Chapter-3

Methodology

3.1 Subject

3.2 Flow chart of the subjects

3.3 Criterion Measure

3.4 Design

3.5 Tools used

3.6 Collection of data
Methodology

In this chapter the subjects, the criterion measures, the design, plan of conditioning, assessment of variables, tools and the procedure for administering tests for the study were described.

3.1 Subjects

Sixty school going boy students, 14-17 years age group of Kanaknagar S.D. institution (H.S), Hingalganj, North 24 Parganas, West Bengal had been randomly selected for this study. All the subjects resided in own houses. Most of the students read in class VIII to class XI. They had same routine of life, diet and environmental set up and hence there was no need to apply any control over these factors. The subjects were interviewed with a standardized scheme to ascertain their medical histories and levels of physical activity. The researcher arranged for a more specific assessment of medical status. Six subjects excluded due to medical disorders. Exclusion criteria were the presence of chronic medical conditions such as asthma, heart disease or any other condition that would put the subjects at risk when performing the experimental tests. Finally, 50 subjects were included in the training study. All the subjects were medically tested and given fit certificate to undergo conditioning programs.

50 subjects who were asked to participate in physical test and questionnaires, 50 consented (100%). From initial stage to final stage of conditioning all students (100%) completed the questionnaires and the entire physical test.

Subjects were divided into two groups. Thirty subjects were in Experimental group and remaining twenty subjects were in control group.
3.2 Flow Chart of the subjects

Assessed for eligibility(N=60)

<table>
<thead>
<tr>
<th>4 subjects Absent</th>
<th>6 Rejected for medical disorder</th>
</tr>
</thead>
</table>

Included fifty(N=50) in the study

<table>
<thead>
<tr>
<th>Experimental (Gr.I) N=30</th>
<th>Control (Gr.II) N=20</th>
</tr>
</thead>
</table>

Analyzed :( Experimental Gr.)
Base Line=30, Post Test=30

Analyzed :( Control Gr.)
Base Line=20, Post Test=20

3.3 Criterion Measures

The performance of the subjects in selected physiological parameters, psychological parameters and physical fitness components and personal data were taken as a criterion measure for the study.

The physiological parameters chosen for this study were Resting Heart rate, Pressure (Systolic & Diastolic), Breath holding capacity, Hemoglobin%, and Fat%.

The psychological parameters chosen for this study were State Anxiety and Trait Anxiety.

The physical fitness components chosen for this study were Speed, Strength, Endurance, Agility and Reaction time.

The only one general component chosen for this study was Weight.
In this study for physical fitness components Speed, Strength, Endurance, Agility, and Reaction time successively 50M Run, Standing broad jump, 12 minute run (Cooper test), 4x10Y Shuttle run, Nelson hand action test (Ruler Drop Test) were chosen.

Measurements involved in two phases; firstly, just before the conditioning program starts, finally; after completion of three months conditioning program.

50M Run, 12 minute run (Cooper test), Nelson hand action test, Fat% and measurement of weight were taken in the morning session, while standing broad jump, 4x10Y Shuttle run test were conducted in the afternoon session.

The psychological State and Trait Anxiety tests were conducted during school time.

Measurements like Resting Heart Rate, Breath Holding Capacity and Fat% were conducting during school time. Measurements like Pressure (Systolic & Diastolic) and Hemoglobin% were taken in the “Chetana Medical Diagnostic services”, Taki, North 24 Parganas under supervision of expert Medical Officer (M.O).

3.4 Design

The experimental design used for this study was pre and post test random group design inviting fifty subjects, who were designed at random into two groups of thirty in group I (Experimental) and twenty in control group II. Group I underwent physical exercises training and group II acted as control groups. The experimental group was treated with respective training for fifty minutes per day for three day a week for a period of fourteen weeks. The control group did not undergo any training program rather than their routine work. All the subjects were tested prior to and after the training on selected variables.
### 3.4.1 Training Protocol for three months conditioning program three days in week

<table>
<thead>
<tr>
<th>Week</th>
<th>Day</th>
<th>Duration</th>
<th>Particular of Exercise</th>
<th>Load and Intensity</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Monday</td>
<td>15 Min</td>
<td>i) Stretching</td>
<td>i) Normal</td>
<td>i) Mobilization of joints and preparing muscles for work</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 Min</td>
<td>ii) Slow running</td>
<td>ii) low</td>
<td>ii) Warming up, endurance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 Min.</td>
<td>iii) Recreational volley ball</td>
<td>iii) Low</td>
<td>iii) To avoid monotony</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 Min.</td>
<td>iv) Massage</td>
<td>iv) General</td>
<td>iv) To avoid exhaustion</td>
</tr>
<tr>
<td></td>
<td>Wednesday</td>
<td>15 Min</td>
<td>i) Stretching</td>
<td>i) Normal</td>
<td>i) Mobilization of joints and preparing muscles for work</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 Min</td>
<td>ii) Slow running</td>
<td>ii) low</td>
<td>ii) Warming up, endurance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 Min.</td>
<td>iii) Recreational handball</td>
<td>iii) Low</td>
<td>iii) To avoid monotony</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 Min.</td>
<td>iv) Massage</td>
<td>iv) General</td>
<td>iv) To remove lactic acid</td>
</tr>
<tr>
<td></td>
<td>Friday</td>
<td>15 Min</td>
<td>i) Stretching</td>
<td>i) Normal</td>
<td>i) Mobilization of joints and preparing muscles for work</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 Min</td>
<td>ii) Slow running</td>
<td>ii) Low</td>
<td>ii) To develop endurance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 Min.</td>
<td>iii) Recreational handball</td>
<td>iii) Low</td>
<td>iii) Strength endurance and Separation from monotonous activity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 Min.</td>
<td>iv) Massage</td>
<td>iv) General</td>
<td>iv) To avoid exhaustion</td>
</tr>
</tbody>
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Training Protocol for three months conditioning program three days in week

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<tr>
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<th>Load and Intensity</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Third-Fourth</td>
<td>Monday</td>
<td>10 Min</td>
<td>i) Stretching</td>
<td>i) Normal</td>
<td>i) Mobilization of joints and preparing muscles for work</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 Min</td>
<td>ii) Jogging</td>
<td>ii) Low</td>
<td>ii) To develop endurance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 Min.</td>
<td>iii) Dips, push ups, sit ups</td>
<td>iii) Low</td>
<td>iii) To develop strength(upper limbs)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 Min.</td>
<td>iv) Warm down exercises</td>
<td>iv) Very low</td>
<td>iv) Cooling down</td>
</tr>
<tr>
<td>Third-Fourth</td>
<td>Wednesday</td>
<td>10 Min</td>
<td>i) Stretching</td>
<td>i) Medium</td>
<td>i) Range of motion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 Min</td>
<td>ii) Jogging</td>
<td>ii) Medium</td>
<td>ii) Endurance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 Min.</td>
<td>iii) Chin ups, pull ups</td>
<td>iii) Low</td>
<td>iii) Strength</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 Min.</td>
<td>iv) Massage</td>
<td>iv) Specific</td>
<td>iv) Cooling down</td>
</tr>
<tr>
<td>Third-Fourth</td>
<td>Friday</td>
<td>10 Min</td>
<td>i) Stretching</td>
<td>i) Low</td>
<td>i) Warming up</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 Min</td>
<td>ii) Yoga</td>
<td>ii) Basic</td>
<td>ii) To increase range of motion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 Min.</td>
<td>iii) Volleyball</td>
<td>iii) Medium</td>
<td>iii) Strength endurance from monotonous activity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 Min.</td>
<td>iv) Massage</td>
<td>iv) Specific</td>
<td>iv) Cooling down</td>
</tr>
</tbody>
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<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fifth-Sixth</td>
<td>Monday</td>
<td>10 Min</td>
<td>i) Jogging</td>
<td>i) Medium</td>
<td>i) Endurance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 Min</td>
<td>ii) Circuit training</td>
<td>ii) low</td>
<td>ii) To develop exclusive strength</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 Min.</td>
<td>iii) Standing kho</td>
<td>iii) Low</td>
<td>iii) To develop agility from recreational activity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 Min.</td>
<td>iv) Massage</td>
<td>iv) General</td>
<td>iv) Cooling down</td>
</tr>
<tr>
<td>Fifth-Sixth</td>
<td>Wednesday</td>
<td>10 Min</td>
<td>i) Stretching</td>
<td>i) Low</td>
<td>i) Range of motion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 Min</td>
<td>ii) Jogging</td>
<td>ii) Medium</td>
<td>ii) Endurance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 Min.</td>
<td>iii) Handball</td>
<td>iii) Low</td>
<td>iii) Agility, endurance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 Min.</td>
<td>iv) Warm down exercise</td>
<td>iv) Very low</td>
<td>iv) Cooling down</td>
</tr>
<tr>
<td>Fifth-Sixth</td>
<td>Friday</td>
<td>10 Min</td>
<td>i) Stretching</td>
<td>i) Low</td>
<td>i) To increase range of motion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 Min</td>
<td>ii) Skipping</td>
<td>ii) Low</td>
<td>ii)endurance, jumping ability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 Min.</td>
<td>iii) Chair exercise</td>
<td>iii) Low</td>
<td>iii) Leg Strength</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 Min.</td>
<td>iv) Volleyball spiking</td>
<td>iv) Low</td>
<td>iv) Leg explosive strength, jumping ability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 Min.</td>
<td>v) Warm down</td>
<td>v) Very low</td>
<td>v) Cooling down</td>
</tr>
</tbody>
</table>
After completion of the first six weeks conditioning program the remaining training programs will be carried with progressive intensity of work up to fourteenth week.

3.5 Tools used

Tools: Tools used for collecting data for the study were as follow:

1) Weighing machine
2) Sphygmomanometer
3) Stop Watch
4) Hemometer
5) Skin fold calipers
6) Stethoscope
7) Measuring tapes
8) Ruler
9) Scale
10) Starting clapper
11) Calculator
12) Anxiety Test Questionnaire etc.

3.6 Collection of data

a) Procedure for administering weight

Purpose:

The purpose of the test was to measure the weight of the subject.

Equipments:

Weighing machine and score sheet of record.

Procedure:

The subject stood on the weighing machine wearing activity dress with barefoot. The heels were on the weighing machine without elevating it and the body was kept at erect position. After the scale vibration stopped the reading was recorded in kilograms.
Scoring:

The *weight* was recorded to the nearest to a kilogram. -Johnson and Nelson, 1988.

![Pict. 2: Measurement of Weight (Kg.)](image)

b) Procedure for administering Resting Heart Rate (RHR)

**Purpose:**

The purpose of the test was to measure resting heart rate.

**Equipments:**

A stopwatch or wrist watch with a second hand was the only equipment needed.

![Pict. 3: Measurement of Resting Heart Rate](image)
**Procedure:**

Heart rate was measured using the radial pulse after sitting and then resting in a supine position for five minutes in order to get a more accurate record of a true resting value. True resting heart rate was accurate first thing in the morning. On signal, subject was allowed to count the pulse for one minute. -Johnson and Nelson, 1988.

**Scoring:**

The number of time heart beats per minute was recorded.

c) & d) **Method of determining blood pressure (Systolic and Diastolic)**

**Purpose:**

The purpose of the test was to measure systolic and diastolic blood pressure.

**Equipment:**

Sphygmomanometer and stethoscope.

Pict. 4: Measurement of Blood Pressure (Systolic)
**Procedure:**

The subject was placed in lying position. Extreme care was exercised in seeing that the subject was placed at ease and that time was allowed for recovery from any exercise prior to this test.

The left upper arm of the subject was encircled by an inflatable rubber bag containing in cuff which was connected to a pressure pump and manometer. By pumping air, the pressure in the bag was rapidly raised to 180 mm. Hg which was sufficient to obliterate completely the brachial artery so that no blood comes through, and radial pulse disappeared. The pressure was then lowered to a point where the pulse could be felt by using a stethoscope; the pulsation of the brachial artery at the bend of the elbow could be distinctly heard. At this point the pressure shown on the scale was considered to be the Systolic pressure. The pressure on the brachial artery was taken gradually reduced until the arterial pulse beats could distinctly heard and the point, at which the sound disappeared, was accepted as the diastolic pressure.

Pic. 5: Measurement of Blood Pressure (Diastolic)
Scoring:

The both pressure was taken for three trials. The median of three trials was considered as the score. -Evelyn C. Pearce, 1979.

e) Procedure for administering breath holding capacity

Purpose:

The purpose of the test was to measure breath holding capacity.

Equipments:

One stopwatch and score sheet of record.

Procedure:

The subject assumed comfortable sitting position. On the command “start”, the subject closed both nostrils by using thumb and index finger of the left arm. The subjects tried to remain in this position as long time as possible. Two trials were allowed.

Pict. 6: Administering of breath holding capacity

Scoring:

Record the maximum length of time in seconds. The better of two trials was recorded.
f) Procedure for administering Hemoglobin%

Purpose:
The purpose of the test was to measure hemoglobin% of the subject.

Equipments & Chemicals required:
Sterilized syringe with needle, cotton, spirit stopper, test tube rubber bung and drab kin’s solution, photoelectric calorimeter.

Procedure:
2 ml of blood from the subject was taken in a test tube and 5 ml of drab kin’s solution was also added to the test tube, stopper tube by means of a rubber bung and fix the solution through inverting several times.

Allow it to stand for 10 minutes at room temperature.

Compare the values with the standard in a photoelectric calorimeter

Drab kin’s solution was a mixture of 18 ml solution bicarbonate, 0.2 gm of potassium cyanide and 0.2 gm of potassium ferricyanide and 1 liter of distilled water.

Scoring:
Hemoglobin% was measured by expert medical officer in gm/dl.
g) Procedure for administering Fat%

**Purpose:**
The purpose of the test was to measure Fat%.

**Equipments:**
Skin fold caliper and score sheet of record.

**Procedure:**
To determine the Body density skinfold measurement of scapula and thigh were taken. Each muscle skinfold Measurement was taken for three times. Middle value was recorded.

Scapula skinfold measurement: Subject stood erectly. The skinfold was lifted on a 45° diagonal plane parallel to the auxiliary border of the interior angle of the scapula.

Thigh skinfold measurement: With the subject’s weight on the left foot a vertical fold on the front of the right thigh halfway between the hip and the knee.

Body Density was calculated by using Sloan equation that was Body density = 1.1043 – 0.00132(thigh skinfold) – 0.00131(scapula skinfold)

To find out the Fat%, Siri formula was used, i.e., Fat %=( 4.950/Body density –4.500) x100

![Pic. 8 Administering of Skinfold Measurement](image)

**Scoring:**
Calculated value was recorded as Fat%. (Johnson and Nelson, 1988)
h) Procedure for administering State anxiety

Purpose:

The purpose of the test was to measure state anxiety of the subjects.

Equipments:

A standard Questionnaire.

Procedure:

STAI (Spielberger and others, 1983), a self-evaluation questionnaire was taken for the test. Subject was asked to answer the selected questionnaire. There were twenty questions available in the questionnaire. Four options were also available for each question and for option 1, 2, 3 and 4 the score were respectively 1, 2, 3 and 4. In the questionnaire there were some direct items and some reserved items.

Scoring:

As per marking of the students of questionnaire the score of the direct items and reserved items were calculated respectively. The state Anxiety score was calculated by using the formula-

\[ \text{Score} = (\text{direct items score}) - (\text{reserve items score}) + 50 \]
i) Procedure for administering Trait anxiety

Purpose:

The purpose of the test was to measure trait anxiety of the subjects.

Equipments:

A standard Questionnaire.

Procedure:

STAI (Spielberger and others, 1983), a self-evaluation questionnaire was taken for the test. Subject was asked to answer the selected questionnaire. There were twenty questions available in the questionnaire. Four options were also available for each question and for option 1, 2, 3 and 4 the score were respectively 1, 2, 3 and 4. In the questionnaire there were some direct items and some reserved items.

![Pict. 10: Administering of Trait anxiety](image)

Scoring:

As per marking of the students of questionnaire the score of the direct items and reserved items were calculated respectively. The trait Anxiety score was calculated by using the formula-

Score = (direct items score) – (reserve items score) +35
j) Procedure for administering 50 meter run

Purpose:

The purpose of the test was to measure speed.

Equipments:

At least two stopwatches and score sheet of record.

Procedure:

After short warm up, the subjects were asked to take position behind the starting line. For obtaining time two trials were allowed with sufficient interval in between, two subjects run at a time.

Scoring:

The score was recorded in seconds to the nearest tenth of a second. The best time of the two trials was recorded. (Donald K. Mathews, 1963)

k) Procedure for administering Standing Broad Jump:

Purpose:

The purpose of the test was to measure the explosive leg strength.

Equipments:

The floor was used for the test. Marking material (tap or chalk) was needed for the starting line, along with a tape measure to mark off increments of distance along the landing area.
Procedure:

With the feet parallel to each other and behind the starting mark, the subject bended and swung the arms and jumped as far forward as possible.

![Pict. 12: Administering of Standing Broad Jump](image)

Scoring:

The number of inches between the starting line and the nearest heel upon landing was the score. Three trials were permitted, and then the best trial was recorded as the score. (Johnson and Nelson, 1988)

1) Procedure for administering Twelve-Minute run:

Purpose:

The purpose of the test was to measure Endurance.

Equipments, Facilities and Materials:

A stopwatch, whistle, distance markers and 400 meters track with marked at 50 meters interval.

Procedure:

Subjects were advised to use standing start method. The subjects stood behind the starting line with the command ‘ready’ and on ‘clap’ they ran as
many laps as possible around the course within the 12 minutes. When the 11th minutes elapsed, the test administrator called out the left to run. At the end of the 12th minutes the subjects were at the instant the whistle or command to stop was given. The subject noted the marking had just passed.

![Pict. 13: Administering of Twelve-Minute run](image)

**Scoring:**

The score in meters is determined by multiplying the number of laps completed, plus the number of segment of a lap, plus the meters stopped off between a particular segments. (Johnson and Nelson, 1988)

**m) Procedure for administering Shuttle Run**

**Purpose:**

The purpose of the test was to measure the agility of the subject in running and changing direction.

**Equipments:**

Marking tape, stopwatch and two blocks of wood (2”x2”x4”).
**Procedure:**

Subjects was advised to start behind the starting line on the signal “go” and ran to the blocks, picked up one, returned to the starting line, and placed block behind the line; he then repeated the process with the second block. Investigator allowed some rest between the two trials.

![Pict. 14: Administering of Shuttle Run](image)

**Scoring:**

The score for each subject is the length of time required (to the nearest tenth of a second) to complete the course. The best trial was the only record. (Johnson and Nelson, 1988)

**n) Procedure for administering Reaction Time**

**Purpose:**

The purpose of the test was to measure the reaction time.

**Equipments:**

Table, chair and ruler with marked in cm.
**Procedure:**

Subject was asked to sit on chair with his forearm and resting comfortably on the table/bench. From the wrist of strongest hand to palm was kept just outside of the any edge of the table/bench. The thumb and index finger was kept 2 inch apart. The investigator kept a ruler vertically just above the loop of the thumb and index finger. Subject was asked “ready” for catching the falling ruler as first as possible.

**Scoring:**

Distance the ruler falls was recorded in cms. The five smallest and largest distance falls were discarded, and average of the middle three was recorded as the score. Then the score was converted into Reaction Time with using the following formula. (Johnson and Nelson, 1988)

\[
\text{Reaction Time} = \sqrt{\frac{2 \times \text{Distance the ruler falls}}{\text{Acceleration due to gravity}}}
\]