2006-07. Seventy five subjects from each group i.e. sprinters, middle distance runners, long distance runners, jumpers and throwers. The age of the subjects ranged from 17 - 25 years. The details of subject, event-wise are presented in Table No. 1.

Table – 1

<table>
<thead>
<tr>
<th>Events</th>
<th>Sprinters</th>
<th>Middle Distance Runners</th>
<th>Long Distance Runners</th>
<th>Jumpers</th>
<th>Throwers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
</tbody>
</table>
Selection of Variables

The study was taken to pinpoint the Physical, Anthropometric, Physiological and Psychological profiles of Athletes of different Events. Therefore, based on literary evidences and scholar’s own understanding, following variables were selected for the purpose of this study:

Physical Variables (AAPHERD)

1. Speed
2. Standing broad jump
3. Sit ups
4. Shuttle Run
5. 600 metres run/walk
6. Pull ups

Anthropometric Variables.

1. Height
2. Weight
3. Leg Length
4. Shoulder Width
5. Hip Width

Physiological Variables

1. Anaerobic Power/Capacity
2. Resting heart rate
3. Resting respiratory rate
4. Body composition
   Total body fat percentage
   Lean body weight
5. Breath Holding Capacity
   Negative breath holding capacity
   Positive breath holding capacity.

Psychological Variables

1. Incentive motivation (consisting of seven system viz. excellence, Power, sensation, independence, success, aggression and affiliation).
2. Sports Achievement motivation
3. State and trait anxiety.

Selection of Tests / Questionnaire

The tests selected for this Study for the collection of data were found to be most reliable and have been used extensively in the profession of physical education and sports throughout the world.
Collection of Data

At the beginning, the investigator gathered all the subjects of particular events in the Track and Field of All India Inter University Athletic Meet and explained the purpose of the present study to them. Necessary instructions were passed on to the subject before the administration of each test. Confidentiality of response was guaranteed to the subjects. The required data in different components was collected during the Course of five days in the Track and Field of Inter University Athletic Meet. The coaches and subjects were consulted personally and their sincere co-operation was solicited. Respondents were called to a common place when they were not occupied and had enough time to spare for testing. Necessary instructions were given to the subjects before the administration of each test. The research scholar motivated the student respondents by promising to send a separate abstract of conclusions of his study to each of the subjects so that they would not camouflage their real feelings. No time limits for filling in questionnaire was set but the subjects were made to respond as quickly as possible once the instructions are clearly understood by them. As soon as a group of players completed one questionnaire, another was given to them after a short interval.
Criterion Measures

The criterion measures chosen were:

**Physical Variables.**

1. Muscular strength was measured with the help of bent knee sit ups and the number of sit ups in one minute was taken as the score.

2. Agility was measured by using 4 x 10 m shuttle run. The score was recorded to the nearest tenth of a second.

3. Explosive strength was measured by the horizontal distance covered in feet and inches between the take off line and the nearer break made in landing using standing broad jump.

4. Speed was measured by 50 m dash. The score was recorded to the nearest tenth of a second.

5. Cardio vascular endurance was measured by the 600m run/walk and the score recorded to the nearest one tenth of a second.

6. Shoulder strength was tested by the help of pull up test and the number of pull up was considered as the score of the test.

7. Pulpatory method (Pulse rate count) was used to measure the Resting Heart Rate. Score was recorded in numbers of pulse per minute.

8. To determine the anaerobic capacity, Sargent Jump – Lewis Nomogram was employed, and anaerobic power was expressed in Kg-m./sec.
9. Resting respiratory rate was measured by manual method using a stop watch over a period of one minute.

10. Positive breath holding was measured by manual method using a stop watch and the score was recorded in second.

11. Negative breath holding was measured by manual method using a stop watch and the score was recorded in second.

12. Weight was recorded nearest to half a kilogram.

13. Height was recorded to the nearest centimeter.

14. Leg length was recorded in centimeters.

15. Shoulder Width was recorded in centimeters.

16. Hip Width was recorded in centimeters.

17. Total Body fat percentage was measured by skinfold calipers and recorded in percentage.

18. Incentive Motivation was measured by Incentive Motivation Inventory (IMI).\(^1\)

19. Achievement Motivation was measured by Sports Achievement Motivation Test (SAMT).\(^2\)

20. State Anxiety was measured by Self Evaluation Questionnaire (SIAT).\(^3\)


\(^3\) Ibid.
21. Trait Anxiety was measured by Self Evaluation Questionnaire (SIAT)\(^4\).

22. Sports Competition Anxiety was measured by Sports Competition Anxiety Test (SCAT)\(^5\).

**Administration of Test and Collection of Data**

**Speed (50 – mts Dash)**

**Equipments:**

Chalk powder, Measuring tape, Stop watches and clapper.

**Marking:**

50 –meter distance was marked on cinder track.

**Description:**

Two subjects at one time took a standing position behind the starting line. The starter gave the start by clapper. The time taken to complete 50- meters by each subject was recorded by the timekeepers at the finishing line.

**Scoring:**

The time recorded to the nearest 1/10\(^{th}\) of a second.

\(^4\) Ibid.

Standing Broad Jump

**Equipments:**

A marking tape, long jump pit

**Description:**

Each subject was asked to stand behind a take off line with his feet comfortably apart. Before jumping, the subject was allowed dipping at the knees and swing the arms backward and then jump forward by simultaneously extending the knees and swinging arms forward to cover maximum possible horizontal distance, landing on both the feet.

**Scoring:**

The recommended procedure was to administer three trials and award the student the best of the three trials. The test was scored in feet and inches.

Sit-Ups

**Equipments:**

A clean surface and a stopwatch.
Description:

The subject lies on their back with the knees bent, feet on the floor, and heels no more than 12 inches from the buttocks. The angle at the knees was less than 90-degrees. The students were on the back of the neck with fingers clasped and elbows touching the surface. By tightening the abdominal muscles, the student brought the head and elbows forward as they curled up to touch their elbows to their knees. This action constituted one sit-up. The subject returned to the starting position before executing another sit-up. The subjects began on the command “Go”, and stopped on the command “stop”.

Scoring:

The score was the number of correctly executed sit-ups performed in 60 seconds.

Shuttle Run

Equipments:

Floor space sufficiently large to allow acceptable traction, stopwatches accurate to a tenth of a second, and wooden blocks (2”x2”x4”) per test station.
Description:

Two parallel lines were marked on the floor, 10 meter apart. Three wooden blocks were placed behind a line of 2"x2"x4" dimensions. The subjects stood behind the starting line. On the signal "go" they ran to the other line, pick up one block, return to the starting line and place the block behind the line and repeated the process with the second and third blocks respectively.

Scoring:

The score was the elapsed time accurately to the nearest tenth of a second. Each subject was allowed two trials and the best score was selected. The watch was started on the signal "Go" and stopped when the second block was carried across the line. Subjects who fell or slipped significantly were given another trial.

600 Mts. Run/Walk

Equipments:

A stopwatch, writing pad, clapper.

Description:

Subjects were made to stand on starting line and instruction were given. At the signal "Ready? Go". The subjects started running the 600-
meter distance. The objective was to cover the distance in the shortest
time. It was possible to have a dozen subjects run at one time by having
the subject pair off before the start of the run and the partner served as the
runners scorer. The timekeeper called out the runners time to the scorer
as the runners crossed the finish line.

**Scoring:**

The time of the run was recorded in minutes and seconds.

**Pull-up Test**

**Equipment:**

A horizontal bar positioned at a height that allowed the subject to
hang without touching the ground.

**Description:**

The bar was adjusted to a height that permitted the subjects to hang
free from the floor. From the hanging position with an overhand grip
(palm forward), the body was pulled upward until the chin rested over the
bar, and then lowered until the arms were straight. This movement was
repeated to exhaustion. The subject was not allowed to kick, jerk, or use
a hip movement.
**Scoring:**

The subjects score was the number of correctly executed chin ups.

**Weight**

**Equipments:**

Weighing machine, pad and pencil.

**Description:**

The weights of the subjects were taken on a weighing machine with the subjects wearing short and vest only. They stood on the weighing machine with weight evenly distributed on both legs and weight was recorded nearest to half a kilogram.

**Standing Height**

**Equipments:**

Stiff hard board, marked scale, writing pad.

**Description:**

The standing height was taken with the subject standing erect without shoes against a wall with a marked scale. The subject was instructed to keep the heels together, touching the wall with heels, buttock and back, head erect without tilt and to take and hold a full breath
and stand tall while measurement was recorded. A stiff hard board was
held vertically on his head slightly pressing his head and touching the
scale marked on the wall at a right angle. The subject was asked to step
out lowering the head and the reading indicated by the hard board at the
lower side and was read on the scale. Height was recorded to the nearest
centimeter.

Leg Length

Equipments:

Anthropometry tapes, writing pad, pencil.

Description:

To determine the leg length, the examiner faced the subject the
hands approximately four to six inches below the subjects waist on the
hip and asked the subject to swing the right leg back and forth showily
and lifting it to the outside. By manipulation, the examiner could locate
the spot where the greater trochanator entered the pelvic girdle. The
height of the greater trochanator from the floor was measured. This
procedure was followed five times with each subject. The measurement
was recorded in centimeters.

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Shoulder Width

Equipments:

Anthropometric compass, skin marking pencil.

Description:

The subjects were asked to stand erect with shoulders dropping a little forward. The investigator marked the acromial points with a skin marking pencil. While standing at the back of the subject, the tips of the two crossbars of the anthropometric compass were made to touch the acromial points on both the shoulders along with the tips of the fore fingers of the investigators so as to ensure firm grip of compass on the outer border of the acromion process with a mild pressure.

Scoring:

The measurement was recorded from the inner border of the movable crossbar of the compass, correct up to 0.1 cm.

Hip Width

Equipment:

Anthropometric compass, recording pad, pencil.
Description:

The subject was asked to stand erect with heels together and arms about six inches away from the body. The investigator stood behind the subject and applied the tips of the crossbar to the lateral most points (iliocristale) of the iliac rest pressing hard the over lying subcutaneous fat.

Scoring:

The measurement was recorded from the inner border of the movable crossbar of the compass, correct up to 0.1 cm.

Positive breath holding capacity

Equipment:

Stopwatch, recording pad and pencil.

Description:

To measure the positive breath holding capacity, the subjects were instructed to place the nose clip tightly. They were asked to inhale through the mouth to the maximum capacity. As soon as the subjects took a deep breath to the fullest capacity of their lungs and closed the lips, the stopwatch was started. As soon as the subjects opened their lips to inhale, the stopwatch was stopped.
**Scoring:**

The time given by the watch was recorded as the score of the positive breath holding capacity.

**Negative breath holding capacity**

**Equipment:**

Stopwatch

**Description:**

To measure the negative breath holding capacity, the subjects were instructed to place the nose clip tightly. They were asked to exhale through the mouth to the maximum capacity. As soon as the subjects exhale to the fullest capacity of their lungs and closed the lips, the stopwatch was started. As soon as the subjects opened their lips to inhale, the stopwatch was stopped.

**Scoring:**

The time given by the watch was recorded as the score of the negative breath holding capacity.
Sargent Jump – Lewis Nomogram

**Equipments:**

12ft. high smooth wall, measuring tape, weighing-machine and marking for the test.

**Descriptions:**

The subject fully extended his hand against the wall to reach as much he could and which was recorded and then had a explosive jump-up to cover maximum jump reach of hand. Three trials were given for each subject.

**Scoring:**

The best distance between the standing reach and 3 trials of jump reach was recorded as the score of the subject.

Anaerobic capacity (power) was recorded by using the Lewis Nomogram in Kg-m./sec. base on the Sargent jump and body weight of the subject.

**Resting Heart Rate**

**Equipments:**

Stopwatch, Stethoscope and comfortable place or bed.
**Descriptions:**

The resting heart rate of each subject was recorded between 6:00 AM to 8.00 AM. 10 minutes before recording the heart rate, the subjects were instructed to remain on resting position on their bed. By using the pulpatory method (pulse rate count) using stethoscope on the chest per minute heart rate was counted.

**Scoring:**

Score was recorded in numbers of pulse per minute.

**Resting Respiratory Rate**

**Equipment:**

Stopwatch

**Description:**

Respiratory rate was taken early in the morning. The subjects were asked to rest in supine lying position on their beds. The respiratory rate was felt by placing the hand just below the thoracic cavity that is on diaphragm. The research scholar used stopwatch for taking the respiratory rate.
Scoring:

Total number of inhalations or exhalations per minute was recorded for each of the subjects.

Body Fat

Equipment:

Skinfold Caliper.

Description:

A skinfold caliper was used to assess the body fat. The instrument consisted of accurately calibrated dial which indicated in millimeter. The thickness of the skinfold was taken when the jaws are open holding the skinfold\(^7\).

To eliminate error, the reading was made between three to four seconds, when essentially all compressions had taken place. If this precaution was not taken, the skinfold would gradually have decreased because the tissue then would squeeze out from the jaws of the caliper.

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

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the thumb and index finger and measurement was taken to the nearest millimeter from four different specific sites using the caliper.

The skinfold is taken on the anterior surface midway between the mid-inguinal point and the superior border of patella. The knee should be placed at 90°.

The skinfold is raised beneath the inferior angle of the left scapular in the direction running obliquely downwards at an angle of about 45° from the horizontal.

For calculating total body fat percentage of the subjects, Slownik Weir Nomogram Technique was used. In this technique two sites (Thigh and Subscapular) skin thickness was used.

**Scoring:**

To obtain a score of total body fat percentage, a straightedge was laid across the nomogram connecting the scores of thigh and subscapular skinfolds, where the straightedge intersected the middle scale was the total body fat percentage.

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8 Fox, Bowers and Foss, *The Physiological Basis of Physical Education and Athletics*, p.
Fig.2: Sloen-Weir Nomogram for Prediction of Total Body Fat Percentage from Skinfolds Measurement (Sub Scapular and Thigh).

Lean Body Weight

The total body weight minus the weight of the body's fat give the lean body weight$^9$.

The weight of the fat was deducted from each subject total body weight and was recorded.

Incentive Motivation Inventory

It is a test of players strength of attraction for incentives operating within goal oriented situations. Incentive motivation provides information on the athletes major reasons for participating in the competitive sports was classified into seven major incentive system viz. Excellence (Ex) Power (Po), Sensation (Se), Independence (Ind), prestige (Pr), Aggression (Agg) And Affiliation (Aff). A modified version of these incentive systems was by Alderman and Wood to examine the more specific motivation of athletes$^{10}$”. The incentive motivation inventory is an instrument preferring to evaluate the incentives perceived by young

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$^9$ Mathews, Measurement in Physical Education, p.287.

athletes as being available and attractive to them through competition sports participation.

The inventory contains 70 items. These question statements are evenly spread over the seven incentive systems i.e. there are ten question statements for each system. The subject responded using a four point ordinal scale respond inventory for each item varies from 1 (never) to 4 always) in order to accidence of the feeling. Hence the maximum response score from the total inventory is 280 minimum 70 and in case of each system response score ranged from 7 to 40, the normative response intervals for each of the systems are given below.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 18</td>
<td>low</td>
</tr>
<tr>
<td>19 - 22</td>
<td>Below Average</td>
</tr>
<tr>
<td>23 - 28</td>
<td>Average</td>
</tr>
<tr>
<td>29 - 32</td>
<td>Above average</td>
</tr>
<tr>
<td>33 - 40</td>
<td>High</td>
</tr>
</tbody>
</table>

The treatment of data emanating from the administration of IML was done in accordance with the instructions of author and objectives of the study.

**Sports Achievements Motivation Test**

Achievement motivation is an athlete's pre-disposition to approach or avoid a competitive situation. The sports achievement
motivation test is a self-evaluation questionnaire of twenty statements responses value of which extended from 0 – 40 in total. Each statement carried a maximum score of two and minimum zero. When the subject kicked the high pole part, he was given two points and when touched to low pole, he earned zero.

After constructing further studies by using SAMI the author had given the following classification criteria based on percentage and points\textsuperscript{11}.

<table>
<thead>
<tr>
<th>Low/mean score</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 24</td>
<td>Low</td>
</tr>
<tr>
<td>25 – 30</td>
<td>moderate</td>
</tr>
<tr>
<td>Above 30</td>
<td>High</td>
</tr>
</tbody>
</table>

The treatment of the data obtained from the administrating of SAMI to the subjects was done in the light of instructions contained in the test.

State and Trait Anxiety Inventory (STAI)

Spilberger along with Gorsuch and Lushana\textsuperscript{12} developed a test of state trait anxiety to measure a person's level of anxiety in specific situations which might fluctuate from one moment to the next and a test of a person's level of anxiety on a more permanent basis as indicated by personality trait.

The test is self-evaluation questionnaire and comprises two forms i.e. $Y_1$ and $Y_2$ the former being measures of situational anxiety and the latter that of trait anxiety.

In responding to the STAI, anxiety scale examines blacken the number on the standard test form to the right of each item statement that best describes the intensity of their feelings.

1. Not at all (1) somewhat (2) Moderately so (3) Very much so.

In responding to the T-anxiety scale, examiners are instructed to indicate how they generally feel by rating the frequency of their feeling of anxiety on the following four point scale.

1) Almost never (2) Sometimes (3) Often (4) Almost always

\textsuperscript{12} Speilberger, Gorsuch and Lushana, STAI Manual for the State - Trait Anxiety Inventory, pp. 4 - 7.
The questionnaire contains a number of statements from 1 to 20 that are related to state - anxiety and indicate how one feels right now that is, at this moment the statements from 20 to 40 assess level of trait - anxiety and indicate how a person generally feels.

Each STAI item is given a weighted score of 1 to 4 indicates the presence of a high level of anxiety for ten state anxiety item and eleven trait anxiety items, e.g. “I feel frightened”. “I feel upset”. A high rating indicates the absence of anxiety for the remaining ten state anxiety items and nine trait anxiety item i.e. “I feel calm”. “I feel relaxed”. The xscoring weight for the anxiety present items are reversed i.e. responses marked 1,2,3,4 are scored 4,3,2 or 1 respectively. The anxiety absent item for which the scoring weights are reverse State Anxiety. 1,2,3,8,10,11,13,14,16,19 &20.

Trail Anxiety : 21,23,26,27,33,34,36 &39.

To obtain scores for the state anxiety and trait anxiety scales, simply add the weighted scores for the inventory items that make up each scale, taking into account the fact that the scores are reversed for the above items. Scores for both the state anxiety and trait anxiety scales can very from minimum of 20 to maximum of 80.
Sports Competition Anxiety Test

The sports competition anxiety test is latest and most popular specific anxiety test whose purpose, as claimed by the authors is to assess individual difference in competition, trait anxiety or the tendency to purpose competition situation on threatening and/or to respond to these situation with elevated state anxiety.

The sports competition anxiety test (SCAT) contains fifteen items. Subjects were asked to indicate how they generally feel when they completed in sports and games, and responded to each item using a three point ordinal scale (Hardly ever, sometimes or often). Ten of the items were also included to reduce possible responses bias. Total scores of the SCAT ranged from 10 (Low competitive Trait Anxiety) to 30 (High competitive Trait Anxiety).

The ten test items were 2,3,5,6,8,9,11,12,14 & 15. The spurious items 1,4,7, 10 & 13 were not scored. Items 2,3,5,8,9,12,14 & 15 were worded so that they were scored according to following key :

1) Hardly ever = 1
2) Sometimes = 2
3) Often = 3
Item 6 and 11 were scored according to following key:

1) Often = 1
2) Sometimes = 2
3) Hardly ever = 3

If a person deleted one of the ten test items, prorated full scale scores could be obtained by computing the mean score for the nine items answered multiply this value by ten, and rounding the product to the next whole numbers.

**Statistical Techniques**

1. To characterize elite Indian Athletes by their selected physical, anthropometric, physiological and psychological variables to standard human performance measures, descriptive statistics was employed.

2. To compare the Indian athletes among sprinters, middle distance runners, long distance runners, throwers and jumpers in relation to selected physical, anthropometric, physiological and psychological variables, analysis of variance was used at 0.05 level of significance.