CHAPTER-III

METHODS AND MATERIALS

With the help of the scientific and systematic process of research, the investigator had to proceed step by step. This heading deals with the sampling of subjects, criterion measure, equipments used and administration of tests for data collection and the last one is the statistical procedure used in this study.

3.1 Subject

A total of 600 hundred children age category of ten, eleven and twelve years were selected for the study. There were three age groups, i.e., ten, eleven and twelve years, for both boys and girls of rural and urban areas. Age was recorded in completed years. Equal numbers of subjects were selected from rural and urban areas. The number of subjects for each group was 50 boys and 50 girls for any age group. Subjects were selected from six rural schools, four from Nadia District and two from South 24 Parganas and eight urban schools, six from Kolkata and two from Howrah of West Bengal, India. In selecting a subject for the study, systematic random sampling procedure was followed. The willing students of the schools having roll no. 1, 6, 11, 16, 21, ..... were considered as a subject, if they did fulfill the age criteria of the study. The subjects’ distribution according to school presented in the Table-1 and Table-2 as follows:

Table-1: Distribution of subjects according to age, gender and locality

<table>
<thead>
<tr>
<th>Age Group</th>
<th>No of Subjects</th>
<th>Locality</th>
<th>No. of Boys</th>
<th>No. of Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-Year</td>
<td>200</td>
<td>Rural (N=100)</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban (N=100)</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>11-Year</td>
<td>200</td>
<td>Rural (N=100)</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban (N=100)</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>12-Year</td>
<td>200</td>
<td>Rural (N=100)</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban (N=100)</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>
Table-2: Subjects selected from different schools

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the Schools</th>
<th>Locality</th>
<th>Gender</th>
<th>No. of Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Majdia Rail Bazar High School (H.S.), Nadia</td>
<td>Rural</td>
<td>Boys=76</td>
<td>76</td>
</tr>
<tr>
<td>2</td>
<td>Atghara Kalikrishna Vidyapith (H.S.), South 24 Parganas</td>
<td>Rural</td>
<td>Boys=09</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Girls=09</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Shibnibus sri sri Mahananda High School, Nadia</td>
<td>Rural</td>
<td>Boys=27</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Girls=29</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Sambhunagar High School (H.S.), South 24 Parganas</td>
<td>Rural</td>
<td>Boys=20</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Girls=23</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Shibmohini Kannya Vidyapith, Nadia</td>
<td>Rural</td>
<td>Girls=69</td>
<td>69</td>
</tr>
<tr>
<td>6</td>
<td>Bhajanghat High School, Nadia</td>
<td>Rural</td>
<td>Boys=18</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Girls=20</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Santragachi Kedarnath Inst. for Girls, Howrah</td>
<td>Urban</td>
<td>Girls=56</td>
<td>56</td>
</tr>
<tr>
<td>8</td>
<td>Santragachi Kedarnath Institution, Howrah</td>
<td>Urban</td>
<td>Boys=45</td>
<td>45</td>
</tr>
<tr>
<td>9</td>
<td>Barisa High School, Kolkata</td>
<td>Urban</td>
<td>Boys=8</td>
<td>08</td>
</tr>
<tr>
<td>10</td>
<td>Atul Krishna Roy Vidyalaya for Girls, Kolkata</td>
<td>Urban</td>
<td>Girls=32</td>
<td>32</td>
</tr>
<tr>
<td>11</td>
<td>Srepur Siksha Sadan High School, Kolkata</td>
<td>Urban</td>
<td>Boys=35</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Girls=28</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Boral High School, Kolkata</td>
<td>Urban</td>
<td>Boys=33</td>
<td>33</td>
</tr>
<tr>
<td>13</td>
<td>Kamrabad High School, Kolkata</td>
<td>Urban</td>
<td>Girls=34</td>
<td>34</td>
</tr>
<tr>
<td>14</td>
<td>Bansdroni Chakdah Vidyamandir, Kolkata</td>
<td>Urban</td>
<td>Boys=29</td>
<td>29</td>
</tr>
</tbody>
</table>

Altogether No. of Subjects (Rural + Urban) = 600

3.2 Criterion Measure

Growth pattern, motor ability and cognitive ability were taken as the criteria measured for the study. The three criterion measure had a few variables in
each, those were: for Growth Pattern- (a) height, (b) weight and (c) body mass index (BMI); for Motor Ability- (a) speed, (b) agility, (c) power, (d) co-ordination, (e) balance and (f) reaction time. And for Cognitive Ability- (a) choice reaction time (CRT) and (b) kinesthetic perception.

3.2.1 Tools Used for Data Collection

Appropriate tools were used while measuring the subjects in each variable. Those were:

i) Measuring tape, scale, standard weighing machine, marking chalk, data collection form.

ii) Stop watch (two) wooden blocks – 2x2x4 inches (two).

iii) Soft ball, metal stakes, yard sticks.

iv) An electronic reaction timer, blindfold equipment, suitable space according to test.

3.2.2 Administration of Test for Data Collection

For speed, agility, power and co-ordination, AAHPER Youth Fitness Test (1976) was used. To measure balance ability, stork stand test of Johnson (1970) was used. Simple and choice forms of reaction times were measured through electronic reaction timer. Perception was measured by kinesthetic perception test of Johnson (1970).

3.2.3 Personal Data

Age: The researcher had collected the date of birth of the subjects from their school admission resister. After collecting their date of birth, age of a subject was considered in completed years. The age groups of the study were 10 years, 11 years, and 12 years.

3.3 Measurement Of Growth Pattern

3.3.1 Height

Objective : To measure stature of a subject.

Equipment used : Steel measuring tape and one wooden scale ruler.
**Procedure:** The height of the subject was measured by simple method. The subjects were directed to stand erect in barefooted on the floor touching the back of the heel against a marked wall. The subjects stood in such a way that the head touched against the wall; now, the scale was placed in such a way that it touched the vertex (mid-point) of the head and make a right angle with the wall. The vertical distance from the floor where the scale touched the wall measured in centimeter and this was considered as the height of the subjects.

**Score:** The score was the nearest 0.5 cm in vertical height.

### 3.3.2 Weight

**Objective:** To measure body mass of a subject.

**Equipment used:** Standard weighing machine.

**Procedure:** The subject stood on the platform of the weighing machine. Taking the pointer with zero of the scale, the subjects were asked to stand erect on the machine keeping body weight equally distributed on both feet. The actual measurement was taken when the pointer had no movement with subjects in motionless position.

**Score:** The score was recorded to the nearest 0.5 Kg.

### 3.3.3 Body Mass Index (BMI)

**Objective:** To obtain weight-to-weight ratio of a subject.

**Procedure:** BMI is a derived measurement from height and weight of an individual. BMI was obtained from the following formula:
BMI = Weight (in Kg) / Height\(^2\) (in meter).

**Score:** The obtained ratio was recorded as the score in Kg/m\(^2\) unit.

### 3.4 Measurement of Motor Ability

#### 3.4.1 Speed

**Tool used:** 50-Yard Dash (AAPHER-Youth Fitness Test, 1976).

**Objective:** To measure speed of the subjects.

**Equipments used:** Two stop watches, a suitable running area to allow the 50-yard run plus extension for stopping was used.

**Procedure:** Two subjects ran at a time. Both started from a standing position. On command “Ready, Go” the subjects started running till crossed the finish line. The subjects were asked to run as fast as possible across the finish line for their best performance.

**Score:** The elapsed time from the starting signal until a subject crossed the finish line was measured to the nearest tenth of a second.

#### 3.4.2 Agility

**Tool used:** 4×10-Yard Run (AAPHER-Youth Fitness Test, 1976).

**Objective:** To measures change of direction of the body.

**Equipment used:** Two wooden blocks of 2×2×4 inches dimension and one stop watch, and an unobstructed running area for the test.

**Procedure:** Each subject started from a standing position behind the starting line. Behind the other line two wooden
blocks wood were placed. At the starting signal the subject raced to the blocks, picked one up, and ran back to the starting line. Then the subject had to do the same thing once more with less possible time.

**Score:** Lowest time of two trials was the score. Time was recorded to the nearest tenth of a second.

### 3.4.3 Coordination

**Tool used:** Softball Throw for Distance (AAPHER-Youth Fitness Test, 1976).

**Objective:** To measure coordination ability of the subjects.

**Equipment used:** Two softballs, one measuring tape and three small metal marking sticks. A football field marked in five-yard intervals.

**Procedure:** The subject had thrown the softball from within a 6 feet restraining area which was drawn parallel to the five-yard field markers. The ball’s point of contact was marked. Three trials were given to each subject.

**Score:** The distance to the nearest feet of the best of three trials was the score.

### 3.4.4 Power

**Tool used:** Standing Broad Jump (AAPHER-Youth Fitness Test, 1976).

**Objective:** To measure explosive power of the subjects.

**Equipment used:** An outdoor jumping pit and a measuring tape and nail.

**Procedure:** The subjects stood behind the take-off line, swung the arms backward and bended the knees, then
jumped as far forward as possible. Three trials were given. One demonstration was given before the test.

**Score:** The distance was measured from the take-off line to the point of contact by the heel or other part of the body which was nearest to the take-off line. The distance of the best of the three trials to the nearest inch was the score.

### 3.4.5 Balance

**Tool used:** Stork Stand Test (Johnson, 1970).

**Objective:** To measure the balance ability of the subjects.

**Reliability:** The reliability of the test is 0.87.

**Validity:** Face validity was accepted for this test.

**Equipment used:** One stop watch.

**Procedure:** From a standing position of each subject’s dominant leg, placed the other foot on the inside of the supporting knee and place the hands on the hips. Then given signal to raise the heel from the floor and maintain the balance as long as possible without moving the ball of the foot from its initial position or letting the heel touch the floor. Three trials were given to each subject.

**Score:** The score was the best of three trials in nearest one-tenth of a second.

### 3.4.6 Simple Reaction Time

**Objective:** To measure reaction ability or response ability of a subject.

**Equipment used:** An electronic reaction timer having the capacity to measure 1/100 fraction of a second.

**Procedure:** A subject seated comfortably and asked to concentrate in a calm and quiet classroom, then asked to place his/her finger on the button of the reaction timer. Instruction was given to press the finger when the subject viewed a light signal of the reaction timer machine. The chronoscope started with the presentation of a stimulus and stopped where the button is no
longer depressed. Ten trials were given to each subject. Time was recorded to the nearest 1/100th of a second.

**Score**: Average of ten trials was the score.

### 3.5 Measurement of Cognitive Ability

Cognitive ability was measured by choice reaction time and kinesthetic perception of depth, size and sense of space.

#### 3.5.1 Choice Reaction Time

**Objective**: To measure decision making ability through stimulus discrimination.

**Procedure**: In case of CRT two stimuli (red light and green light) were used at random. The subjects were instructed to respond exactly according to the stimuli. Ten trials were given. Time was recorded to the nearest 1/100th of a second.

**Score**: Average of ten trials was the score of CRT of a subject.

#### 3.5.2 Kinesthetic Perception

Kinesthetic perception was measured through three test items- DPJ, PKTS and VLST. To measure these abilities the tests of Johnson (1970) was used.

##### 3.5.2.1 Distance Perception Jump (DPJ)

**Objective**: To measure the perceptual ability in relation to the depth of an object.
Reliability: A reliability coefficient is 0.44.

Validity: Face validity.

Equipment used: One yardstick, one blindfold material and a marker.

![Diagram of DPJ]

Procedure: The subjects were instructed to sense the distance between the two lines without a practice trial. The performer was then blindfolded and instructed to jump from behind one line toward the other line trying to land the heels as close to the line as possible. Two trials were given to each subject. The performance was the distance between the heels and the target line on both sides measured to the nearest quarter of an inch.

Score: Two trials were totaled for the score.

3.5.2. 2 Pedesterial Kinesthtic Test of Size (PKTS)

Objective: To measure the perceptual ability of the subject in relation to size of an object.

Reliability: The test retest score is 0.90.

Validity: Face validity.

Equipment used: A marking chalk and one measuring tape.
Procedure: The subjects stood erect with the eyes closed and the heels touching and then stood to separate the heels so that the medial sides of the heels were twelve inches apart. The subjects instructed to mentally concentrate on the length of a twelve inch ruler before each of three trials. The deviation from the preferred score of 12 inches was measured with a yardstick to the nearest one-fourth of an inch. Three trials were given to each subject.

Score: The total amount of deviation in the three trials was the score in inch.

3.5.2.3 Vertical Linear Space Test (VLST)

Objective: To measure the kinesthetic ability to determine a specific position along a vertical line to perceive the size of a space.

Reliability: Test-retest correlation was 0.30.

Validity: Face validity.

Equipment used: A yardstick, one blindfold equipment and a measuring tape.
**Procedure of test:** A yardstick vertically taped to a wall in front of the seated subjects at a height where the 16-inch mark was about eye level for the average student. The subjects were instructed to look at the 16-inch mark and sense its position. Without a practice trial each subject was blindfolded and instructed to point to the mark indicated. Three trials were given. The deviation from the desired mark was recorded to the nearest quarter of an inch for each trial.

**Score:** Total deviation of the three trials was the score in inch.

**3.6 Statistical Procedure Used**

To come into definite conclusion through data interpretation the statistical procedures adopted for this study were:

1. Mean
2. Standard Deviation
3. Three-way ANOVA
4. Independent t-test
5. Post-Hoc LSD test