CHAPTER – III
MATERIALS AND METHODS

3.1 Introduction

In this chapter, the selection of the subjects, selection to variables, design of the study, training schedule, tester competency, reliability of the instruments, reliability and validity of the test, procedure for administering the test and statistical-techniques for analyzing the data have been described.

3.2 Selection of Subjects

The subjects of this study were thirty middle aged male, age between 45 and 55 years of Kandi, a sub-divisional town in the district of Murshidabad, West Bengal volunteered themselves for this study.

3.3 Selection of Criteria and Variables

Physiological potentialities, motor ability variables and psychological parameters were the criteria of the study. Keeping in view the feasibility, criteria and relevancy of the variables to the present study, the physiological parameters considered with their units are presented in Table–1, the motor ability variables selected for the study along with the test items chosen to measure these variables are given in Table–2 and psychological parameters were measured by questionnaire and presented in Table–3.

Table – 1 : Selected Physiological Potentiality Measurement with their Units

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameters</th>
<th>Measurement Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Blood Pressure (Systolic &amp; Diastolic)</td>
<td>mm. Hg</td>
</tr>
<tr>
<td>2.</td>
<td>Resting Heart Rate</td>
<td>Beats / minute</td>
</tr>
<tr>
<td>3.</td>
<td>Blood Sugar</td>
<td>mg / dl</td>
</tr>
<tr>
<td>4.</td>
<td>Blood Cholesterol</td>
<td>mg / dl</td>
</tr>
<tr>
<td>5.</td>
<td>Body Fat Percentage</td>
<td>Percentage %</td>
</tr>
</tbody>
</table>
Table – 2 : Test Items Selected for Motor Ability Variables with their Measurement Units

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Variables</th>
<th>Test Items</th>
<th>Measurement Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Trunk Flexibility</td>
<td>Flexibility test / Sit &amp; Reach test</td>
<td>Inches</td>
</tr>
<tr>
<td>2</td>
<td>Balance</td>
<td>Stork Stand Test</td>
<td>Seconds</td>
</tr>
<tr>
<td>3</td>
<td>Strength</td>
<td>Hand grip strength Test</td>
<td>Kg.</td>
</tr>
<tr>
<td>4</td>
<td>Hand eye coordination</td>
<td>Johnson Basket Ball (Wallpass)</td>
<td>Minute</td>
</tr>
</tbody>
</table>

Table – 3 : Test Items Selected for Psychological Parameters

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Variables</th>
<th>Measurement Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anxiety (State / Trait)</td>
<td>Questionnaire</td>
</tr>
<tr>
<td>2</td>
<td>Depression</td>
<td>Questionnaire</td>
</tr>
<tr>
<td>3</td>
<td>Anger</td>
<td>Questionnaire</td>
</tr>
</tbody>
</table>

It was assumed that the above selected parameters would indicate the physiological potentiality and motor ability variables of middle aged male. The choice of the tests was made in the light of the objectivity and reliability of the tests. The physiological parameters and the motor performance variables for the present study were selected keeping in view the administrative feasibility, which provide maximum accuracy for the valid and reliable result and which ensure minimum of time consumption. The instruments involved in the measurement of physiological parameters were simple and were readily available at Pathological Investigation Clinic, Kandi and from Laboratory, Department of Physical Education, University of Kalyani. The instruments for measuring motor performance variables were available from Physical Education Department, University of Kalyani. Due to lack of facilities and instruments the researcher had to restrict his findings only to above tests and measurements.

3.4 Design of the Study

The present study has three separate parts (i) Pre-test, (ii) The specific training programme and (iii) Post-test. All the subjects were informed about the purpose of the study and strict schedule of the programme for appropriate evaluation. Subjects were duly motivated so that they could be voluntarily involved in the training programme.
i) Conducting Pre-test:

All the subjects were asked to report on a specified date 1st February, 2009 in a place in Kandi Raj High School Hall, Murshidabad. All physiological tests including body fat percentage for all subjects were measured on the first day. On the second day balance and strength test for all subjects were conducted. The tests for hand eye coordination and flexibility were conducted on the third day. On the fourth day psychological factors, viz. state-anxiety and trait anxiety tests were conducted and on the fifth day depression and anger tests of all subjects were conducted.

ii) The Specific Training Programme:

After completion of the pre-test, subjects were introduced to the Yogasana, Pranayama, Suryanamaskara, Kriya regimen. The detail were explained and demonstrated to all the subjects. The Yoga Programme was conducted four days a week for 24 weeks. A day’s programme was 30–80 minutes duration. Yoga programme consisted of Suryanamaskar, Ardha Halasana, Biporit Karani, Sarvangasana, Ardha Salvasana, Bhujongasana, Ardha Mathsendrasana, Gomukhasana, Ardha Kurmasana, Ustrasana, Noukasana, Mandukasana, Pabannuktasana, Simhasana, Padmasana, Vajrasasana, Batayanasana, Ekpadangusthasanasa, Briksasana, Side bending Chakrasana, Utkatasana and Anulom belome, Suryavedana, Ujjayi, Shitali and Kapalbhati. Details of the training programme is depicted in Table – 4.

Table – 4 : Schedule for Yogic Practices of Experimental Group

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Yogic Practice</th>
<th>Duration (minute)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Surya Namaskar</td>
<td>8  (3-2-3)</td>
</tr>
<tr>
<td>2.</td>
<td>Asanas</td>
<td>10  15</td>
</tr>
<tr>
<td>3.</td>
<td>Kriya (Kapalbhati)</td>
<td>5  (2-1-2)</td>
</tr>
<tr>
<td>4.</td>
<td>Pranayama</td>
<td>7   8</td>
</tr>
<tr>
<td>Total (1 – 4)</td>
<td>Practice Session</td>
<td>30  40</td>
</tr>
</tbody>
</table>

N. B.: Figures in brackets indicate (Training – Rest – Training)
Fig. 1: Researcher Measuring Height of Subject
Fig. 2: Researcher Measuring Weight of Subject
Fig. 3: Medical Expert Measuring Blood Pressure of Subject

Fig. 4: Subjects practicing Yogasana
iii) Post-test Conducted:

Post-test was conducted in similar fashion with that of pre-test. It was completed in 1st week of August, 2009.

3.5 Tester Competency

To ensure that the investigator was well versed with the technique of conducting the field tests for measuring various motor performances, the investigator had a number of practice sessions in the testing-procedures under the guidance of an expert. Tester-reliability was established by the Test-retest method under the identical condition and the consistency of the results was obtained. The various physiological parameters were measured under the strict supervision of medical doctors / paramedical experts. At the initial stage, the researcher with the help of experts conducted the tests. Later the researcher himself conducted in presence of experts. The test-retest reliability was highly significant. Thereby tester's competency was established.

3.6 Reliability of the Instruments

The stop watch, grip dynamometer, skinfold caliper and steel tapes used in the study were procured from the reliable companies. All the instruments used were available in the Physical Education Department, University of Kalyani, Nadia, West Bengal and their calibrations were accepted as accurate enough for the purpose of this study. The instruments for measuring physiological and motor ability parameters, were taken from registered medical experts and also from the laboratory of the Department of Physical Education, University of Kalyani, were used for regular medical examinations. Thus instruments reliability was established.

3.7 Reliability and Validity of Test

The physiological and motor performance variables were measured for the present study according to the standard published literatures of leading authors. Psychological tests were adopted from standard questionnaire of leading authors. Thereby the reliability and validity of the tests were established.
3.8 Procedure for Administering the Tests

The administration, conduction of the tests and measurements for the present study were made at Kandi Raj High School, Kandi. Murshidabad, West Bengal. The data for the present study were collected from middle aged male of 45–55 years old during the year 2009.

3.8.1 Collection of Personal Data:

**Equipment**: Measuring steel tape and weighing machine.

**Procedure**: At first each subject was asked his age and was recorded against each name chronologically. The height of the subject was measured by asking them to stand erect by keeping their feet flat on the floor. For that the wall was marked in cm. The point of vertex on the wall indicated his height and was recorded in cm. Then the weight of each subject was recorded by using weighing machine.

3.8.2 Physiological Parameter Test:

a) Heart-Rate at Rest:

**Objective**: To measure the resting heart-rate.

**Equipment**: A Stopwatch

**Test**: The subjects were given a 20–30 minutes of bed rest before administering the test. Then the pulse beats (radial-artery) were counted at close intervals for about 3–4 times. The heart sound was recorded in number for a duration of one minute with the help of a stop watch.

**Scoring**: 4 trails were administered. The lowest reading was taken. The reading was measured in beats /minute.

b) Blood Pressure at Rest:

**Objective**: To assess the arterial blood pressure i.e. systolic and diastolic.

**Equipment**: One dial type sphygonomanometer and one stethoscope.

**Test**: The subjects were asked to report at the test-site in the morning after an overnight good sleep. They were instructed not to perform any physical activity except the unavoidable movements. Their blood pressures were recorded after they were in quiet condition for at least 30 minutes.
To determine resting blood pressure the investigator had chosen the Korotkoff method and adopted auscultory method to measure blood pressure.

**Korotkoff Method**: Systolic blood pressure was determined from the first of the Korotkoff sounds. The bell of the stethoscope was placed gently below the antecubital notch over the distal brachial artery. The point may be marked with marker to identify the spot without delay. The pressure of the calf was elevated quickly so as the mercury column was raised up to 200 mm Hg during determining the resting B. P. The pressure was reduced up to 60 mm Hg by slowly deflating (2 mm Hg/sec or 2 mm/heart beat) the calf by regulating the knob.

**Score**: The systolic and diastolic pressure were measured in mm Hg unit.

c) **Blood Sugar**:

**Objective**: To assess the blood glucose concentration.


**Test**: Blood glucose concentration is one of the best measurements of the presence of diabetes as well as diabetic control. Blood sugar is affected by the food eaten, the amount of time after or before eating and activity and stress. In the present study the subjects were asked to note down the time at the end of their lunch. They were instructed to report at the test-site just one and half hour after the lunch. To give the most sensitive results the sample was taken within two hours after their lunch. The one touch basic plus diabetes monitoring system is intended for vitro diagnostic use, for quantitative determination of glucose in whole blood as an aid in monitoring effectiveness of diabetes management.

The Life Scan Glucometer, as an electro-medical device, has been thoroughly tested and found to comply with the essential requirements of the Electro Magnetic Compatibility Directive (EMC, 89/336/EEC), 2000.

One touch test strips – the one touch basic plus diabetes monitoring system measures the amount of blood glucose in whole blood. When the blood was applied to one touch test strip, reacts with the blood to form a blue colour. The one touch basic plus meter reads the colour to determine the blood glucose level. The one touch basic
plus system requires only a small drop of blood. It is very important that the drop be large enough to cover the test spot completely. The blood from a subject was placed on the strip and after 45 seconds the meter displayed the reading.

**Scoring**: The blood sugar level was measured in mg/dl unit.

d) **Cholesterol**:

Cholesterol is a sort of fat (lipid) in the blood. While high-density lipoprotein (HDL) or “good” cholesterol helps in the protection of the heart, low-density lipoprotein (LDL) or “bad” cholesterol could clog the arteries of the heart. Some cholesterol home tests; or tests done by the physicians are also used to measure tryglicerides, which is another type of fat found in the blood.

A Cholesterol Blood Test is used for measuring the amount of cholesterol and triglycerides in the serum – a part of the blood. This can be done with a simple home cholesterol test or cholesterol self test, using a cholesterol test kit. This sort of cholesterol blood test can also be done at a medical centre, and the cholesterol test results are used, not so much as to diagnose or to monitor a disease, but to evaluate the individual’s risk for heart disease. Cholesterol test preparation and testing are considered as routine parts of preventive health care, since high blood cholesterol is associated with heart disease, hardening of the arteries, and enhanced risk of death from heart attack.

To take a home cholesterol test, using a cholesterol kit, the patient would need to prick his finger with a lancet, in order to get a drop of blood. This drop of blood must be put on piece of paper which contains special chemicals. The paper would change color depending on the level of cholesterol in the blood. Some home cholesterol tests use small cholesterol test machines to inform the individual as to how much of cholesterol is present in the blood.

e) **Body Fat**:

**Objective**: To assess the body fat percentage.

**Equipment**: A Harpender skinfold caliper.

**Procedure**: The instrument consists of accurately calibrated dial which indicates in millimeter thickness of the skinfold when the jaws are open, holding the skinfold.
The right side of the body was used to determine the percentage of fat. The thickness of the skin and subcutaneous fat was grasped between the thumb and index finger and measurement was taken to the nearest millimeter from four different sites of the body using the skinfold caliper.

To eliminate errors the reading was made between three to four seconds when essentially all comparisons have taken place and the measurements were stabilized. If this precaution was not taken, the skinfold would have gradually decreased because of the tissues being squeezed out from the jaws of caliper.

The skinfold measurements were taken at the following prescribed sites of the body.

**Biceps**: The skinfold was lifted over the bicep muscle at a point half way between the forearm and the tip of the elbow.

**Triceps**: A point half-way between the tip of the acromial process (bony projection on top of shoulder) and the tip of the oberanon process (tip of elbow) was located with the elbow at a 90-degree angle. Then the skinfold was measured with arm relaxed and hanging in extension.

**Supra-illiac**: The measurement was taken just above the crest of the illium at the mid auxiliary line. The fold was lifted diagonally following the natural line of the iliac.

**Subscapular**: The skinfold was lifted at the lip of the right scapula on a diagonal plane of about 45° from the horizontal when the subject remained in a relaxed standing position. The measurement was taken about one centimeter laterally below this site.

**Scoring**: The skinfold thickness at the site of biceps, triceps, suprailliac and subscapulla were used to calculate the body density (Durnin & Womersley, 1974). The body fat percentage was calculated by using the formula of Siri (1961).
3.8.3 Conductance of Motor Ability Test:

a) Flexibility (Sit and Reach Test – Wells & Dillon, 1952):

Objective: To measure trunk flexion (hip & back flexion) and ability to stretch-back thigh muscles (hamstrings).

Test: Middle aged male.

Equipment: Standard sit and reach box.

Set-up: The sit and reach box was placed on smooth & clean surface.

Test: After sufficient warm-up, subjects were instructed to sit with the legs fully extended and arms extended forward, one-hand on the top of the other with palms down, subjects were instructed to bend forward from the waist, extending the fingers as far forward as possible along the scale (cm. marked) on top of the box, holding this position at least on second (Rikli & Edwards, 1991) was the score of a subject.

Trails: Three trails were given to each subject.

Scoring: The score is recorded in inches and determined by the location of the fingertips reaches.

b) Balance (Stork Stand Test – Johnson & Nelson, 1966):

Objective: To assess the balance of middle aged male.

Equipment: One Stopwatch.

Test: From a stand on the foot of dominant leg, the subject was said to place the other foot on the inside of the supporting knee and hands on the hips. A signal ready, start was given to raise the heel from the floor and maintain the balance as far as possible without the ball of the foot from its initial position.

Trails: Three trails were allowed to each subject.

Score: The highest score in second was taken from the three trials.

c) Strength (Philips & Hornak, 1979):

Objective: To assess the hand grip strength.

Equipment: Hand dynamometer – equipped with adjustable handle.
**Set-up**: Subject placed the hand dynamometer in the palm of dominate with dial towards the palm. The grip was adjusted so that the bottom of the dynamometer may rest against the base of the palm and the fingers grasped the adjustable position of the hand. The hand then had to stretch so that the grip could be taken between the first and second joint of the fingers.

**Test**: The subjects bent the elbow slightly and raised the arm, then move the arm forward and downward gripping with maximum strength.

**Trails**: Two trails were given with 30 seconds rest between trails.

**Score**: The score was the best of two trails. The dynamometer scale was read in kg.

d) **Coordination (Wall Pass) (Scott Motor Ability Test, 1959)**:

**Objective**: To measure the hand eye coordination (Barrow & McGee, 1979).

**Equipment**: Regulation basketball, a flat wall space of at least 2.438 (8 feet) square with a line 2.743 (9 feet) from the wall for a restraining line and one stopwatch.

**Test**: The subject stood with feet behind the restraining line and passed the ball against the wall as many times as possible in 15 sec. Subjects were instructed that they could pass the ball against the wall in any manner and catch it on the return.

**Trails**: Subjects were given two trails for practice and finally two trails were administered and scores were recorded.

**Score**: The final score was the number of times the ball hit the wall in 15 second time period. The best of two scores were recorded as final score.

3.8.4 **Psychological Parameter Test**:

a. **Anxiety (State and Trait)**:

**Aim**: To measure anxiety (state and trait) level of middle aged male of both the experimental and control group.

**Materials Used**: A questionnaire of state and trait anxiety inventory.

**Procedure**: The State and Trait Anxiety Inventory (STAI), prepared by Spielberger, Gorsuch, and Lushane (1970), is the most extensively used and highly recommended instrument for the assessment of state and trait anxiety in any area of psychological investigation (Levitt, 1980).
As Bengali was the mother tongue of the subjects, so the Bengali version of STAI was used. The Bengali version of the inventory was prepared by Chattopadhyay, Mallick and Spielberger themselves in 1986 and it was standardized on Indian population (n = 640). Both forms of STAI were administered together as per the recommendations of Spielberger et al. (1970). State-Anxiety form was administered first. The test was self-administered by the subjects in a calm and quiet environment inside the auditorium hall of Kandi Raj High School, Kandi, Murshidabad. The subjects were clearly instructed prior to the test and they were requested to co-operate as best as possible from their end.

**Scoring** : In trait anxiety the direct items (D. I.) are the questions, of 2, 3, 4, 5, 8, 9, 11, 12, 14, 15, 17, 18, 20 and reverse items (R. I.) are 1, 6, 7, 10, 13, 16, 19 number questions. To calculate the trait anxiety count, score of D. I. and R. I. was considered. Subtract the sum of R. I. from D. I. (D. I. – R. I.) and added it with a constant value, that is 35.

In state anxiety the direct items (D. I.) are the questions of 3, 4, 6, 7, 9, 12, 13, 14, 17, 18 and reverse items (R. I.) are 1, 2, 5, 8, 10, 11, 15, 16, 19, 20 number questions. To calculate the state anxiety count score of D. I. and R. I. was considered. Subtract the sum of R. I. from D. I. (D. I. – R. I.) and added it with a constant value, that is 50.

The score for either form (T-anxiety and S-anxiety) range from 20 to 80, the higher the score, the greater is the level of anxiety.

b. **Anger (State and Trait)** :

**Aim** : To assess the level of anger (state and trait) among the middle aged male of experimental and control groups.

**Materials Used** : The state and trait anger inventory questionnaire were adopted for measuring anger. This scale was developed by Speilberger (1988) and adopted in Bengali by D. C. Nath, Department of Applied Psychology, University of Calcutta in 1988.

**Procedure** : In the present study, two scales, state anger and trait anger, have been utilized. Each of these two scales consists of 10 items and each item has four
alternative answers scored as 1, 2, 3 and 4 respectively depending on the mode of answer given. Subjects were asked to choose one alternative for each item.

**Scoring** : Total score for each scale is determined by adding all the numbers (answers) for each scale. Higher score indicated higher level of state and trait anger.

c.) **Depression** :

**Aim** : To measure depression level among middle aged male of both the experimental and control group.

**Materials Used** : Questionnaire of Beck Depression Inventory.

**Procedure** : The Beck Depression Inventory (BDI-II), created by Dr. Aaron T. Beck is a 21 question multiple choice self report inventory. One of the most widely used instruments for measuring the severity of depression. There are three versions of the BDI – the original BDI, first published in 1961 and later revised in 1978 as the BDI-1A, and the BDI-II, published in 1996. The BDI-II contains 21 questions, each question has a set of at least four possible answer choices, each answer being scored on a scale value of 0 to 3. For example :

(0) I do not feel sad.

(1) I feel sad.

(2) I am sad all the time and I can not snap out of it.

(3) I am so sad or unhappy that I can not stand it.

Following points were carefully considered by the researcher.

a) The depression test was administered in a calm and quiet environment inside the auditorium hall of Kandi Raj High School, Kandi, Murshidabad.

b) Subjects were properly motivated to give the test.

c) Simple language was used so that each subject may understand what is required from him.

d) Subjects were asked to read all questions carefully and to choose one option (which describes the best how much the statement is applicable on them) for each item and were requested not to leave any item.
**Scoring:** Sum of the total scoring indicates the depression level.

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Depression Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 13</td>
<td>Minimal depression.</td>
</tr>
<tr>
<td>14 – 19</td>
<td>Mild depression.</td>
</tr>
<tr>
<td>20 – 28</td>
<td>Moderate depression.</td>
</tr>
<tr>
<td>29 – 63</td>
<td>Severe depression.</td>
</tr>
</tbody>
</table>

Higher total score indicates more severe depressive symptoms.

### 3.9 Environmental Condition

During the initial test the temperature ranged from 18°C (± 3) to 27°C (± 3) and humidity ranged from 50% to 60%. During the final test the temperature ranged from 22°C to 32°C. The range of humidity was 80% to 90%.

### 3.10 Statistical Analysis

At first mean and SD of raw data of each parameter were taken separately and were computed. For comparison between two paired means t-test was conducted and appropriate software was used.