Chapter –III

METHOD AND PROCEDURE

In this chapter the sample of the study, the tools/measurements, procedure for collection of data have been described.

3.1 Research Problem:

The previous studies already conducted are silent about the motor performance and its relationship with the developmental age, which is of great importance in the field of sports, since motor performance and physical fitness components have direct relationship with maturity status. Since there is lack of studies in India and particularly in Punjab, especially longitudinal, to look into maturation process during adolescence among school going students, the processed study is an attempt in this direction.

Here the present problem can be stated as follow: "A longitudinal study of assessment of developmental age and its relationship with motor performance tests in boys of 12 to 18 years."

3.2 Sample of the Study:

Sampling is an essential process in the field of research, especially in longitudinal study where the investigator wants to collect data at different times in continues method from a particular population, as it is not possible for him to approach each and every member of the population. So, a research worker has to resort to sampling technique which leads to the selection of the sample, which is the representative of the population. The conclusions are drawn and generalizations are made about the whole population. The process of using a part as a basis for an estimate of the whole population is known as sampling. Practically all research studies in education are of a type in which information and data are obtained from relatively small group of individuals. Such studies are known as sampling studies.
There are several methods of sampling such as stratified sampling, purposive sampling, incidental sampling and random sampling. In the present study an effort was made to employ purposive sampling technique. Purposive sampling technique was employed to collect data from the boys 12 to 18 years of different schools of Punjab.

The data of 350 boys ranging in age from 12 to 18 years were collected from different schools of the Punjab. The subjects were divided into 7 age groups i.e. (12, 13, 14, 15, 16, 17 and 18 years). Each group contains 50 subjects. The date of birth was converted into decimal age and categorized in to 7 age groups. The subjects following in the age groups of 11.501-12.500 were considered as 12 years similarly the other age groups were formed.

**CATEGORIZED DIFFERENT AGE GROUPS CONSIDERATION 12 TO 18 YEARS**

<table>
<thead>
<tr>
<th>Age group</th>
<th>Age group considered as</th>
<th>No. of subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.501 to 12.500</td>
<td>12 years</td>
<td>50</td>
</tr>
<tr>
<td>12.501 to 13.500</td>
<td>13 years</td>
<td>50</td>
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<tr>
<td>13.501 to 14.500</td>
<td>14 years</td>
<td>50</td>
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<tr>
<td>14.501 to 15.500</td>
<td>15 years</td>
<td>50</td>
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<tr>
<td>15.501 to 16.500</td>
<td>16 years</td>
<td>50</td>
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<tr>
<td>16.501 to 17.500</td>
<td>17 years</td>
<td>50</td>
</tr>
<tr>
<td>17.501 to 18.500</td>
<td>18 years</td>
<td>50</td>
</tr>
</tbody>
</table>

The data collected from different schools of Punjab are as follows:

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name of the School</th>
<th>12 Yrs</th>
<th>13Yrs</th>
<th>14Yrs</th>
<th>15Yrs</th>
<th>16Yrs</th>
<th>17Yrs</th>
<th>18 Yrs</th>
</tr>
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<tbody>
<tr>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Sports academy Hoshiarpur</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>8</td>
<td>4</td>
</tr>
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<tr>
<td>2</td>
<td>Sports wing Mahilpur</td>
<td>7</td>
<td>9</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>Sports wing Kharar Achharwal</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>7</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>King Edward Public School near Gharshanker</td>
<td>8</td>
<td>7</td>
<td>5</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Govt. Sen. Sec. School Nangal</td>
<td>8</td>
<td>7</td>
<td>4</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>Govt. High School Tuto Majara</td>
<td>4</td>
<td>6</td>
<td>10</td>
<td>7</td>
<td>4</td>
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<td>2</td>
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<tr>
<td>7</td>
<td>Sen. Sec. School Massanian</td>
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<td>7</td>
<td>6</td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Sports wing Paldi</td>
<td>7</td>
<td>5</td>
<td>7</td>
<td>3</td>
<td>9</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Total Subject</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

### 3.3 Tools:

Health related physical fitness is defined as the ability to perform strenuous activity without fatigue, showing evidence of traits that limit the risks of developing diseases and disorders which reflects a person’s functional capacity. Health and physical fitness is important to everyone and should be stressed by physical educators and medical people alike. (Tancred 1987)

American Alliances of Health, Physical Education, Recreation and Dance (AAHPERD) (1980) health related physical fitness tests were used to measure health related physical fitness.
3.3.1 MOTOR FITNESS VARIABLES: -

Motor Fitness performance of subjects of age 12 to 18 years at different levels is taken by applying Motor fitness test variables (Singh, 1991) as given below: -

1. Speed: 50 mtr. Run
2. Cardiovascular Endurance 2.4 K .m.
3. Agility Fan Test

Description of Test:

1. **Speed: (50 mtr. Run):**

   **Equipment:** :-

   Stop watches 3 to 5, measuring tape, lime powder, whistle.

   **Testing Procedure :**

   The test was conducted outdoor in the school track/football field or any other even space was used as per availability. To achieve the valid and reliable results, the students were prepared as follows:

   Assurance was obtained that no student had any medical problem which indicates vigorous exercise. Students were allowed to practice distance running with emphasis placed on the concept of pace. Students were also properly motivated. Students were instructed to run in the groups from 3 to 5 each.

   The students are asked to stand at the starting point and on the command of go, they ran all out up to the finishing point in two attempts with the minimum rest period of at least five minutes in between and time is recorded in seconds.

2. **Cardiovascular Endurance (2.4 K .m.):**

   **Equipment:** :-

   Stop watches 3 to 5, measuring tape, and lime powder, whistle.
**Testing Procedure:**

The subjects were asked to stand at the starting point and on the command, run at an even pace and close to the inner edge of the track. This test conducted was once and the time is recorded.

3. **Agility (Fan Test):**

**Equipment:**

- Stop watches 3 to 5, measuring tape, lime powder, whistle, cone.

**Testing Procedure:**

The subjects were asked to stand at the starting point and on the command go, at optimum pace and touch the different angles in minimum time. The test was conducted in two attempts with the five minutes rest period in between. The time is recorded in seconds.

4. **Explosive Strength of Legs**

(i) **Standing Broad Jump**

**Equipment:**

- Measuring tape, lime powder, Mat or smooth landing area.

**Testing Procedure:**

The subject stand just behind the take off line, which is one meter away from the landing pit. Both feet are parallel and several inches apart by bending knees and taking arm swing, the subject jumps forward without touching the take off line. Three attempts were given with the little rest in between and distance was recorded in cm

(ii) **Vertical Jump**

**Equipment:**

- Measuring tape, lime powder, vertical wall and water. A black board 200 cm high and 60 cm wide was fixed on the wall 155 cm above the ground. The board was divided by horizontal lines placed 5 cm...
cm apart. The exact height above the ground was written on the board every 10 cm in order to facilitate the reading of the results.

**Testing Procedure:**

In this test the subject with bare feet facing the wall without raising his heels, extends his one arm upward to the maximum level along the scale (marked on the wall). This level is recorded as standing reach of the subject. Then he puts chalk powder on the tips of the fingers of the hand and stands facing toward wall and away 20 cm and parallel to the wall by bending his knees and taking arm swing, he jumps vertically up and makes a mark on the scale with his hand as high as possible. There should be no double jump. Three attempts are given with a little rest period in between and distance is recorded in cm.

**Age (years):** -

The date of birth of each subject was taken from the documentary record of the school and the date of birth data were converted into decimal age by using Tanner’s calendar (1964).

### 3.4 Anthropometric Variables

The body development index (BDI) was determined by taking the following Anthropometric measurements: -

1. Body weight (kgm)
2. Body height (cm)
3. Forearm circumference (cm)
4. Bicrominal breadth (cm)
5. Billiospinal breadth (cm)

The technique used for taking various Anthropometric measurements were as follows: -

1. **Body weight (kg):**
   
   **Equipment:**
   
   Standard weighing machine.
**Procedure:**

The subject, wearing minimal clothing, stood erect in the center of the scaled platform of a standard portable weighing machine and the weight was recorded to the nearest half of kilogram. The zero of the scale was checked before taking each measurement. The same portable machine was used for all subjects.

2. **Height (cm):**

**Equipment:**
Anthropometric rod vertical wall and leveled surface.

**Procedure:**

It is the vertical distance from the vertex to the horizontal ground. The stature was measured with an anthropometric rod. The measurement was taken with the subject standing straight against an upright wall, touching it with heels, buttock and back. The head was oriented in the Frankfurt plane (the upper border of the tragus of the ear or the tragion and the lower border of the eye socket were on a horizontal line), and the heels were together, and the hands were hanging downwards. The subject was stretched upward by a gentle traction on the mastoid region, taking care that the heels were kept on the ground. The anthropometer was held vertically in front of the subject in mid sagittal plane and the horizontal movable bar was brought down to touch the point vertex. The stature was recorded in the cm.

3. **Forearm circumference (cm):**

**Equipment:**
Anthropometric rod

**Procedure:**

It is the maximum circumference of the forearm usually recorded proximal to the elbow joint. The arm of subject was hanging normally and relaxed and measurement was taken at the level of maximum development.
4. **Biacromial breadth (cm):**

**Equipment:**
- Anthropometric rod

**Procedure:**

It is maximum width of the shoulder when shoulders are relaxed and slumping forward. The subject was asked to stand erect and the shoulder dropping a little forward. The measurement was taken between the outside edges of both the acromion processes, from the backside of the subject.

5. **Biilliospinal breadth (cm):**

**Equipment:**
- Anthropometric rod

**Procedure:**

It is the maximum width between the tip of the anterior superior iliac spine of both the sides.

The subject was asked to stand erect. The bars of anthropometer were applied to the tips of antrio-posterior iliac spine of both the sides from the front side of the subject and reading was recorded.

Standard instruments and techniques as given by Weiner and Lourie, (1969) was used for taking these measurements as given by Wutscherk, (1982).

In India Singh et.al. (1992) and Kaur (1993) also attempted to assess skeletal maturity from radiographs of left hand-wrist which can provide useful clues regarding the developmental process of Indian growing children but still the work pertaining to skeletal maturity assessment of different populations of India are scanty.

Sharma and Krishnan (1987) and Kumar et. al. (1987) estimated for the first time those developmental ages of male and female children of India through Body Development Index method (B.D.I). This method is popular in Germany and it involves only the five anthropometric
measurements. Kumar et. al. (1989) used this same method to find out the biological age of 12 to 14 Years girls. Rajni (1993) estimated developmental age of Wrestlers and Boxers by using B.D.I. method.

The formula to calculate BDI was used to find out body development index of each subject, the method is explained as follows:

\[
\text{B.D.I.} = \frac{\text{Middle Breadth} \times \text{Forearm circumference Breadth}}{\text{Body Height (cm) \times 10}}
\]

\[
\text{Middle Breadth} = \frac{\text{Bicromial Breadth} + \text{Biliospinable Breadth}}{2}
\]

\[
\text{Forearm circumference (corrected)} \times (\text{F.A.Circumference (given)} - \text{R. I. (correction value)}).
\]

\[
\text{R.I. (Rohrer Index)} = \frac{\text{Body Weight (kg) \times 10}}{\text{Body Height}^3 (meters)^3}
\]

To find out correction value for forearm circumference, the obtained R.I. value has been referred to the table 1. given by Wutcscherk, (1973) (Appendix-1)

The body Development Index of 350 subjects of each age group was calculated on the bases of longitudinal investigation i.e. after every six months. This way every subject was measured six times. The variations in the growth were also determined by considering the mean values of chronological and developmental ages. Such variations can be considered fewer than three categories viz early, normal and late developers. For examples subjects having one-year difference considered as normal individual. The subjects having different of two years or more in ascending manner are considered as early matures and the subjects having the difference of two years or more in descending manner considered as late matures.