CHAPTER – III

METHODOLOGY

In this chapter selection of subjects, selection of variables, experimental design, pilot study, criterion measures and selection of tests, reliability of data, reliability of instruments, reliability of questionnaire, subject reliability, orientation of the subjects, administration of test items, administration of training programs, collection of data, statistical techniques and its justification adopted for the analysis of data have been described.

3.1 SELECTION OF SUBJECTS

The purpose of the study was to find out the effect of aerobic and anaerobic training on selected physiological and body composition profiles among middle aged obese women. To achieve the purpose of this study Forty five middle aged obese women were randomly selected in and around from Namakkal district, Tamil Nadu, India and their age ranged between 35 to 45 years.

3.2 SELECTION OF VARIABLES

The research scholar reviewed the available scientific literature pertaining to the problem from books, journals, magazines, websites, and research papers which revealed the importance of aerobic training and anaerobic training. Taking into consideration of feasibility, criteria and availability of the instruments the following variables were selected for this study.

3.2.1 DEPENDENT VARIABLES

a. Physiological Variables

- Breath Holding Time
- Systolic Blood Pressure
- Diastolic Blood Pressure
- Resting Pulse Rate
- Aerobic Power
- Anaerobic Power

b. Body Composition Profiles

- Body Weight
- Lean Body Mass
- Fat Mass
- Body Mass Index

3.2.2 INDEPENDENT VARIABLES

- Group I – Aerobic Training
- Group II – Anaerobic Training
- Group III – Control Group

3.2 EXPRIMENTAL DESIGN

The study was formulated as a pre and post test random group design, in which forty five obese women were randomly assigned into three equal groups and each group consisting of 15 subjects. Group I underwent Aerobic training and Group II underwent Anaerobic training and Group III act as a control group; they did not undergo any above mentioned special training programme. After

assessing the subjects to treatment and control groups, they were tested on selected criterion variables. It was considered as pre – test. After assessing the pre – test performance on criterion variables, the subjects were treated with their respective training programme for twelve weeks. After twelve weeks of their training programme, again the subjects were tested (Post-test) on selected criterion variables as such in the pre – test.

3.4 PILOT STUDY

A pilot study was conducted to assess the initial capacity of the subjects in order to fix the load. For this purpose ten subjects were selected randomly and underwent training packages under watchful eyes of the experts and the researcher. Based on the response of the subjects in the pilot study the training schedule were constructed, however the individual differences were considered while constructing the training programme. The basic principles of training (progression, over load and specificity) were also followed.

3.5 CRITERION MEASURES AND SELECTION OF TESTS

The present study mainly concerns with the effect of aerobic and anaerobic training on selected physiological and body composition profiles among middle aged obese women.

The following tests were administered to measure the selected physiological and body composition profiles. The tests were administered to the subjects before and after the training programme.

TABLE – 3.1

TEST SELECTION

S.No	Variables	Tests	Units
1	Breath Holding Time	Breath Holding	In Seconds
2	Systolic Blood Pressure	Sphygmomanometer	In mmhg
3	Diastolic Blood Pressure		
4	Resting Pulse Rate	Stethoscope	In Beats/Min
5	Aerobic Power	Queens College step test	In ml/kg/min
6	Anaerobic Power	Margaria-Kalamen Power Test	In Watts
7	Body Weight	Bioelectrical Impedance Analyzer (Omron Body Fat Monitor HBF-306)	In Kilograms
8	Lean Body Mass		In Kilograms
9	Fat Mass		In Kilograms
10	Body Mass Index		In Numbers

3.6 RELIABILITY OF DATA

The reliability of data was established by using test-retest method. To achieve this purpose, ten subjects were randomly selected and the test was administered twice after a day's gap. Care was taken to keep all testing conditions uniformly during testing and retesting. The scores recorded for the ten subjects during the test and retests were correlated using Intra Class Correlation for the different variables. The co-efficient of correlation is presented in Table – 3.2.

TABLE – 3.2

RELIABILITY CO-EFFICIENT OF CORRELATION OF TEST-RETEST SCORES

S. No	Variables	Co-efficient of correlation 'r'(N=10)
1	Breath holding time	0.89
2	Systolic Blood Pressure	0.95
3	Diastolic Blood Pressure	0.98
4	Resting Pulse Rate	0.97
5	Aerobic Power	0.96
6	Anaerobic Power	0.97
7	Body Weight	0.98
8	Lean Body Mass	0.94
9	Fat Mass	0.97
10	Body Mass Index	0.90

3.7 RELIABILITY OF INSTRUMENTS

The instrument such as digital stop watch, sphygmomanometer, stethoscope, step benches, bioelectrical impedance analyzer, stadiometer, weighing machine were reliable and accurate enough to carry out the test procedures successively.

3.8 TESTER'S RELIABILITY

To ensure the tester's reliability of the tests the investigator had a number of practice sessions in the teaching procedure and well versed in the technique of conducting the test. Tester reliability of test was established by test-retest

process. For this purpose ten subjects were selected at random on the chosen variables, which were recorded twice under identical conditions on different occasions by the different investigator.

3.9 SUBJECTS RELIABILITY

In order to get uniform results from the same subjects, they were used under similar conditions for the same test by the same tester. The test-retest method was used to find out the subjects reliability.

3.10 ORIENTATION TO THE SUBJECTS

The investigator held a meeting with the subjects prior to the administration of tests. The purpose, the significance of this study and the requirements of the testing procedure were explained to them in detail, so that there was no ambiguity in their minds, regarding the efforts required of them. All the subjects voluntarily came forward to co-operate in the testing procedures and the training to put in their best efforts in the interest of the scientific investigation and in order to enhance their own performance. The subjects were very enthusiastic and co-operative throughout the project.

3.11 ADMINISTRATION OF TEST ITEMS

3.12 PHYSIOLOGICAL VARIABLES

3.12.1 Breath Holding Time (Digital Stop Watch)

Purpose:

To measure the ability of the subject to hold the breath for longer time.

Procedure:

The subject stands at ease and in hold deeply after which he hold his breath for a length of time possible to him. The index finger of the respondent served as an indicator to the investigator to know the start and end of the recording time. The centre finger were used to hold the nose avoid letting the air through the nostrils. The subject were requested not be let the air out by opening the mouth while recording the breath holding time.

Scoring:

The time is recorded in seconds and the best of two trials were recorded.

3.12.2 Blood Pressure (Sphygmomanometer)

Purpose:

The purpose was to measure the blood pressure (systolic and diastolic pressure) of the subjects.

Equipments:

Sphygmomanometer was needed.

Procedure:

The measurements were taken with the subjects in supine position. The cuff was wrapped around the arm evenly with the lower edge approximately one inch above the anticubital space. The stethoscope was placed on the medical side of the elbow, over the artery and was made sure that it had no contact with the cuff. The cuff was inflated until the artery was fully collapsed to the extent that number of pulse beat could be heard. Pressure off the cuff was then slowly released as the investigator watched the gauge when sound of the pulse become

audible the reading in mm of Hg at that instant was recorded as the systolic pressure. The pressure was farther released gradually as the sound of the pulse change in intensity and quality. The index of the diastolic pressure was would in mm of Hg when the heart beat sound completely ceased.

Scoring:

The blood pressure was measured in millimeters of mercury (mmHg).

3.12.3 Resting Pulse Rate (Stethoscope)

Purpose:

The purpose was to measure the rate of the pulse beat per minute.

Equipments:

Stethoscope, Score Sheet, Stop Watch was needed to execute the test.

Procedure:

For the sake of accuracy, in this study, the students were asked to stay in the hostel for a night. The resting pulse rate was measured in the subject's hostel rooms as soon as they woke up from their sleep in the morning. They were instructed to remain in their beds till the investigator arrived to measure their resting pulse rates. The resting pulse rate was measured while the subject remained lying on the bed around 6.30 a.m. in the morning. The stopwatch was used to count the seconds for starting and ending the pulse beat counts. After every minute, when the stopwatch was stopped, both the subjects and investigator called out the number of beats counted by them simultaneously.

Scoring:

There were five repetitions of such one – minute counts and the highest count were recorded as the subject's resting pulse rate. Number of beats per minute was counted.

3.12.4 Aerobic Power (Queens College Step Test)

Purpose:

This sub-maximal test provides a measure of cardiorespiratory or endurance fitness.

Equipments:

16.25 inches / 41.3 cm step, stopwatch, metronome or cadence tape, pulse rate monitor.

Procedure:

The athlete steps up and down on the platform at a rate of 22 steps per minute for females and at 24 steps per minute for males. The subjects are to step using a four-step cadence, 'up-up-down-down' for 3 minutes. The athlete stops immediately on completion of the test, and the heart beats are counted for 15 seconds from 5-20 seconds of recovery. Multiply this 15 second reading by 4 will give the beats per minute (bpm) value to be used in the calculation below. See video of this test being performed.

Scoring:

An estimation of VO2max can be calculated from the test results, using this formula (McArdle et al.,1972). A rating can be determined using the VO2max norms.

- men: VO2max (ml/kg/min) = 111.33 - 0.42 x heart rate (bpm)
- women: VO2max (ml/kg/min) = 65.81 - 0.1847 x heart rate (bpm)

3.12.5 Anaerobic Power (Margaria-Kalamen Power Test)

Purpose:

This is a classic test of anaerobic power.

Equipments:

Stopwatch, timing mats (optional), tape measure, flight of 12 steps with a starting line of 6 meters in front of the first step. Each step is approximately 17.5 cm high with the 3rd, 6th and 9th step clearly marked. The vertical distance between the 3rd and 9th step must be accurately measured for use in the results formula.

Procedure:

The athlete's weight is determined in kilograms. The athlete is given a few practice runs up the steps to warm up. The athlete stands ready at the starting line 6 meters in front of the first step. On the command "Go", the athlete sprints to and up the flight of steps, taking three steps at a time (stepping on the 3rd, 6th and 9th steps), attempting to go up the steps as fast as possible. The time to get from the 3rd step to the 9th step is recorded (either using a stopwatch or using switch mats placed on the 3rd and 9th steps), starting when the foot was in first in contact with the 3rd step, and stopped when the foot contacts the 9th step. Allow three trials of the test, with 2-3 minutes recovery between each trial.

Scoring:

Power (Watts) is calculated from the formula below, where P = Power (Watts), M = Body mass (kg), D = Vertical distance, between steps 3 & 9 (meters), t = Time (seconds). 9.8 is the constant of gravity: P = (M x D) x 9.8 / t.

3.13 BODY COMPOSITION PROFILES

3.13.1 Body Weight

Purpose:

To measure the body weight.

Equipment:

Weighing machine and score sheet.

Procedure:

The body weight of each subject was taken on a portable weighing machine. Before taking the measurements, care was taken to see that the pointer of weighing machine stood at zero when there was no weight on it. The measurement of body weight was recorded to nearest one tenth a kilogram.

Scoring:

The body weight was recorded with nearest one tenth of kilogram and recorded as score.

3.13.2 Lean Body Mass

Purpose:

To assess the subjects fat mass.

Procedure:

Subject's body weight was measured by using weighing machine and fat mass was measured by using the formula fat mass (kg) = percentage fat X body weight (kg). Lean body mass was calculated by the following formula.

Scoring:

Lean Body Mass (kg) = body weight (kg) – Fat Mass (kg)

3.13.3 Fat Mass

Purpose:

To assess the subjects fat mass.

Procedure:

Subject's percentage of fat and body weight was measured by using Omron body fat monitor and weighing machine respectively. Fat free mass was calculated by the following formula.

Scoring:

Fat mass (kg) = percentage fat X body weight (kg)

3.13.4 Body Mass Index

Purpose:

To measure the body composition of the subjects.

Equipment:

Scales and stadiometer as for weight and height.

Procedure:

BMI is calculated from body mass (Weight in kg) and height in meter. BMI = Weight in kg / (Height in meter)^2. The higher the score usually indicating higher levels of body fat.

Scoring:

Use the table below to determine the BMI rating.

Body Mass Index	Weight Status
Below 18.5	Under weight
18.5-24.9	Normal
25.0-29.9	Overweight
30.0 and above	Obese

3.14 TRAINING PROGRAMME

During the training period the experimental groups underwent their respective training programme in addition to their daily regular activities as per the schedule. Experimental groups namely aerobic training, anaerobic training underwent their respective experimental training on three alternate days per week for twelve weeks. The experimental training programmes were designed based on the resources collected from books, periodicals, e-materials and discussions with the experts. The duration of experimental training were planned for 90 minutes. The subjects reported for experimental training between 7.00 am and 8.30 am. All the subjects involved in this study were carefully monitored throughout the training programme and attained 90% of attendance.

TABLE – 3.3

GENERAL STRUCTURE OF TRAINING PROGRAMS

GROUPS WITH TRAINING PARTICULARS	TRAINING
Group I	Aerobic Training
Group II	Anaerobic Training
Group III	Control Group
Training Duration	Ninety Minutes
Training Session per week	Three days
Total length of training	Twelve Weeks
Training load progression	Every Four Weeks

TABLE – 3.4

AEROBIC TRAINING GROUP (ATG)

ng	Duration	Intensity	Time	Frequency /Week	Rest
ng	90 Mins	40 to 50%	7.00 to 8.30 AM	3	2 Mins
g					2 Mins
g					2 Mins
bing					2 Mins
ance					2 Mins
Games					2 Mins
ng	90 Mins	50 to 60%	7.00 to 8.30 AM	3	3 Mins
g					3 Mins
g					3 Mins
bing					3 Mins
ance					3 Mins
Games					3 Mins
ng	90 Mins	60 to 70%	7.00 to 8.30 AM	3	4 Mins
g					4 Mins
g					4 Mins
bing					4 Mins
ance					4 Mins
Games					4 Mins

TABLE – 3.5

ANAEROBIC TRAINING GROUP (AATG)

ng	Duration	Intensity	Time	Frequency/Week	Rest
ng	90 Mins	40 to 50%	7.00 to 8.30 AM	3	2 Mins
ifting					2 Mins
, 200M)					2 Mins
Rope					2 Mins
rval Training					2 Mins
Exercises					2 Mins
ng	90 Mins	50 to 60%	7.00 to 8.30 AM	3	3 Mins
ifting					3 Mins
, 200M)					3 Mins
Rope					3 Mins
rval Training					3 Mins
Exercises					3 Mins
ng	90 Mins	60 to 70%	7.00 to 8.30 AM	3	4 Mins
ifting					4 Mins
, 200M)					4 Mins
Rope					4 Mins
rval Training					4 Mins
Exercises					4 Mins

3.15 COLLECTION OF DATA

At the end of the treatment period, as post test, the subjects belong treatment groups namely (ATG) Group I and (AATG) Group II and control group were tested on criterion variables of physiological variables and the body composition profiles as such in the pre test of the same. The collected data were processed with appropriate statistical tool.

3.16 STATISTICAL TECHNIQUES

The group means gains recorded by the various groups during the experimental period of twelve weeks to the criterion measures were tested for significance by applying paired 't' test. The present study pays attention mainly on testing the means of three treatment groups and secondarily deals with the increase of means in each group from base line to post treatment for various measures. The statistical tool used for these are described here. Analysis of co variance (ANCOVA) was applied to determine whether the training programmes produced significantly different improvements in selected variables after 12 weeks of training. Since the initial means were not matched, comparisons between actual could not be made, all means were adjusted by regression to a common mean. The significance of difference of pairs of adjusted final group means was tested for significance by applying Scheffe's post hoc test. In all the cases 0.05 level of confidence was utilized.