CHAPTER III

METHODOLOGY

The purpose of the study was to find out whether there would be any significant improvement on selected variables as an effect of physical conditioning on selected physical physiological and biochemical variables of engineering college obese male students. The selection of subjects, experimental variables, instruments reliability, tester’s reliability, orientation of the subjects, test administrations, and statistical techniques were discussed in this chapter.

3.1 SELECTION OF SUBJECTS

To achieve the purpose of the study, sixty students were selected as the subjects for this study from Karpagam Group of Institutions, Coimbatore. The participants were randomly selected from students and assigned to Group – I (Aerobic Training Group), Group – II (Anaerobic Training Group) and Group – III (Control Group). Each group consisted of 20 subjects.

3.2 SELECTION OF VARIABLES

The researcher reviewed the available scientific literatures pertaining to the study from books, journals, periodicals, magazines and research papers. Considered the feasibility of tests, following variables were selected for this study.
3.2.1 INDEPENDENT VARIABLES

1. Aerobic Training
2. Anaerobic Training

3.2.2 DEPENDENT VARIABLES

PHYSICAL FITNESS VARIABLES

1. Speed
2. Strength Endurance
3. Endurance
4. Agility

PHYSIOLOGICAL VARIABLES

1. Vital Capacity
2. Systolic Blood Pressure
3. Diastolic Blood Pressure
4. Resting Pulse Rate

BIOCHEMICAL VARIABLES

1. High Density Lipoprotein (HDL)
2. Low Density Lipoprotein (LDL)
3. Triglyceride (TG)
3.3 EXPERIMENTAL DESIGN

The purpose of this study was to determine the effect of physical conditioning on selected physical, physiological and biochemical variables of engineering college obese male students. For this purpose, sixty engineering college obese male students were selected and they were divided into three groups of 20 subjects each. The groups were assigned in their respected groups such as Group – I (Aerobic Training Group), Group – II (Anaerobic Training Group) and Group – III (Control Group). After assigning the group all the students were administered with the criterion variable which was considered as a pre test. The experimental groups were treated with packages of exercise for the period of twelve weeks and the control group did not participated in any training. After the treatment period was over all the subjects were administered with the criterion measures which was considered as post test.

3.4 SELECTION OF TESTS

Table 3.1 shows the category of variables, selected variables and the tests / equipments used to assess the variables.
### TABLE 3.1

**LIST OF VARIABLES, TESTS AND UNIT OF MEASUREMENTS**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name of the Variables</th>
<th>Tests / Equipments</th>
<th>Units of Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Physical Fitness Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Speed</td>
<td>50 Mts Run / Stop watch</td>
<td>Seconds</td>
</tr>
<tr>
<td>2.</td>
<td>Strength Endurance</td>
<td>Sit Ups / Counts</td>
<td>Numbers</td>
</tr>
<tr>
<td>3.</td>
<td>Endurance</td>
<td>Cooper’s 12 Minutes Run / Walk / Stop watch &amp; Measuring Tape</td>
<td>Distance in meters</td>
</tr>
<tr>
<td>4.</td>
<td>Agility</td>
<td>Shuttle Run / Stop watch</td>
<td>Seconds</td>
</tr>
<tr>
<td></td>
<td><strong>Physiological Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Vital Capacity</td>
<td>Computerised Spirometer</td>
<td>CC / Milliliters</td>
</tr>
<tr>
<td>2.</td>
<td>Systolic Blood Pressure</td>
<td>Sphygmomanometer/ Stethoscope</td>
<td>mm Hg</td>
</tr>
<tr>
<td>3.</td>
<td>Diastolic Blood Pressure</td>
<td>Sphygmomanometer/ Stethoscope</td>
<td>mm Hg</td>
</tr>
<tr>
<td>4.</td>
<td>Resting Pulse Rate</td>
<td>Radial pulse rate</td>
<td>Beats per minute</td>
</tr>
<tr>
<td></td>
<td><strong>Biochemical Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>High Density Lipoprotein (HDL)</td>
<td>Auto analyzer</td>
<td>mg / dl</td>
</tr>
<tr>
<td>2.</td>
<td>Low Density Lipoprotein (LDL)</td>
<td>Auto analyzer</td>
<td>mg / dl</td>
</tr>
<tr>
<td>3.</td>
<td>Triglyceride</td>
<td>Auto analyzer</td>
<td>mg / dl</td>
</tr>
</tbody>
</table>

**3.4.1 RELIABILITY OF INSTRUMENTS**

The staff used the following instruments for measuring various tests; stop watch, measuring tape, starting clapper, Spiro-Meter, Radial Pulse Rate,
Sphygmomanometer/ Stethoscope and Auto analyze. All the instruments were good and in working condition. These instruments has calibrated in standard units, their calibration were tested and found to be accurate enough to serve the purpose of the study. These equipments used for this study were from the Karpagam Medical College and Hospital, Coimbatore, Tamil Nadu State.

3.4.2 TESTER’S RELIABILITY

The researcher with the assistance of physical education staff members of the Karpagam College of Engineering and Karpagam Medical College Hospital, were used to conduct the tests and collect data. Testers were carefully oriented the testing procedures. To ensure that the researcher and his assistants were well versed with the techniques of conducting the tests. The researcher had a number of practice sessions in the correct testing procedure, under the guidance of an expert. The intra class correlation coefficient obtained by pre test and post test method is presented in Table 3.2.

The Reliability Coefficient of the subjects in Physical, Physiological and Bio Chemical Variables were tested by pre test and post test method.
### TABLE 3.2
**INTRA CLASS CORRELATION COEFFICIENT ON TEST ITEMS**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Test Items</th>
<th>Coefficient of Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>50 Mts Run to measure the Speed</td>
<td>0.89*</td>
</tr>
<tr>
<td>2.</td>
<td>Sit ups to measure the Strength Endurance</td>
<td>0.94*</td>
</tr>
<tr>
<td>3.</td>
<td>Cooper’s 12 Minutes Run / Walk to measure the Endurance</td>
<td>0.91*</td>
</tr>
<tr>
<td>4.</td>
<td>Shuttle Run to measure the Agility</td>
<td>0.90*</td>
</tr>
<tr>
<td>5.</td>
<td>Spiro-meter to measure the Vital Capacity</td>
<td>0.96*</td>
</tr>
<tr>
<td>6.</td>
<td>Sphygmomanometer / Stethoscope to measure the Systolic Blood Pressure</td>
<td>0.96*</td>
</tr>
<tr>
<td>7.</td>
<td>Sphygmomanometer / Stethoscope to measure the Diastolic Blood Pressure</td>
<td>0.96*</td>
</tr>
<tr>
<td>8.</td>
<td>Radial pulse rate to measure the Resting Pulse Rate</td>
<td>0.89*</td>
</tr>
<tr>
<td>9.</td>
<td>Auto analyze to measure the High Density Lipoprotein (HDL)</td>
<td>0.97*</td>
</tr>
<tr>
<td>10.</td>
<td>Auto analyze to measure the Low Density Lipoprotein (LDL)</td>
<td>0.97*</td>
</tr>
<tr>
<td>11.</td>
<td>Auto analyze to measure the Triglyceride</td>
<td>0.97*</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level of confidence

#### 3.5 ORIENTATION OF THE SUBJECTS

The researcher explained the purpose of the training programme and their part to the subjects participating in the study. For the collection of data, the researcher explained the various tests for this study also gave instructions to the subjects about the procedure to be adopted by them for measuring the speed, strength endurance,
endurance, agility, vital capacity, blood pressure, resting pulse rate, high density lipoprotein (HDL), low density lipoprotein (LDL) and triglyceride (TG).

3.6 PILOT STUDY

A pilot study was conducted to assess the initial capacity of the subjects in order to fix the load and to make sure that the duration of exercise included in the programme was within the limits of the subjects to ensure the satisfactory effect. For this, ten subjects were selected at random and divided into two groups of five each, in which group I underwent aerobic training group and group II underwent anaerobic training group. They were asked to do the exercise continuously to their sub maximal effort. The minimum distance covered during the Cooper’s 12 minutes run/walk test by the group I subjects was fixed as initial load for aerobic training. The maximum time duration for 50 meters dash by the group II subjects was fixed as initial load for anaerobic training. Based on the response of the subjects in the pilot study the training load for the experimental groups to the main study was fixed for a period of 12 weeks. After completion of the pilot study the present study was conducted on 60 subjects.

3.7 AEROBIC AND ANAEROBIC TRAINING PROGRAMS

The researcher and experts were acted as trainers for the individualized physical education programme and they were given enough orientation on aerobic and anaerobic training programme to be performed. During the training period, the experimental groups underwent their respective training programs three days per week (Alternative
days) for 12 weeks. During the training days they worked out approximately for 45 to 60 minutes including warming up and warming down periods. Another group acted as control group and they do not participate in any strenuous physical exercises and specific training throughout the training program. However, they performed their regular activities as per their wish. The subjects underwent their respective programs as per the schedule under the supervision of the researcher. Each group was having training session of ten minutes for warm up and warm down exercise, involving calisthenics, stretching, aerobic exercises and anaerobic exercises. All the subjects involved in the training programs were questioned about their stature throughout the training period. None of them reported any injury. However, muscle soreness and fatigue were reported in the early weeks, which subsided later. Attendance was recorded and calculated for the three experimental groups separately by dividing total number of training sessions by the number of sessions present. The 12 week training schedule is given in appendix I & II.

3.8 COLLECTION OF DATA

The data were collected on the selected test items as per the methods described. The pre test was conducted one day before the commencement of the experimental period. Likewise the post test was conducted one day after twelve weeks of the experimental period.
3.9 TEST ADMINISTRATIONS

3.9.1 SPEED (50 METERS DASH)

Purpose

To measure the Speed

Equipments required

Two stop watches, measuring tape, clapper, and track marking 50 meters

Procedure

Two lines were marked 50 meters apart from the starting line and finish line. The subjects were advised to run in their own line from the starting to finish, with maximum speed. The command used for starting was ‘on your mark’, ‘set’. ‘clap’. On the command, ‘clap’, the subject ran as fast as possible across the finish line to cover 50 meters.

Scoring

The elapsed time was measured to the nearest one tenth of a second.

3.9.2 STRENGTH ENDURANCE (SIT-UPS)

Purpose

This test measures Strength Endurance

Equipment required

Gymnastic Mats, stop watch
Procedure

The subject being tested took supine lying position with bent knees, feet flat about 18 inches from the buttocks, and the hands touching the side of the head. A partner holds the subject feet as the exercises performed. The subject touched the elbow to the alternate knee with each sit up. The subject performs as many sit ups in one minute as possible.

Scoring

The score was recorded in numbers of correct repetitions for one minute.

3.9.3 ENDURANCE (Cooper’s 12 Minutes Run / Walk Test)

Purpose

To measure the Endurance

Equipment required

A 200 M track and stop watch with cones or flags fixed at every 50 meters along the track.

Procedure

Subjects would run individually or in groups of a dozen or more. When subjects ran in groups, they were paired. While 9 subjects ran the partners listened for the time to call out his partner’s time. The subject was asked to run or walk for 12 minutes. If the subject was unable to run continuously for 12 minutes, he was allowed to walk. The total distance covered by the subjects in 12 minutes were recorded as the distance covered by the subject and it was the cardiovascular ability of the subject.
Scoring

Record time in meters the distance covered in 12 minutes run / walk

3.9.4 AGILITY (Shuttle run)

Purpose

To measure the Agility

Equipment

Two lines parallel to each other were placed on the floor 10 meters apart. Since the students must over run both of these lines, it was necessary to have several feet more at floor space at either end. Two blocks of wood 2 x 2 x 4 inches and a stop watch were needed.

Procedure:

The students stand at one of the line with the two blocks at the other line. On the signal to start, the students ran to the blocks, took one returned to the starting line, and placed the block behind that line, he then returned to the second block, which is carried across the starting line on the way back. Two students could run at the same time if 2 items were available, or if one test administrator had a split second timer and of course, if there were two sets of blocks. Two trials were permitted. If the students started first at one line and then at the other, it was not necessary to return the block after each race. Sneakers were worn or the students ran bare-footed. The score was the time elapsed.
Scoring

The time of the better of the trials to the nearest tenth of a second was recorded.

3.9.5 VITAL CAPACITY

Purpose

The purpose of this test was to find out the maximum quantity of air that can be expired after a full inspiration.

Equipment required

Computerised Spirometer, Mouth pieces and nose clips.

Procedure

Vital capacity was measured by Computerised Spirometer in liters. The Spirometer was equipped with a good length of rubber hose. The Spiro meter was fixed with computerised machine, all the subject can sit erect at the beginning of the test. The mouth piece was disinfected by an antiseptic solution after use by each subject. The subjects were asked to take a deep breath for test. There after the fullest possible inhalation, the subject exhaled slowly and steadily bending forward over the hose till the air within his control was expelled. Care was taken to prevent air from escaping either through nose or around the edges of mouth piece and was also ensured that a second breath was not taken by the subject during the test. In case of doubt the test was repeated.
Scoring

The computerised Spirometer would display the amount of air blown by the subject and it was recorded in litters.

3.9.6 SYSTOLIC AND DIASTOLIC BLOOD PRESSURE

Purpose

The purpose of this test was to find out the blood pressure.

Equipment required

A Sphygmomanometer

Procedure

The blood pressure of all the subjects was recorded in a sitting position, the subjects were asked to relax. Then the subjects were instructed to sit in a back supported chair and maintain in a slight incline position. Then the Sphygmomanometer was used in the upper arm of the subject with help of the technician. In this way the researcher was measured the blood pressure of the subject.

Scoring

The Sphygmomanometer would show the pressure levels in mm Hg.

3.9.7 RESTING PULSE RATE

Purpose

To measure the resting pulse rate of each subject per minute
Equipments required

Radial pulse rate was selected to measure Resting Pulse Rate and the score is to be recorded in beats/min.

Procedure

The pulse rate of all the subjects was recorded in a sitting position, in the evening between 4 and 5 p.m. Before taking pulse rate the subjects were asked to relax for about 30 minutes. Then the subjects were instructed to sit in a back supported chair and maintain in a slight incline position and placed his left hand on the table. Then the resting pulse rate of each subject was recorded by using holding radial artery. In this way the researcher was measured the resting pulse rate of the subject.

Scoring

The number of heart beats per minute was recorded as score.

3.9.8 HIGH DENSITY LIPOPROTEIN (HDL)

Purpose

The purpose of this test was to find out the level of high density lipoprotein (HDL) in blood.

Equipment required

A needle and syringe, in lab auto analyzer

Procedure

Venipuncture was the process of obtaining intravenous access for the purpose of blood sampling of venous blood. This procedure was performed by technicians, and
other nursing staff. The subjects were advised come with an empty stomach in the morning take the blood samples after one hour take another samples, (after breakfast).

Scoring

Through auto analyzer report, get the HDL values in mg / dl

3.9.9 LOW DENSITY LIPOPROTEIN (LDL)

Purpose

The purpose of this test was to find out the level of low density lipoprotein (LDL) in blood.

Equipment required

A needle and syringe, in lab auto analyzer

Procedure

Venipuncture was the process of obtaining intravenous access for the purpose of blood sampling of venous blood. This procedure was performed by technicians, and other nursing staff. The subjects were advised come with an empty stomach in the morning take the blood samples after one hour take another samples, (after breakfast).

Scoring

Through auto analyzer report, get the LDL values in mg / dl

3.9.10 TRIGLYCERIDE (TG)

Purpose

The purpose of this test was to find out the level of triglyceride (TG) in blood.
Equipment required

A needle and syringe, in lab auto analyzer

Procedure

Venipuncture was the process of obtaining intravenous access for the purpose of blood sampling of venous blood. This procedure was performed by technicians, and other nursing staff. The subjects were advised come with an empty stomach in the morning take the blood samples after one hour take another samples, (after breakfast).

Scoring

Through auto analyzer report, get the TG values in mg / dl

3.10 STATISTICAL TECHNIQUES

The data collected from the subjects were analysis with statistical technique to find out the significant improvement in physical fitness, physiological and biochemical variables from Aerobic training group, Anaerobic training group and Control group were analyzed by using ANOCOVA. Whenever the ‘F’ ratio for adjusted post test was found to be significant, Scheff’s post hoc test was applied to test the significant differences between the paired adjusted means. 0.05 level of confidence was fixed for physical, physiological and biochemical variables to test the level of significance.