CHAPTER III
METHODOLOGY

The selection of subjects, collection of data, selection of the test battery and test items, criterion measures, experimental design, the procedure and administration of the tests, the reliability of data and the statistical techniques used are presented in this chapter.

SELECTION OF SUBJECTS

The subjects were 6000 school children of the state of Kerala. They were divided into two age groups i.e., 12 years to 13 years and 13 years to 14 years and each age group have had 1500 girls and 1500 boys.

COLLECTION OF DATA

The data for the purpose of this study was collected from various schools from the coastal and hilly areas of Kerala state. Around 6000 students were evaluated from five coastal and five hilly districts of Kerala state. 3000 students were evaluated from the coastal areas of Thiruvananthapuram, Kollam, Alappuzha, Ernakulam and Thrissur and the same number of students from the hilly areas of five districts namely Pathanamthitta, Idukki, Wayanad, Kottayam and Palakkad, thereby making the students strength from each district to 300. Thus 150 male and 150
female school children belonging to a particular age group were tested from a single district. Fifteen subjects were selected randomly from each of the age group from five schools of a district from the enrolment rolls as on the 6th working day of an academic year.

**SELECTION OF THE TEST BATTERY AND TEST ITEMS**

The Asian health-related physical fitness test battery being proposed by the regional board of International Council for Health Physical Education Recreation Sport and Dance (ICHPER.SD) was selected and used for the purpose of the study to measure health-related physical fitness components.

The ICHPER.SD Asian health-related physical fitness test battery consists of the following items namely One mile run (Cardio-respiratory endurance), Sit-ups in 60 seconds (Abdominal strength and endurance), Modified Pull-ups (Shoulder strength), Sit-and-reach test (Flexibility of the low back and posterior thighs) and Sum of triceps and calf skinfold measurement (body composition).

**CRITERION MEASURES**

The criterion measures of the selected variables used are:

1. Cardio-respiratory endurance was recorded in minutes and seconds.
2. Abdominal Strength was recorded in numbers.
3. Shoulder strength was recorded in numbers.

4. Flexibility was recorded in centimetre.

5. Body composition was recorded in millimetres.

EXPERIMENTAL DESIGN

The experimental design used for this study was simple random group design and the subjects were randomly selected from each of the age group from five schools of a district from the enrolment rolls as on the 6th working day of an academic year.

THE PROCEDURE AND ADMINISTRATION OF THE TESTS

ICHPER-SD Asia Youth health-related physical fitness test was conducted on the subjects to measure health-related physical fitness.

1. 1 mile run (Cardio-respiratory endurance)

   Equipment: Stop watch

   Purpose: The purpose of the one-mile run was to measure maximal functional capacity and endurance of the cardio-respiratory system.

   Test Description: Subjects were instructed to run one mile in the fastest possible pace. The subjects begin on the signal, "ready, start". As they cross the finish line, elapsed time were announced to the participants. Walking is
permitted, but the objective is to cover the distance in the shortest possible time.

**Scoring**: Time was recorded in minutes and seconds.

2. **Sit-ups in 60 seconds (Abdominal strength and endurance)**

**Equipment**: Stop watch, Gymnastic mats.

**Purpose**: The purpose of the Sit-ups test was to evaluate the abdominal muscular strength and endurance.

**Test Description**: Subjects lies on the back on a flat surface with knees medium flexed and with fingers of both hands clasped behind the neck. A partner kneels facing the subject, and presses down on subject's insteps. At the signal 'Go' the subject starts, coming to the sitting position and touching the knees using the elbows. Rotation of the body is not required and the subjects repeated the action as many times as possible in 60 seconds.

**Scoring**: Number of Sit-ups done in 60 seconds was recorded.

3. **Modified Pull-ups (Shoulder Strength)**

**Equipment**: Modified Pull-up stand

**Purpose**: The purpose of the modified Pull-up test is to test the shoulder strength.
**Test Description:** The horizontal bar was positioned at a particular height, which is just reachable to a subject, who lies on his/her back on a flat surface. Then the subject was asked to clasp the horizontal bar with the over grasp grip. When the subject was ready, the test leader gives the signal "Go". On hearing the signal "go", the subject starts to raise the body by flexing the arm until the chin is pulled up to the level of the horizontal bar. Then the subject lower back to the starting position with shoulders touching the ground, this procedure was repeated as many times as possible. The test will stop when the subject pauses for two or more seconds. The tester ensured that the subject keeps the knees straight during the course of the test.

**Scoring:** The number of correctly executed Pull-ups were recorded.

4. **Sit & reach test (Flexibility of the low back and posterior thighs)**

**Equipment:** Test box. The test apparatus consists of a specially constructed box with a measuring scale where 23 cm is at the level of the feet.

**Purpose:** The purpose of the Sit & reach test is to evaluate the flexibility (extensibility) of the low back and posterior thighs.

**Test Description:** To assume the starting position, the subjects were asked to remove their shoes and sit down at the test apparatus with their knees fully extended with the feet, shoulder width apart. The feet were asked to be placed flat against the end board. The arms were extended forward with the hands placed on top of each other inorder to perform the test. The subject
tries to reach directly forward with the palms down, along the measuring scale four times and holds the position at the maximum reach on the fourth trial. The position of the maximum reach were asked to be held for one second.

**Scoring:** The farthest position the subject reached was measured in centimetres.

5. **Sum of triceps and calf skinfold measurement (body composition)**

**Equipment:** Skinfold Caliper

**Purpose:** To measure the body composition.

**Test Description:**

Triceps Skinfold: The subject was asked to hold the arms loosely. Then a fold was picked up at the back of the arm level halfway on the line connecting the Acromion and the Olecranon process. Then the picked up skinfold was measured using the skinfold caliper for the measurement of triceps skinfold thickness.

Calf Skinfold: A vertical skinfold was picked up on the medial side of the leg, at the level of the maximum growth of the calf. Then the picked up skinfold was measured using the skinfold caliper for the measurement on calf skinfold thickness.

**Scoring:** The sum of triceps and calf skinfold thickness were measured in millimetres.
RELIABILITY OF THE DATA

Reliability of the data was ensured by tester's competency and instrument reliability.

Tester's Competency

All the measurements on the different selected variables in this study were taken by the investigator with the help of assistants. From the research point of view, it is very important to be familiar in using the various instrument and hence, the investigator had undergone training under an expert, inorder to ensure the reliability of measurements taken. After a series of practice sessions, the tester's competency was statistically analysed and were established by using the test-retest method and is presented in Table 2. Since, the correlation coefficient values were very high, the tester's competencies in taking measurements were accepted.

TABLE 1
COEFFICIENT OF CORRELATION DONE ON THE TEST-RETEST METHOD TO ASCERTAIN THE COMPETENCY OF THE TESTER

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Tests, Methods &amp; Variables Tested</th>
<th>Coefficient of correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1 mile run (Cardio-respiratory endurance)</td>
<td>0.94</td>
</tr>
<tr>
<td>2.</td>
<td>Sit-ups in 60 seconds (Abdominal strength and endurance)</td>
<td>0.98</td>
</tr>
<tr>
<td>3.</td>
<td>Modified Pull-ups (Shoulder Strength)</td>
<td>0.99</td>
</tr>
<tr>
<td>4.</td>
<td>Sit &amp; reach test (Flexibility of the low back and posterior thighs)</td>
<td>0.95</td>
</tr>
<tr>
<td>5.</td>
<td>Sum of triceps and calf skinfold measurement (body composition)</td>
<td>0.93</td>
</tr>
</tbody>
</table>
Instrument Reliability

The instrument such as stop watches, test box, skinfold caliper, modified Pull-ups stand, etc. for measuring health-related physical fitness variables were all of ISI standard and manufactured by reputed companies and being used in research laboratories. Thus, the instruments used in this study were reliable enough for the purpose of the study.

STATISTICAL TECHNIQUES

Various descriptive profiles like mean, median, mode, standard deviation, variance, skewness, kurtosis, standard error of skewness, standard error of kurtosis, range, minimum score, maximum score, 25th percentile, 50th percentile and 75th percentile of boys and girls of the two age groups (under 13 years and under 14 years) of both hilly and coastal areas were statistically analysed separately on the five health-related physical fitness variables such as Abdominal strength and endurance (Sit-ups), Flexibility of lower back and posterior thighs (Sit & reach), Shoulder strength (Pull-ups), Cardiorespiratory endurance (One mile run) and Body composition (Sum of skinfolds).

Data collected from the various groups were statistically examined for significant difference in means by applying one-way analysis of variance (ANOVA) to compare all the five different dimensions of health-related physical fitness namely Abdominal strength and endurance, Flexibility of the
low back muscle and posterior thighs, Shoulder strength, Cardio-respiratory endurance and Body composition among the eight different groups of subjects such as under 13 year boys of hilly areas, under 14 year boys of hilly areas, under 13 year girls of hilly areas, under 14 year girls of hilly areas, under 13 year boys of coastal areas, under 14 year boys of coastal areas, under 13 year girls of coastal areas and under 14 year girls of coastal areas.

Further, one-way analysis (ANOVA) were done, one across different age and gender groups, irrespective of terrain such as under 14 year boys, under 13 year boys, under 14 year girls and under 13 year girls. Second across different gender and terrain groups irrespective of age such as boys of hilly areas, boys of coastal areas, girls of hilly areas and girls of coastal areas and the third across different age and terrain groups irrespective of gender such as under 14 years of hilly areas, under 14 years of coastal areas, under 13 years of hilly areas and under 13 years of coastal areas on all the five dimensions of health-related physical fitness.

Later the LSD (equivalent to no adjustments) post-hoc tests were done on those dimensions in which F-ratio's were found to be significant, inorder to verify whether the difference really exist or not for which the level of significance was set at 0.05.

Further, t-ratios were done to identify the significant difference in means among under 13 years and under 14 years of children irrespective of
gender and terrain on all the five test items of the ICHPER.SD test battery. Similarly, t-ratio’s were done to identify the significant differences in means among students of hilly and coastal areas irrespective of gender and age on all the five test items of the ICHPER.SD test battery. Again, t-ratios were done to identify the significant differences in means among boys and girls irrespective of age and terrain on all the five test items of the ICHPER.SD test battery.

The level of significance for making inferences were set at 0.05.