Chapter –III

PROCEDURE

In this chapter, selection of subjects as per the objectives of our study, tools and techniques employed for collecting the relevant data and statistical techniques applied for its analysis are described in detail.

SELECTION OF SUBJECTS

Keeping in view the objectives of our study 50 subjects each from high and low performance handball women players of our country were selected. Fifty High performance female Handball players (Winners and runners) were selected from all India Intervarsity Interzonal handball championship held at Periyar University, Salem on February 2013. Fifty Low performance female Handball players were selected from South zone handball championship (women) held at Periyar University, Salem on February 2013 and various district level tournaments.

CRITERIAN MEASURE

The criterion measures for this study was be

* Weight - Kilogram
* Anthropometrical parameters - Centimeter and mm.
* Proportionality (indices) - Ratios
* Somatotype - Grading

INSTRUMENTS

The following instruments was be used in collecting the data:

1) Anthropometric kit
2) Skin fold caliper
3) Sliding caliper
4) Measuring tape
5) Weighing machine
6) Stadio-meter

**RELIABILITY OF DATA**

The data reliability was ensured by establishing the reliability of anthropometrical and physiological instruments and tester’s competency.

**Instruments reliability**

Anthropometrical kit was used for obtaining anthropometric measurements and psychological questionnaires respectively. Instruments were of standard quality; their accuracy was ensured by the instrument manufacturers. International society for the advancements of Kinanthropometry (ISAK) approved techniques were used for obtaining anthropometrical and psychological data. The reliability was checked by test-retest method and average co-efficient was found to be 0.96.

**COLLECTION OF DATA**

The handball players of the two categories were approached through coaches and managers of the teams participating in the above mentioned tournaments. The anthropometrical and psychological measurements were taken in the way described below.

**(A) Anthropometric measurements**

The delimited anthropometrical measurements of selected body parts of high and low performance handball players were taken in the following way.
1) Weight

The subject was examined in clothing of known weight in order to record
nude weight with the help of weighing machine.

2) Stature

Stature was taken as the maximum distance from the point vertex on the
head to the ground. Subject was made to stand erect with heels together and arms
hanging naturally by the side and head in the Frankfort plane, along a wall on
which was fixed a measuring tape.

3) Sitting height

The subject was made to sit on the stool with his legs hanging down freely.
The subject was asked to stretch his back as far as possible and hold his head up
right so that Frankfort plane become horizontal gentle upward pressure was applied
to the mastoid process. The muscles of the thigh and buttocks are contracted in
order to stretch him full. The horizontal bar of the anthropometer rod was brought
down so that it touched the highest point on the head. The distance between
anthropometer rod and the highest point of the stool was measured.

4) Femur bi-epicondyler diameter

The subject was made to sit and the right leg was flexed at the Knee to form
a right angle with thigh. The distance between medial and lateral epicondyler of
the femur was measured with the help of sliding calliper and the value was
recorded.

5) Humerus bi-epicondyler diameter

The subject’s right arm was raised forward to the horizontal and the forearm
flexed to right angle at elbow. The distance between medial and lateral epicondyler
of the humerus was measured with the help of sliding caliper and the value was recorded.

6) **Shoulder width**

   The subject was made to stand erect with the arms hanging loosely at the side. Sliding caliper was applied between the most lateral points on the acromion process. Caliper was applied from behind the subject and the branches of caliper were at an angle $45^0$ from the horizontal plane.

7) **Hip width**

   The subject was made to stand erect with sliding caliper applied from behind the subject, so that the branches of sliding caliper were at most lateral points on the superior border of the iliac crests.

8) **Upper arm length**

   The subject was made to stand erect with arm hanging down normally with the palm of right hand directed towards the thighs. Interior border of acromion process and the external superior border of the hand of the radius were marked. The distance of these two points was measured with the help of measuring tape and value was taken.

9) **Lower arm length**

   The subject was made to stand normally with arm hanging down normally. Radial and styallion were marked on right arm. The distance between these two points was measured with the help of measuring tape and value was taken.

10) **Hand length (palm & fingers)**

    The subject was made to stand normally with arms hanging down. Right arm was made erect with palm and fingers directed towards thigh and then we
measured the straight distance from the point stallion radial to dactylion 3, with the help of measuring tape.

**11) Total arm length**

The subject was made to stand normally with arms hanging down. Right arm with hand (Palm and Fingers) was made straight. Distance from Acrominon to Dactylion 3, with the help of measuring tape.

**12) Wrist width**

It means the width between the most medial and lateral points of the distal epiphyses of radius and ulna. The subject was made to sit with hand extended downwards and palm facing forward. The measurements were taken with sliding caliper at right angles to the axis of forearm, with firm pressure on the cross bars of sliding caliper.

**13) Biceps skin fold**

Vertical skin fold was measured at the anterior aspect of the right arm with arms hanging relaxed at the sides with right palm directed interiorly. The jaws of the calipers were applied to the fold and after waiting for 2 to 3 seconds the reading was taken. One more reading was taken in the same way and average of the two was the final score

**14) Triceps skin fold**

The mid acromiale-radial line on the posterior surface of the right arm was marked and the skin fold about one centimeter above marked level was picked up and jaws of the calipers were applied to the fold and after waiting for 2 to 3
seconds the reading was taken. One more reading was taken in the same way and average of the two was the final score.

15) **Sub-scapular skin fold**

A point below the right scapula was marked. The skin fold about one centimeter below marked level was picked up and jaws of the caliper were applied to the fold and after waiting for 2 to 3 seconds the reading was taken. One more reading was taken by the same procedure and average of the two was the final score.

16) **Supra iliac skin fold**

A point above the anterior superior iliac spine on the line to the anterior axillary's border of right side was marked. The skin fold about 2 to 5 centimeter above marked level was picked up and jaws of the caliper were applied to the fold and after waiting for 2 to 5 seconds the reading was taken. One more reading was taken by the same procedure and average of the two was considered.

17) **Calf skin fold**

The subject was made to sit on a chair with knees bent at right angles. Medial side of the right calf, slightly above the level of the maximum girth was marked. The skin fold above the marked level was picked up and jaws of the caliper were applied to the fold. After waiting for 2 to 3 seconds the reading was taken. One more reading was taken by the same procedure and average of the two was considered.

18) **Biceps muscles girth**

The subject was made to raise his right arm to the horizontal position in the sagittal plane with the fully supinated forearm flexed at the elbow to an angle of 45°. The subject was encouraged to ‘Make a muscle’ by fully tensing his biceps.
The measurement was taken with the help of measuring tape wrapped at right angles to the long axis of the upper arm where the maximum girth was affected.

19) Calf muscles girth

The subject was made to stand erect with body weight equally supported on both legs. The measuring tape was wrapped around the right lower leg and measurement was taken at right angles to the axis of lower leg where it was maximum.

20) Thigh length

The subject was made to stand erect with weight equally distributed on both legs. Trochanterion and tibial lateral of the right leg were marked. The distance between these two points were measured with the help of measuring tape.

21) Lower leg length

The subject was made to stand erect with weight equally distributed on both legs. Tibial of the right leg was marked. The distance between tibial and floor was measured with the help of measuring tape.

22) Somatotype

The following Heath and Carter (1990) method was applied to determine Somatotype of subjects;

**Endomorphic Ratings**

-0.7182 + 0.1451 × *∑SF - 0.00068 × *∑SF² + 0.0000014 × *∑SF³

[Where SF = sum of triceps, sub scapular and supraillic skin fold multiplied by 170.18/height in centimeter].
Mesomorphic Ratings

0.858 × humerus breadth + 0.601 × Femur breadth + 0.188 × *Corrected arm girth + 0.161 × *Corrected calf girth – height × 0.131 + 4.5

(* Subtract the triceps skin fold and calfskin fold from the arm girth and calf girth, respectively).

Ectomorphic Ratings: - The ectomorphy was determined by comparing the calculated height, weight ratio (HWR) of the subject with the underline values given below.

\[
HWR = \left[ \frac{\text{height(cm)}}{3\sqrt{\text{weight(kg)}}} \right]
\]

- If HWR is greater than or equal to 40.75 than ectomorphy = 0.732 * HWR - 28.58
- If HWR is less than 40.75 and greater than 38.25 than ectomorphy = 0.463*HWR-17.68
- If HWR is equal to or less than 38.25 than Ectomorphy = 0.1

(B) PSYCHOLOGICAL PARAMETERS

The delimited psychological variables of high and low performance handball players were taken in the following way.

1. Achievement Motivation

Sports Achievement was measured by sports achievement motivation test (SMAT) developed by M.L. Kamlesh (1990). The SMAT carrying test retest reliability as 0.70. The SMAT is a self evaluation questionnaire of twenty
statement response values of which extend from 0-40 total. Each statement carry a maximum score of 2 and minimum of Zero. After constructing further author has given classification criteria based on percent and point as 0-24 (Low), 24-30(moderate) and 30-40( High).

2. **State Trait Anxiety**

   State trait anxiety was measured by using State Trait Anxiety Inventory (STAI) developed by Spielberger and his associates which first published in 1977. The Revised version of STAI was republished in 1983. STAI based on a 4-point Likert scale. The STAI measured two types of anxiety state anxiety and trait anxiety. The score range of STAI start from 20 to 80 points, higher scores shows higher level of anxiety. The most current revision of this is form Y.

3. **Sports Competition Anxiety**

   Sports Competition Anxiety was measured by using Martens Sports Competition Anxiety Test developed by Martens (1977).

   Sports competition anxiety test questionnaire (SCAT) prepared by Rainer Martens (1986), was originally constructed for children (ages 10-15) its adult version was developed later on by suitably modifying the instructions and items. The reliability quotient at 0.85 had been reported for the adult version of SCAT.

   The Sports Competition Anxiety Test questionnaire presents 15 items. The subjects were asked to indicate how they commonly felt in competitive sports situations and responded to each item using a 3 point ordinal scale (often, sometimes, or hardly ever).

   Out of fifteen items, only ten items were score rest of five item were not scored. These ten items were: 2, 3, 5, 6, 8, 9, 11, 12, 14, and 15. The remaining
five test items were the spurious items which were added to the questionnaire to diminish response bias towards the actual test items. These five spurious items were : 1, 4, 7, 10 and 13 not scored.

The scholar scrutinized the completed questionnaire in order to ensure that the subject responds to every item and there was no question left unanswered. The items 2, 3, 5, 8, 9, 12, 14 and 15 were worded in such a manner that they were scored according to the following key:-

<table>
<thead>
<tr>
<th>Score</th>
<th>Mean Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hardly ever</td>
</tr>
<tr>
<td>2</td>
<td>Sometimes</td>
</tr>
<tr>
<td>3</td>
<td>Often</td>
</tr>
</tbody>
</table>

In the case of items 6 and 11 scoring was carried out according to the following key:-

<table>
<thead>
<tr>
<th>Score</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Often</td>
</tr>
<tr>
<td>2</td>
<td>Sometime</td>
</tr>
<tr>
<td>3</td>
<td>Hardly ever</td>
</tr>
</tbody>
</table>

However spurious questions i.e. 1, 4, 7, 10, and 13 were not be scored as suggested by Rainer Martens.
STATISTICAL PROCEDURE

Reiterating the objective of the study we have to point out that we intend to investigate the anthropometrical and psychological differentials between high and low performance handball players. Thus, Z test is used to test the significance of difference between psychological and anthropometrical parameters of high and low performance handball players. Z test is based on normal probability distribution and is used for judging the significance of several statistical measures, particularly the mean. It is the most frequently used test in research and is generally used for judging the significance of difference between means of two independent samples, when sample size is more than 30 (Verma, 2000).

LEVEL OF SIGNIFICANCE

The differences in various variables of high and low performance handball players were tested at 0.05 level of significance.