Chapter III

METHODOLOGY

This chapter deals with the procedure followed in the selection of the subjects, selection of variables, selection of criterion measures, instrument reliability, reliability of the data, orientation to the subjects, pilot study, training programme, training schedule, collection of data, test administration, experimental design, statistical techniques and justification for using statistical techniques applied for analyzing the data.

Selection of Subjects

The purpose of the preset study was to find out the impact of aerobic training and yogic practices on health related physical fitness, basal metabolic rate, and blood lipid profiles of the obese college men. To achieve the purpose of this study, a qualified physician examined 968 male students studying different graduation courses from four degree colleges namely – Government Degree College for Men, Sree Sai Baba National Degree College, PVKK Degree College and Sai Degree College in Anantapurmu town, Andhra Pradesh, India, and found out 174 obese college men. Out of 174 obese college men 45 obese college men were selected at random as subjects. Their age ranged from 18 to 22 years as per the college records. The selected subjects were divided into two experimental groups and a control group with fifteen subjects in each (n=15). Experimental Group I underwent aerobic training (ATG),
Group II underwent yogic practices (YPG) and Group III served as control group (CG) for the training period of 12 weeks.

All the subjects were informed about the nature of the study and their consent was obtained to co-operate till the end of the experiment and testing period. Pilot study groups and experimental groups (namely ATG and YPG) were trained-up in which two modes of training were given independently with separate subjects in each group. A qualified physician examined the subjects medically and declared them fit for the study. The subjects were free to withdraw their consent in case they felt any discomfort during the period of their participation, but there were no dropouts.

**Selection of Variables**

Health related physical fitness, physiological and blood lipid parameters are the ideal indicators of healthy lifestyle of an individual. Good healthy lifestyle is merely the product of health related fitness and lipid parameters prerequisites possessed by an individual. The investigator had gone through the relevant literature in the area of aerobic training and yogic practices and its various aspects in association with the guide and other experts in this area. The variables were selected after considering the feasibility and availability of proper techniques and instruments.
**Criterion Variables**

A high BMI and, in particular, a high waist/hip ratio, which indicate overweight and abdominal fatness, respectively, are important health risk factors for some severe and potentially disabling conditions. It must be recognized, however, that a high BMI and a high waist/hip ratio may reflect heterogeneous underlying genetic, socioeconomic, and lifestyle factors that may substantially affect their health implications. Weight loss seems to have at least short-term beneficial results for almost all overweight subjects, regardless of their race/ethnicity, sex, or age, who tend to suffer, partly as a result of their overweight, from conditions such as coronary heart disease, hyperlipidemia, hypertension or mechanical problems of overweight (*Pi-Sunyer, 1993*).

Strategies to characterize and approach different sub-groups that differ in the causes and consequences of overweight and abdominal fatness have yet been developed. Because therapies for the attainment of “optimal” weights are commonly unsuccessful, the concept of “reasonable” weight and weight loss goals should be further developed (*St. Jeor, et al., 1993*), and a focus on the maintenance of attained “reasonable” weights is necessary. From a public health viewpoint, it is desirable that emphasis be placed on the prevention of overweight, but preventive strategies are mainly theoretical. None has been proven to be successful.
Increased exposure of the liver to free fatty acids may also lead to increased synthesis of triglycerides and secretion of very low density lipoprotein cholesterol *(Despres, 1991).*

As suggested by Despres, the high circulating VLDL-C levels may lead to a triglyceride enrichment of LDL-C and HDL-C and result in reduced plasma HDL-C and the formation of atherogenic, small “dense” LDL. Despres also proposed that the slow catabolism of VLDL-C and the high activity of hepatic triglyceride lipase activity may contribute to a further lowering of HDL-C levels. The mechanisms responsible for the association between visceral fat and lipoproteins may also include effects of gluco-corticosteroids and androgens, which are related to the accumulation of fat in the abdominal cavity as well as to disturbances in glucose and lipid metabolism.

The joggers and marathon runners alike had higher levels of HDL in their blood than the sedentary group, and the marathon runners had more HDL than the joggers. This result suggested that HDL levels increase in proportion to the distance run *(Fonda’s, 1984).*

Hence, the following dependent variables were selected and are presented below.

1. Health Related Physical Fitness Components
   i. Cardio-respiratory Endurance
   ii. Flexibility
   iii. Body Composition
   iv. Muscular Strength and Endurance
2. Basal Metabolic Rate

3. Blood Lipid Profiles
   i. High Density Lipoprotein (HDL)
   ii. Low Density Lipoprotein (LDL)
   iii. Total Cholesterol (TC)
   iv. Triglycerides (TG)

**Independent Variables**

According to *Gilmore, 1981*, every day millions of people was taking part in running, bicycling, skipping, weight lifting, playing tennis, football, walking, swimming and shadow boxing. There are scores of such exercises, and the physical effects of one differ subtly from the effects of any other. Yet the variety of aerobic exercises is less confusing and diverse than it seems. Each leads to at least one of five fitness goals greater stamina from a strengthened heart and circulatory system, increased power in the muscles, a trimmer and slimmer body, greater flexibility and joint mobility and relaxation of tensions of all these goals the most important, say fitness experts, is a strengthened circulatory system. Many aerobic exercises promote several of these goals simultaneously. The psychological and physiological profits of exercise accrue to everyone, male and female, young and old. This fact has long been accepted, but it has not been acted upon. Until recently, regular vigorous aerobic exercise undertaken for its aid in promoting fitness-has been largely the province of men and mainly men in their
young to middle years. Only now is the importance of deliberate programs of activity for children, women and the elderly being recognized. Children were thought to get enough exercise from play. That many of them do not is indicated by the alarming incidence of obesity in the young, caused generally by inactivity most fat children eat less than slim ones but are much less active.

No one doubts that excess fat impairs health life insurance companies, drawing on comparisons of weight and mortality over more than a century, have made most people aware of the dangers of overweight. Regular physical activity alters the chemical composition of the blood in such a way that it is better able to dissolve blood clots. Because clots in an artery are believed to trigger some heart attacks, strokes and other circulatory diseases by cutting off circulation to the heart, brain or some other vital organ, the change in the blood induced by aerobic physical activity may also give some protection against such disorders. One example of the difficulty of proving that exercise results in better health is the tenuous connection between exercise and reduced risk of heart disease. Physiologists have demonstrated to everyone's satisfaction that a certain type of regular exercise brings about a number of changes in the heart and circulatory system. The heart, for example, acquires the capacity to pump more blood with each beat than it did before. BP generally drops slightly the resting pulse rate slows- indeed, the heart may beat as many as 13 million fewer times per
year. “Heart becomes like a low-mileage used car, it takes longer to wear out”.

Exercising to lose weight and firm the body demands hard work, will power and time. Hard to avoid the conclusion that exercise can decrease the probability of heart attack. Less equivocal evidence that exercise might forestall heart attack comes from research into the effects on the heart of cholesterol, a fat used by the body as a vital part of cell walls and as raw material for sex hormones and bile acids. It has been known for years that a high level of cholesterol in the blood is associated with an increased risk of heart attack. Cholesterol does not travel alone in the blood but must first be combined with proteins to form other substances called lipoproteins. HDLs were rich in cholesterol not because they were carrying this dangerous substance to deposit it around the body, but because they were acting like garbage trucks to help the body get rid of it. The high levels of HDL might be associated with a reduced risk of heart attack.

Morrow, et al., (2005) stated that one should select modes of exercise that allow the individual to maintain constant exercise intensity and are not highly dependent on the participant’s skill. Group I activities, namely walking, cycling and simulated stair climbing. Group II activities namely aerobic dance, step aerobics and swimming, the rate of energy expenditure is highly dependent on the participant’s skill level. Group III activities namely racquetball, basketball and volleyball are highly variable in terms of exercise intensity and skill.
Yoga can be done for relaxation, but it improves flexibility as well. And almost all asanas have some effect on the shape of the body. Prolonged yoga asana practices can decrease pulse rate, respiratory rate and blood pressure, it can contribute to stabilizing the nervous system equilibrium, to normalizing gastrointestinal functions and endocrine function, to increasing the joint range of motions, endurance level, energy level, immunity to diseases and cardiovascular efficiency, to improving eye-hand coordination, reaction time, dexterity skills, depth perception, sleep, etc. As for the biochemical benefits, we can enumerate substantial decreases of glucose, sodium, cholesterol, total white blood cell and remarkable increases of vitamin C, total serum protein, hemoglobin etc. Aerobics fitness will enhance every area on one’s life- improving one’s mental and physical vibrancy, one’s energy and alertness. It may also make one feel better emotionally. This happens because the cardiovascular system is central to the vitality of the entire body. Aerobics activity includes brisk walking, hiking, jogging, running, cross-country skiing, swimming, cycling, jump-robe and studio aerobics. It improves the blood circulation, strengthens the heart, lung, muscles and bones. A program of gradual cutting back on calories combined with burning them through exercise is the best, healthiest, most permanent way to lose weight. It’s the only way to lose fat and not muscle, to raise one’s metabolism and lower one’s appetite. Metabolism is the process by which digested fate, proteins and carbohydrates are burned with the help of oxygen to create energy. This is what “burning
calories” means. The muscles, which make up the largest part of our body, are the key to a well-tuned metabolism because they are responsible for burning almost all of the calories we consume. The more muscle we have, the more calories we burn. This is true not only while we exercise but while we are at rest as well (Fonda’s, 1984).

Each stage in training requires modification of the various modes and methods of training according to the goals set by the practitioner, therapists, doctors and the conditioning specialist. Training is only a means of achieving success. Hence, the following training methods were selected as independent variables.

1. Aerobic Training
2. Yogic practices

**Selection of Criterion Measures**

After reviewing the available literature, the following standardized tests were selected and used to collect the relevant data on the selected dependent variables and they are presented in table I.
## Table I

### SELECTION OF TESTS

<table>
<thead>
<tr>
<th>Variables</th>
<th>Test/Method/Instrument</th>
<th>Unit of Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Related Physical Fitness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardio-respiratory Endurance</td>
<td>9 minutes Run/Walk</td>
<td>In Meters</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Sit and Reach</td>
<td>In Cms</td>
</tr>
<tr>
<td>Body composition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body Fat</td>
<td>Bioelectrical Impedance Analyzer (Omron Body Fat Monitor HBF-306)</td>
<td>In Percentage</td>
</tr>
<tr>
<td>Fat Free Mass</td>
<td>Formula</td>
<td>In Kgs</td>
</tr>
<tr>
<td>Body Mass Index</td>
<td>Formula</td>
<td>In Percentage</td>
</tr>
<tr>
<td>Muscular Strength and Endurance</td>
<td>Bent Knee Sit-ups</td>
<td>In Numbers</td>
</tr>
<tr>
<td>Basel Metabolic Rate</td>
<td>Bioelectrical Impedance Analyzer (Omron Body Fat Monitor HBF-306)</td>
<td>In Calories</td>
</tr>
<tr>
<td>Blood Lipid Profiles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Density Lipoprotein (HDL)</td>
<td>Enzymatic Calorimetric Method</td>
<td>In mg/dL</td>
</tr>
<tr>
<td>Low Density Lipoprotein (LDL)</td>
<td>Enzymatic Calorimetric Method</td>
<td>In mg/dL</td>
</tr>
<tr>
<td>Total Cholesterol (TC)</td>
<td>Enzymatic Calorimetric Method</td>
<td>In mg/dL</td>
</tr>
<tr>
<td>Triglycerides (TG)</td>
<td>Enzymatic Calorimetric Method</td>
<td>In mg/dL</td>
</tr>
</tbody>
</table>
**Instrument Reliability**

Instruments like stopwatch, dynamometer, sit and reach box and bioelectrical impedance analyzer were reliable and manufactured by standard companies. Instrument reliability was also established by test-retest method. Blood lipid profiles were estimated in Star Diagnostics and CT Scan Centre, Anantapuramu, Andhra Pradesh.

**Reliability of the Data**

Three months before the commencement of the pilot study, the reliability of the data was established by using 10 subjects at random. To ensure reliability, test and re-test method was executed. In between the test and retest, one-day rest was given to all the subjects. The same testing personnel by using the same equipment’s under identical conditions tested all the variables selected in the present investigation twice on the same subjects. The intra class co-efficient of correlation was used to find out the reliability of the data and the results are given in table II.
### Table II

**INTRA CLASS CO-EFFICIENT OF CORRELATION ON SELECTED VARIABLES**

<table>
<thead>
<tr>
<th>Variables</th>
<th>‘r’ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Health Related Physical Fitness</strong></td>
<td></td>
</tr>
<tr>
<td>Cardio-respiratory Endurance</td>
<td>0.89*</td>
</tr>
<tr>
<td>Flexibility</td>
<td>0.91*</td>
</tr>
<tr>
<td><strong>Body Composition</strong></td>
<td></td>
</tr>
<tr>
<td>Body Fat</td>
<td>0.95*</td>
</tr>
<tr>
<td>Fat Free Mass</td>
<td>0.95*</td>
</tr>
<tr>
<td>Body Mass Index</td>
<td>0.96*</td>
</tr>
<tr>
<td><strong>Muscular Strength and Endurance</strong></td>
<td>0.91*</td>
</tr>
<tr>
<td>Basel Metabolic Rate</td>
<td>0.96*</td>
</tr>
<tr>
<td><strong>Lipid Profiles</strong></td>
<td></td>
</tr>
<tr>
<td>High Density Lipoprotein (HDL)</td>
<td>0.92*</td>
</tr>
<tr>
<td>Low Density Lipoprotein (LDL)</td>
<td>0.93*</td>
</tr>
<tr>
<td>Total Cholesterol (TC)</td>
<td>0.93*</td>
</tr>
<tr>
<td>Triglycerides (TG)</td>
<td>0.92*</td>
</tr>
</tbody>
</table>

*Significant at 0.01 level.
(Table value required for significance at 0.01 level of confidence is 0.77)

Since the obtained ‘r’ values were much higher than the required value, the data were accepted as reliable in terms of instrument, tester and the subjects.
Orientation to the Subjects

The investigator explained the purpose of the training programme and explained the involvement of the subjects. Before the commencement of the training programme, the aerobic training and yogic practices were taught to Groups I and II. Two one-hour sessions was spent on alternate days to practice the techniques. This helped the subjects to perform the aerobic training and yogic practices perfectly by avoiding injuries.

Pilot Study

A pilot study was conducted to assess the initial capacity of the subjects in order to fix the load. For this, 12 subjects were selected at random and divided into two groups of six each, in which Group I underwent aerobic training and Group II underwent yogic practices under the supervision of the investigator for a period of 6 weeks. Based on the response of the subjects in the pilot study, the training schedule was constructed for the main study. The basic principles of sports training namely progression of load, over load and specificity were followed.

Training Programme

During the training period, the experimental groups underwent their respective training programmes three days per week on alternate days for twelve weeks in addition to their regular school activities. Experimental Group I (ATG) underwent aerobic training and Group II (YPG) underwent yogic practices. Before the commencement of the experimentation and at the middle of the training period (after fifth week), the investigator
recorded the target heart rate tests for aerobic training group subjects. The details are cited in training schedule.

Training volume and intensity were increased progressively on different phases. The training schedule for all the two experimental groups were presented in the table III to IX. Every day the workout lasted for 45 minutes. Group III served as the control group. However, they were involved in regular activities as per the school timetable.

The subjects underwent their respective training programme under strict supervision of the investigator. Prior to every training session, subject underwent 5-10 minutes warm-up exercises. All the subjects involved in the training programmes were questioned about their stature throughout the training period. None of them reported any injuries. However, muscle soreness was reported in the early weeks, but it subsided later.

**Aerobic Training**

The experimentation period was lasted for twelve weeks. Initially, in the first four weeks, the subjects were asked to walk and jog slowly for five to ten minutes before going to protocol of aerobic exercises. Then the following aerobic training (protocol of aerobic exercises) was performed by the subjects. All the time the subjects were asked to monitor their pulse rates to see that their pulse rate may not go beyond 60% (THR) of their maximum heart rate. From fifth to eighth weeks, the target heart rate was increased to 70% (THR). For the last four weeks i.e. ninth to twelfth weeks the target heart rate was maintained
at 80% (THR). To initiate and maintaining the qualities of oxygen during each training session and also throughout experimental period the following protocol of aerobic exercises were incorporated in each training session.

- **Aerobic training** (protocol of aerobic exercises) namely – marching on the spot, walking, jogging, running, hopping, galloping, jumping, forward and backward kicking, swinging the legs side to side, swinging the legs side to side with arms moving, two count jumping jacks and Skip-kick.

The above routine work was done three times per week on alternative days for twelve weeks continuously.

**Yogic Practices Training**

Yoga and pranayama has been incorporated into modern medicine during recent days. For the purpose of yogic practices training, various asanas including suryanamaskar, which are given below in table III and the following different types of pranayama techniques were selected as training protocols were selected as training protocols:

**Pranayama Techniques**

1. Nadi Shodhana
2. Ujjayi
3. Bhastrika
## Table III

### LIST OF ASANAS

<table>
<thead>
<tr>
<th>Position</th>
<th>Name of the Asanas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standing</td>
<td>Suryanamaskar</td>
</tr>
<tr>
<td></td>
<td>Tadasana</td>
</tr>
<tr>
<td></td>
<td>Trikonasana</td>
</tr>
<tr>
<td></td>
<td>Utkatansana</td>
</tr>
<tr>
<td></td>
<td>Utthita Parsvakonasana</td>
</tr>
<tr>
<td></td>
<td>Cakrasana</td>
</tr>
<tr>
<td>Long Sitting</td>
<td>Yoga Mudra</td>
</tr>
<tr>
<td></td>
<td>Paschimottanasana</td>
</tr>
<tr>
<td></td>
<td>Ardha Matsyendrasana</td>
</tr>
<tr>
<td>Kneeling</td>
<td>Vajrasana</td>
</tr>
<tr>
<td>Prone</td>
<td>Bhujangasana</td>
</tr>
<tr>
<td></td>
<td>Shalabhasana</td>
</tr>
<tr>
<td></td>
<td>Dhanurasana</td>
</tr>
<tr>
<td>Supine</td>
<td>Naukasana</td>
</tr>
<tr>
<td></td>
<td>Sarvangasana</td>
</tr>
<tr>
<td></td>
<td>Halasana</td>
</tr>
<tr>
<td></td>
<td>Savasana</td>
</tr>
</tbody>
</table>
The above routine training of yogic practices was done three times per week on alternative days for twelve weeks continuously.

**Training Schedule**

The training was scheduled in the morning session for 3 days per week for twelve weeks. The training schedule of aerobic training group (ATG) and yogic practices group (YPG) is presented in the table from IV to X.

The training schedule of aerobic training group is presented in the table IV. The difficulty level in aerobic training is based on the percentage of target heart rate (THR).
### Table IV

**EXERCISES PRESCRIBED FOR AEROBIC TRAINING DURING THE TRAINING PERIOD**

<table>
<thead>
<tr>
<th>Number of Weeks and Intensity</th>
<th>Exercises</th>
<th>Number of Sets</th>
<th>Duration of Aerobic Exercises</th>
<th>Density Between Sets</th>
<th>Density Between Rounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st to 4th Weeks Phase I</td>
<td>Aerobic Type</td>
<td>1</td>
<td>15min</td>
<td>6 min</td>
<td>10 min</td>
</tr>
<tr>
<td></td>
<td>Exercises</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Running</td>
<td>1</td>
<td>20 min</td>
<td>5 min</td>
<td>7 min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>10 min</td>
<td>3 min</td>
<td>5 min</td>
</tr>
</tbody>
</table>

- **SET** – Number of repetitions done in each exercise
- **ROUND** – The total number of exercises completed once
- **THR** = Target Heart Rate

- **Aerobic training** (protocol of aerobic exercises) namely – marching on the spot, walking, jogging, running, hopping, galloping, jumping, forward and backward kicking, swinging the legs side to side, swinging the legs side to side with arms moving, two count jumping jacks and Skip-kick.

The training schedule of yoga practice group is presented in the table IV to X.
## Table V

### ASANAS PRESCRIBED FOR YOGIC PRACTICES GROUP
### FOR FIRST FOUR WEEKS

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Asanas Position</th>
<th>Repetition</th>
<th>Sets</th>
<th>Rest Between Asanas</th>
<th>Frequency per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 4</td>
<td>Standing</td>
<td>1</td>
<td>1</td>
<td>30 secs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sitting</td>
<td>1</td>
<td>1</td>
<td>30 secs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kneeling</td>
<td>1</td>
<td>1</td>
<td>30 secs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prone</td>
<td>1</td>
<td>1</td>
<td>30 secs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supine</td>
<td>1</td>
<td>1</td>
<td>30 secs</td>
<td></td>
</tr>
</tbody>
</table>

## Table VI

### PRANAYAMA PRESCRIBED FOR YOGIC PRACTICES GROUP
### FOR FIRST FOUR WEEKS

<table>
<thead>
<tr>
<th>Pranayama Exercises</th>
<th>Intensity Ratio</th>
<th>Repetition</th>
<th>Sets</th>
<th>Rest Between Repetition</th>
<th>Rest Between Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nadi Shodhana</td>
<td>1:0:1</td>
<td>3</td>
<td>1</td>
<td>30 sec.</td>
<td>5 - 6min.</td>
</tr>
<tr>
<td>Ujjayi</td>
<td>1:0:1</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bhashrika</td>
<td>1:0:1</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table VII

**ASANAS PRESCRIBED FOR YOGIC PRACTICES GROUP**
**FOR FIFTH TO EIGHTH WEEK**

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Asanas Position</th>
<th>Repetition</th>
<th>Sets</th>
<th>Rest Between Asanas</th>
<th>Rest Between Sets</th>
<th>Frequency Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 - 8</td>
<td>Standing</td>
<td>1</td>
<td>2</td>
<td>30 secs</td>
<td></td>
<td>3 days</td>
</tr>
<tr>
<td></td>
<td>Sitting</td>
<td>1</td>
<td>2</td>
<td>30 secs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kneeling</td>
<td>1</td>
<td>2</td>
<td>30 secs</td>
<td>5 – 6 min</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prone</td>
<td>1</td>
<td>2</td>
<td>30 secs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supine</td>
<td>1</td>
<td>2</td>
<td>30 secs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table VIII

**PRANAYAMA PRESCRIBED FOR YOGIC PRACTICES GROUP**
**FOR FIFTH TO EIGHT WEEK**

<table>
<thead>
<tr>
<th>Pranayama Exercises</th>
<th>Intensity Ratio</th>
<th>Repetition</th>
<th>Set</th>
<th>Rest Between Repetition</th>
<th>Rest Between Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puraka: Kumbaka : Rechaka</td>
<td>1:1:1</td>
<td></td>
<td></td>
<td>45 sec</td>
<td>10 - 11 min.</td>
</tr>
<tr>
<td>Nadi Shodhana</td>
<td>1:1:1</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheetkari</td>
<td>1:1:1</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bhastrika</td>
<td>1:1:1</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table IX

**ASANAS PRESCRIBED FOR YOGIC PRACTICES GROUP FOR NINTH TO TWELFTH WEEK**

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Asanas Position</th>
<th>Repetition</th>
<th>Sets</th>
<th>Rest Between Asanas</th>
<th>Rest Between Sets</th>
<th>Frequency Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 - 12</td>
<td>Standing</td>
<td>1</td>
<td>3</td>
<td>30 secs</td>
<td></td>
<td>5 - 6 min</td>
</tr>
<tr>
<td></td>
<td>Sitting</td>
<td>1</td>
<td>3</td>
<td>30 secs</td>
<td></td>
<td>3 days</td>
</tr>
<tr>
<td></td>
<td>Kneeling</td>
<td>1</td>
<td>3</td>
<td>30 secs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prone</td>
<td>1</td>
<td>3</td>
<td>30 secs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supine</td>
<td>1</td>
<td>3</td>
<td>30 secs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table X

**PRANAYAMA PRESCRIBED FOR YOGIC PRACTICE GROUP FOR NINTH TO TWELFTH WEEKS**

<table>
<thead>
<tr>
<th>Pranayama Exercises</th>
<th>Intensity Ratio</th>
<th>Repetition</th>
<th>Set</th>
<th>Rest Between Repetition</th>
<th>Rest Between sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nadi Shodhana</td>
<td>1:1.5:1.5</td>
<td>5</td>
<td>1</td>
<td></td>
<td>14 - 15 min.</td>
</tr>
<tr>
<td>Sheetkari</td>
<td>1:1.5:1.5</td>
<td>5</td>
<td>1</td>
<td>60 sec</td>
<td></td>
</tr>
<tr>
<td>Bhastrika</td>
<td>1:1.5:1.5</td>
<td>5</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Description of Aerobic Training

Marching on the Spot

To begin with the position of attention with areas held together close to the body. For the first court, raise the right leg up to hip level in folded manner and put is back in this original position, repeat it for the left leg. While, raising the right leg the left arm has to be raised with a bend up to the level of chest and Vice Versa for the other leg.

Diamond Shape Movement

To begin with on spot marching and move forward with one leg and keep the other parallelly apart and for the next count again more forward and keeps legs placed closely. This form similar to that of diamond shape.

And for the next count, the movement has to be done backward and with legs apart and again for the next he legs has to be kept close. Repeat the same for further counts both forward and backward.

Walk Forward

To begin with on spot marching, move forward for two steps by beginning with right and fall back to the original position by repeating the movements. For the second count, begin the motion with left leg and move forward for two steps and again fall back to the original position.

Stand straight in attention place a leg forward and keep the other still and firm and move the other forward. The leg other than the one in movement should be keep still.
Walk Forward Knee up

To begin with the walk forward movements, at the end of the forward steps, the left leg has to be raised with a knee bend up to hip level and gain fall back to the original position.

For the second count, walk forward has to be begin with left and move forward for two steps and at the end the right leg has to be raised with a knee bend up to hip level and again fall back to the original position.

Walk Forward Knee up Single

To begin with walk forward knee – up exercise and at the end of the forward movements the leg has to be raised with a knee bed up to hip level with simultaneous leg change for three times.

To begin with right and move forward for two steps and raise the left leg as mentioned and change the leg to right and then left again and fall back to the original position and again begin the forward movement with left and move forward for two steps and raise the right leg as mentioned and change the leg to left and then right again and fall back to the original position.

Jogging

To begin with the position attention and move forward with right leg and then the left and move both the legs simultaneously and move right arm for left leg and left arm for right leg and continue them. Jogging should be done little fast than marching.
**Single Step**

The beginning position of this aerobic exercise is to be apart and then move to one side and balance the body with a leg and touching the toe in the floor with kicking the other leg and Vice – Versa for simultaneous counts.

For the Further counts the movements has to be repeated and further the hand has to be raised without folding it, the same hand to be raised as the toe touching the floor and Vice – Versa for the simultaneous counts.

**Double Step**

As the beginning of this aerobic exercise too follow the similar steps of single step. Instead of touching the floor with toe once, it should be done twice and Vice – Versa for the other and to be continued for the simultaneous counts for the further counts the earlier movements has to be repeated and following that, the hands has to be raised and folded, twice as it the tow touches the floor twice and Vice – Versa for the simultaneous counts.

**Sideward Movement**

**Right Side Movement**

To begin with on spot march and then using the right leg to more a step towards right side and more back to the started place.

For the further counts both the hands to be spread in the air straight and move a step towards right and fall back to the started position and the hands left free and held close to the body.
**Left Side Movement**

To begin with on-spot march and then using the left leg to move a step towards left side and move back to the started place for the further counts both the hands to be spread in the air straight and move a step towards left and fall back to the started position and the hands left free and held close to the body.

**Both Side Movement**

To begin with on-spot march and for the both side movement, the movement has to be in side wards two steps and again return to the started place and the following the same procedure to the other side too. for the further counts both the hands to be spread in the air straight and move side wards and against for the further second step the hands to be closed straight towards the chest and in the second step again spread in the air, and repeat the same to two times to reach the started position and repeat the same procedure the other side too.

**V Step**

**V Step Right**

Sand erect, the legs and hands are to be held close.

For the first count, the right leg has to be moved forward followed by the left in obtuse angle, ad fall back to the original position by moving the left leg first and followed by the right leg.
For the second count, now, the left leg has to be moved forward in an obtuse angle and followed by the right and fall back to the original position by moving the right leg first and followed by the left leg.

**Grape Vine Leg Curl L**

To begin with the legs apart and with arms loosened and while start, the fight leg is criss-crossly placed behind the left leg and the left leg moved towards left and again the first step of criss-crossing the right leg has to be repeated and again the left leg has to be moved left. By then, the hands are crossed against the chest and kept back to the original position. And again moving back to the original position by repeating them towards right.

For the second count, form the original position, a right angled turn has to done and repeat the above mentioned steps again, and fall back to the original position.

**Forward – Backward Kick**

To begin with the position attention, and start with the right leg forward and then keep it still and kick forward with the left leg without bending the knee. Then lower the left leg and get back to its original position and then keep the right leg too in its original position.

For the second count, the left leg has to be put forward and the kick has to be done with the right leg as mentioned above and then keep the legs back to their original position.
**Skipping**

To begin with the position in attention with the skipping rope in hands, though there are many positions in a single place. And the legs have to be kept apart with one forward and another behind it. Jumping with enough space to pass through the legs and ground is mess and important.

**Stair Climbing**

To begin with attention position, climb the stairs fast and while coming back be slow. Climbing the stairs by walking fast and skip the stair one by one and while get back don’t skip any and slow.

**Description of Yogic Practices**

**Suryanamaskar (Sun Salutation)**

The Sun Salutation is a 12-part warm-up exercise. It limbers up the body and mind in preparation for the ensuing yoga session. Each of the 12 positions brings a different vertebral movement to the spinal column and is tuned to the inhalation or exhalation of the breath, thereby instilling a feeling of balance and harmony. The positions follow on from one another, making this Salutation graceful to perform.

1. **Prayer Pose:** Stand up straight with one feet together and one’s arms by one’s sides. Take a deep breath, and then exhale while bringing one’s palms together at chest level.

2. **Arch Back:** Inhale and stretch one’s arms up over one’s head. Arch one’s back, so one’s hips come forwards, and stretch as far as is comfortable.
3. **Bend Over:** Exhale as one stretch forwards and bend down into the third Sun Salutation position. Bring one’s hands down to the floor, and place them next to one’s feet, with the palms downwards. One’s hips should be kept as high as possible. If necessary, bend one’s knees so that one can touch the ground. Tuck one’s forehead in towards one’s knees.

4. **Leg Back:** Inhale as one stretch one’s right leg back as far as possible and bend one’s right knee, lowering it to the floor. Stretch one’s head and look upwards. One’s hands should stay in the same position throughout the movement.

5. **Push up Pose:** Retain the breath. Bring one’s left foot back, next to one’s right foot. Keep one’s spine straight and do not let one’s head or hips drop.

6. **Lower chest to the floor:** Exhale, Lower one’s knees to the floor and one’s chest straight down between one’s hands, without rocking one’s body. Bring one’s forehead to the floor (a beginner may need to lower the chin instead).

7. **Arch One’s Chest:** Inhale as one slide one’s body forwards and bring one’s hips down to the floor. Arch one’s chest towards and tilt one’s head back. Slightly bend one’s elbows into one’s body.

8. **Inverted 'V':** Exhale, tucking one’s toes under, and raising one’s hips to come into the inverted "V". Do not move one’s hands or feet as one come into position.

9. **Lunge Forwards:** Inhale as one bring one’s right foot forwards and place it between one’s hands, dropping one’s left knee to the floor.
Raise one’s head and look up to the ceiling.

10. **Forehead to knees:** Exhale as one bring one’s left foot forwards and place it next to one’s right foot, so that the tips of one’s fingers and toes form a straight line. Raise one’s hips and stretch them upwards, keeping one’s hands in the same position. If one cannot straighten one’s legs fully, allow one’s knees to remain slightly bent, but keep one’s hips up throughout. Bring one’s head down as far as possible and tuck it in as close to one’s knees as one can manage.

11. **Stretch Back:** Inhale and then stand up, stretching one’s arms over one’s head as one straighten one’s body. Stretch one’s arms back, arch one’s chest and hips, and keep one’s feet together.

12. **Return To Start:** Exhale and straighten up, lowering one’s arms to one’s sides. Now take a deep breath and prepare to begin another Sun Salutation sequence.

**Tadasana**

Stage 1: Stand erect with the feet together, the heels and big toes touching each other. Rest the heads of metatarsals on the floor and stretch all the toes flat on the floor.

Stage 2: Tighten the knees and pull the knee-caps up, contract the hips and pull up the muscles at the back of the thighs.

Stage 3: Keep the stomach in, chest forward, spine stretched up and the neck straight.
Stage 4: Arms are stretched out over the head.

**Trikonasana**

Stage 1: Take a deep inhalation and with a jump spread the legs apart sideways 3 to 3.5 feet.

Stage 2: Turn the right foot sideways 90 degrees to the right. Turn the left foot 60 degrees to the right, keeping the left leg stretched out and tightened at the knee.

Stage 3: Left leg in the opposite direction so as to bring the left palm on the floor near the outer side of the right foot.

Stage 4: Stretch the right arm up, bringing it in line with the left arm. Gaze at the right thumb.

Stage 5: Stretch both the shoulders and shoulder-blades

**Utkatasana**

Stage 1: Stand in tadasana, stretch the arms straight over the head and join the palms.

Stage 2: Exhale, bend the knees and lower the trunk till the thighs are parallel to the floor.

Stage 3: Do not stoop forward, but keep the chest as far back as possible and breathe normally.

Stage 4: Stay in the pose for a few seconds. To balance in this pose.

Stage 5: Inhale, straighten the legs, lower the arms, come back to tadasana and relax.
**Utthita Parsvakonasana**

Stage 1: Take the right leg apart from the left approximately 1 to 1.5 meters.

Stage 2: Turn the right foot towards the right side at $90^\circ$, without turning the body.

Stage 3: Bend towards right side, keeping the right thigh parallel to the ground. Place the right palm on the right side of right feet, with fingers together and facing outside. Right side of the body should touch the right thigh.

Stage 4: Raise the left arm up biceps touching the left ear, keeping the arm straight and gaze at the finger tips.

Stage 5: Bring the left hand back and place it on the left thigh.

**Cakrasana**

Stage 1: Lie down on the supine keeping the legs together and stretching the hands straight above the head region i.e., from toes to head, the entire body in a straight line.

Stage 2: Bend the knees and place the heels closest to the buttocks. Place One’s palms by the side of the respective ears by bending the elbows.

Stage 3: Lift the body up above the ground and balance on the palms and feet.

Stage 4: Slowly return to position.

**Yoga Mudra**

Position: Sitting, legs together and extended.

Stage 1: Sit on the floor with the legs straight.
Stage 2: Bend the right leg at the knee, hold the right foot with the hands and place it at the root of the left thigh so that the right heel is near the navel.

Stage 3: Bend the left leg at the knee, hold the left foot with the hands and place it at the root of the right thigh so that the left heel is near the navel. Keep the hands at the back.

Stage 4: Bend forward and touch the floor with forehead.

**Paschimottanasana** (Posterior Stretching Posture)

Position: Sitting, legs together and extended.

Stage 1: Bend one’s index fingers to form a hook and hold the great toes with them and bend the elbows. Exhale while bending forward bringing one’s head between the hands

Stage 2: Bending the elbows and the trunk further, try to touch the knees with one’s forehead without raising the knees.

Stage 3: Inhale now, as one raise one’s head slowly bringing it between the hands.

Stage 4: Raise the trunk and the head leaving the toes and straightening the spine, with one’s hands on the sides and back to the position.

**Ardha Matsyendrasana** (Spinal Twist)

Position: Sit on one’s heels. Knees and feet should be together, and the chest faces forwards.

Stage 1: Gently shift one’s buttocks down to the floor on the left side of one’s legs. Keep one’s back straight and centered over the buttocks.
Stage 2: Bring one’s right knee in close to one’s chest, and gently lift it over one’s left leg; place the right foot flat on the floor by one’s left knee.

Stage 3: Keep one’s body straight and upright, turn one’s body to the right and place one’s right hand flat on the floor. Raise one’s left arm and stretch it up above one’s head.

Stage 4: Twist one’s body to the right and look over one’s shoulder. Carry one’s left arm around one’s right knee, clasping one’s right ankle. Hold the pose for 30 seconds. Repeat on the other side.

Vajrasana (Thunder Bolt Posture)

Stage 1: Kneel on the floor. Keep the knees together and the feet about 18 inches apart.

Stage 2: Rest the buttocks on the floor, but not the body on the feet. The feet are kept by the side of the thighs, the inner side of each calf touching the outer side of its respective thigh. Keep the toes pointing back and touching the floor. Keep the wrists on the knees, palms facing up, and join the tips of the thumbs and forefingers. Keep the other fingers extended. Stretch the back erect.

Stage 3: Stay in this position as long as one can, with deep breathing. Stage 4; then rest the palms on the knees for a while.

Bhujangasana (Cobra)

Position: Lie prone with one’s feet together and hands placed on the sides.

Stage 1: Bend one’s elbows and place one’s hands flat on the floor beneath one’s shoulders. Tilt one’s head forwards until one’s forehead touches the floor. Tuck one’s elbows into one’s sides.
Stage 2:  Inhaling steadily, slowly roll one’s head backwards raising one’s forehead and bringing first one’s nose, and then one’s chin, into contact with the floor. Keep pressing down with one’s hands.

Stage 3: Continue the steady inhalation as one slowly push down with one’s arms to raise one’s head and chest up and arching backwards away from the floor. Try to press one’s hips and legs down into the floor, allowing only one’s upper body to be lifted up.

Stage 4:  Arch backward as far as comfortable by raising one’s chest and abdomen. Keep one’s hips on the ground. Roll one’s neck back and look up. Breathe as one hold the pose for 10 seconds. Take a deep breath, and exhale as one roll slowly out of the posture, uncurling one’s back first and keeping one’s head back until last. Repeat three times.

**Shalabhasana** (Locust)

Position:  Same as Ardha Shalabhasana

Stage 1:  Same as Ardha Shalabhasana

Stage 2:  Inhale a little, pressing on the wrists raise both the legs as much as one can without bending.

Stage 3:  Slowly bring down the legs.

Stage 4:  Exhale.

**Dhanurasana** (Bow pose)

Position:  Lie prone with one’s feet together and hands placed on the sides.

Stage 1:  Lie on one’s front with one’s forehead on the floor. Bend one’s knees and reach one’s arms back until one’s hands can grip one’s ankles.
Stage 2: Inhale. Raise one’s head, chest, and legs and attempt to straighten one’s legs.

Stage 3: Hold the pose for 10-30 seconds while breathing normally.

Stage 4: Exhale while releasing the pose. Repeat three times.

**Naukasana** (Boat pose)

Position: Lie supine with one’s feet together and hands placed on the sides.

Stage 1: Inhale and raise the legs together till they are at about a 45 degree angle, taking care not to bend them.

Stage 2: Also, raise one’s head and even the trunk to 45-degree angle.

Stage 3: Stretching the hands forward. Maintain this position.

Stage 4: Get back to starting position slowly and stage by stage,

  a) Place one’s hands on the sides,

  b) Lower one’s head and trunk,

  c) Lower the feet, bringing them to the ground, and so back to the starting position.

**Sarvangasana**

Stage 1: Lie flat on the back on the carpet keeping the legs stretched out tightened at the knees. Place the hands by the side of the legs, palms down. Take a few deep breaths.

Stage 2: Exhale, bend the knees and move the legs towards the stomach till the thighs press it. Take the two breaths.

Stage 3: Raise the hips from the floor with an exhalation and rest the hands on them by bending the arms at the elbows. Take two breaths.
Stage 4: Exhale, raise the trunk up perpendicularly supported by the hands until the chest touches the chin.

Stage 5: Only the back of the head and the neck, the shoulders and the backs of the arms up to the elbows should rest on the floor. Place the hands in the middle of the spine. Take two breaths.

Stage 6: Exhale and stretch the legs straight with the toes pointing up.

**Halasana** (Plough Posture)

Position: Lie supine with one’s feet together and hands placed on the sides.

Stage 1: Raise both one’s legs in a steady movement up to 90-degree Stage 2: Without bending the legs, slowly raise the hips and the lower part of one’s back. Bring down the legs until the toes touch the floor beyond one’s head.

Stage 3: Push the legs further from one’s head, and maintain this stage for few seconds.

Stage 4: Get back to starting position slowly and stage by stage.

**Shavasana** (Corpse pose)

Stage 1: Keep upper and lower limbs in a relaxed position. Upper limb making an angle of 15-degrees with the trunk and the lower ones about 30-degrees apart

Stage 2: Close the eyes with drooping eyelids, breathing deeply.

Stage 3: Concentrate on

(1) The sensation at the nostrils

(2) The coolness of the inspired air
Stage 4: Slowly open one’s eyes turn to a side and get up.

**Pranayama Techniques**

**Nadi Shodhana**

**Purpose**

The purpose of paranayama is to purify the nerves and thereby to strengthen the nervous system.

**Procedure**

Sit in any comfortable posture. Make one’s breathing normal. Close one’s right nostril with one’s thumbed and fills in the breath through the left nostril. When the breath has been filled inside close the left nostril with one’s third finger and stay in this state of Antrik Kumbhaka for a few seconds. Then lift the thumb from the right nostril and exhale slowly, keeping the left nostril closed. Repeat the process by inhaling through the left nostril and exhaling through the right nostril.

**Ujjayi**

**Purpose**

Useful in diseases like epilepsy and other ailments of the brain. Tonsils are removed and cold, cough, etc. are relieved.

**Procedure**
Sit in Jnan Mudra. First breathe 5-7 times normally, contracting this instrument a little. Practice Khechari Mudra (It is formed by twisting the tongue inward and by touching the palate with it.) Now inhale, producing the sound of snoring from the throat and exhale similarly. Then gradually increase the number of such breaths. While removing the Khechari Mudra, Swallow the saliva collected in the mouth.

**Bhastrika**

**Purpose**
A large amount of Prana Vayu is supplied to the body.

**Procedure**
Sit in padmasana and make the body erect. Make the mind thought-free and relaxed. Now close the right nostril with one’s right thumb, inhale and exhale with full force. First do this slowly, then increase one’s speed. In the end, inhale fully, close the left nostril with one’s third finger, and perform all the three Bandhas. Increase the Kumbkaha according to one’s capacity. Now open the Bandhas slowly, lift the thumb from the right nostril and exhale through it slowly. Relax for a moment. Repeat this process by closing the left nostril.

**Collection of Data**
The data on selected dependent variables for pre tests and post tests were collected two days before and after the training programme respectively. On the first day body composition, basal metabolic rate, blood lipid profiles,
flexibility, muscular strength and endurance were tested whereas cardio-respiratory endurance was tested on the second day.

**Test Administration**

**Health Related Physical Fitness Tests**

**Nine Minutes Run/Walk Test**

**Objective**

To measure cardio-respiratory endurance

**Equipment**

400-mts track, marked at 50 meters interval, stop watch and whistle.

**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 within the allotted time. When 8th minutes have elapsed, the test administrator calls out the time left to run. At the end of the 9th minutes, the test administrator blows a blast on his whistle and the subject’s notes the making he has just passed.

**Scoring**

The score in meters in 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)*
Sit and Reach Test

Objective

To measure the flexibility.

Equipment

Measuring stick and mat.

Procedure

The investigator has directed the subjects to take a long sitting position. Hands were kept by the side of his body heels were placed 10 cm apart. The equipment (measuring stick) was placed at the 40 cm mark of the scale with a line on the floor.

The subjects were asked to sit erect then slowly raise both the hands till they come to vertical position and palms facing each other, they were asked to reach forward to the yard stick (scale) and maximum possible measurement was taken one quarter of the centimeter. Three trails were given with adequate rest in between.

Scoring

The best of three trails was treated as final score in cms (Johnson and Nelson, 1988)

Body Composition

(Body Mass Index)

Purpose

To measure the body mass index (BMI) of the individual
Measurements required finding out the BMI

Height and weight

Height

Purpose

To measure the height of the subjects.

Equipment

Stadiometer, score sheet and piece of chalk were used.

Procedure

The subject stood on the stadiometer with barefoot. At the time of measuring, the heels were on the platform without elevating it. The scale was brought down firmly in conduct with vertex. A mark was made with chalk piece on the side of the scale on the stadiometer. After that the subject stepped away from the stadiometer, stand board and measurement was taken.

Scoring

The vertical distance from the stadiometer stand board to chalk piece mark was measured. The measurement was taken to the nearest one centimeter (Johnson and Nelson, 1988)

Weight

Purpose

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

Weighing machine and score sheet.

**Procedure**

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

**Scoring**

The weight was recorded to the nearest to a kilogram \((Johnson and Nelson, 1988)\)

**Body Mass Index Scoring**

Subject’s height and body weight was measured by using stadiometer and weighing machine respectively. BMI was calculated by the following formula:

\[
BMI = \frac{Wg}{Ht^2}
\]  \((Johnson and Nelson, 1988)\)

**Bioelectrical Impedance Analyzer**

**Purpose**

To measure the body fat and basal metabolic rate (BMR) of the individual.
**Equipment**

Omron Body Fat Monitor (Bioelectrical Impedance Analyzer)

**Procedure**

Enter the subjects’ gender, age, height and weight in the Omron body fat monitor.

The subjects stood with feet slightly apart. Subjects wrap the middle finger around the grove of the handle. Subjects place the palm on the top and the bottom electrodes. Subjects put thumbs up position, resting on the top of the unit. Then subject hold the arms straight out at a 90° angle to his body. On gripping with both hands, measurements will automatically begin.

**Scoring**

Only one trial was permitted, displayed score (body composition and BMR) in the Omron body fat monitor was recorded as the test score.

**Fat Free Mass**

**Purpose**

To assess the subjects fat-free mass.

**Methods**
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:

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

Fat-free Mass (kg) = body weight (kg) – fat mass (kg)  \((\text{Stanley, et al., 1998})\)

**Bent Knee Sit-ups**

**Objective**

To assess the abdominal muscular endurance

**Equipment**

Mat, floor or dry turf and stop watch.

**Procedure**

Subjects’ lies on back with legs flexed at the knees and feet approximately 12 - 18 inches apart. The hands are placed behind the head with fingers interlaced. A partner holds the subject’s ankles and keeps the feet in contact with the floor while counting each sit-up. On the signal to begin, the subject sit-ups, turns the trunk touching one elbow to the opposite knee, and returns to the starting position. The next sit - up is performed touching the other elbow to the knee. This alternating sequence is repeated as many times as possible. One complete sit-up is counted each time the subject returns to the starting position. Subjects should be informed that credit will not be given for sit-ups completed when finger-tips do not maintain contact behind the
head, when the knee is not touched by the opposite elbow, or when the performer pushes off the floor with the elbow.

**Scoring**

The total number of sit-ups successfully completed in one minute is recorded as the score. *(Johnson and Nelson, 1988)*

**Collection of Blood Samples**

Subjects were asked to report at the laboratory after an overnight fasting and 10.0 ml of venous blood samples were collected in heparins test tubes. Thus the pre-samples were collected in two days prior to training. After the twelve-week-training programme, the subjects were asked to assemble at the laboratory, in fasting state on the day after the last session of the training period. The blood samples were again collected in heparins test tubes for post-training estimation of biochemical variables.

**Method**

Enzymatic calorimetric method was applied for estimation of blood cholesterol, low density lipoprotein (LDL), high density lipoprotein (HDL), triglycerides. These tests were administered to find out the levels of total cholesterol, LDL, HDL Cholesterol and triglycerides before and after the aerobic training and yogic practices to the experimental groups and to the control group without giving any special physical and mental assignments except their routine works.
Estimation of High Density Lipoprotein Cholesterol (HDL-C)

Purpose

To find out the high density lipoprotein-cholesterol level in blood

(Ramnisood and Jaypee, 1999).

Procedure

Step I

<table>
<thead>
<tr>
<th>Pipette into Centrifuge Tubes</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>0.3 ml</td>
</tr>
<tr>
<td>Precipitating reagent</td>
<td>0.3 ml</td>
</tr>
</tbody>
</table>

Mix well, keep at room temperature for 10 minutes and then centrifuge at 4000rpm for 10 minutes and then centrifuge for 10 minutes or at 2000 rpm for 20 minutes, to obtain a clear supernatant. Proceed to step -II.

Step II

Estimate the cholesterol content in the supernatant from step-1. For this, the use of RANBAXY CHOLESTEROL (CHOD-PAP) reagent is recommended.

<table>
<thead>
<tr>
<th>Pipette into Test Tubes</th>
<th>Blank</th>
<th>Standard</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholesterol working reagent</td>
<td>1ml</td>
<td>1ml</td>
<td>1ml</td>
</tr>
<tr>
<td>Standard</td>
<td>--</td>
<td>100µl</td>
<td>__</td>
</tr>
<tr>
<td>Sample</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
Mix and incubate at 37\(^0\) C for 10 minutes or at RT (25\(^0\) C ± 2\(^0\)C) for 20 minutes. Mix and read absorbance of the test (A), Standard (A) and reagent Blank at 500nm (490-550nm) or with Green filter.

**Calculations**

\[
\text{HDL - Cholesterol (mg/dl)} = \frac{A_T - A_B}{A_S - A_B} \times 50 \times 2 \text{ (Dilution factor of sample)}
\]

To convert mg /dl to mmol/L, mmol/L = mg/dl × 0.0258.

**Estimation of Low Density Lipoprotein Cholesterol (LDL-C)**

**Purpose**

To find out the low density lipoprotein-cholesterol level in blood (Ramnisood and Jaypee, 1999).

**Principle**

Low Density Lipoproteins (LDL) are precipitated by heparin at their isoelectric point (PH 5.04). After centrifugation the high-density lipoproteins (HDL) and very low-density lipoproteins (VLDL) remain in the supernatant. These can then be determined by enzymatic methods.

LDL cholesterol = Total cholesterol – Cholesterol in the supernatant.

**Procedure**

<table>
<thead>
<tr>
<th>Wave Length</th>
<th>500 nm. Hg 546</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuvette 1 cm</td>
<td>1 cm light path</td>
</tr>
<tr>
<td>Temperature</td>
<td>+20 to +25(^0) C, 37(^0) C</td>
</tr>
</tbody>
</table>
Pipette into Centrifuge Tube

<table>
<thead>
<tr>
<th></th>
<th>Serum</th>
<th>Precipitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>48 µl</td>
<td>100 µl</td>
<td>100 µl</td>
</tr>
</tbody>
</table>

**Calculation**

Concentration of cholesterol in the supernatant =

\[
\frac{A_{\text{sample}}}{A_{\text{standard}}} \times \text{Conc. of Std.}
\]

Calculation of the LDL – Cholesterol

LDL-cholesterol = Total cholesterol - Cholesterol in the supernatant.

**Estimation of Total Cholesterol (TC)**

**Purpose**

To find out the total cholesterol level in blood *(Ramnisood and Jaypee, 1999).*

**Principle**

\[
\begin{align*}
\text{Cholesterol esters} & \xrightleftharpoons{\text{C.Esterase}} \text{Cholesterol} + \text{Fatty Acids}, \\
\text{Cholesterol} + O_2 & \xrightleftharpoons{\text{C.Oxidase}} \text{Cholesterol-3-one} + H_2 O_2,
\end{align*}
\]

\[2H_2O_2 + 4\text{-Amino – antipyrine} + \text{Na-HB peroxidise} \rightarrow \text{Quinoneimine} + 2H_2O_2.\]

**Procedure**

1. Label tubes: blank, standard, control, patient, etc.

2. Pipette 10 ml of reagent to all tubes and pre warm at 37 °C for at least five minutes.
3. Add 0.01 ml (10µ l) of sample to respective tubes, mix and return to 37°C.

4. Incubate all tubes at 37°C for ten minutes.

5. Zero spectrophotometer with the reagent blank at 500nm.

6. Read and record absorbance’s of all vials.

**Calculation**

\[
\frac{A(\text{patient})}{A(\text{Standard})} (A=\text{Absorbance}) = X \text{ Concentration of standard (mg/dl)} = \text{Cholesterol(mg/dl)}.
\]

Example: \( A \text{ (patient) = 0.40, } A \text{ (standard) = 0.32,} \)

Concentration of standard = 200 mg/dl.

\[
\frac{0.40}{0.32} \times 200 = 250 \text{ mg/dl}
\]
**Estimation of Triglycerides (TG)**

**Purpose**

To assess the triglycerides level in blood *(Ramnisood and Jaypee, 1999).*

**Procedure**

1. Reconstitute reagent vial with distilled water according to instructions. Label test tubes “Blank”, “Standard” “Controls”, “Patient”, etc.
2. Pipette 1.0 ml of reagent into each cuvette.
3. Place all tubes in incubator and bring reagent up to 37ºC.
4. Pipette 0.01 ml (10 ul) of sample into respective tubes.
5. Incubate all tubes at 37ºC for five minutes.
7. Read and record absorbance’s of all tubes.
8. To obtain value in mg/dl, see “Calculations”.

**Calculation**

\[
\text{Abs} = \text{Absorbance} \\
\text{Abs} \times \frac{\text{Sample} \times \text{Concentration}}{\text{Standard} \times \text{Standard of Standard}} = \text{mg/dl as triolein} \\
\text{Abs} \times \frac{\text{Standard of Standard}}{\text{Standard}} = \text{mg/dl triglycerides}
\]

Sample Calculation: If Abs. Sample = 0.300, Abs. of Standard = 0.200, concentration of Standard = 300mg/dl.

\[
0.300 \times 300 \text{ mg/dl} = 450 \text{ mg/dl triglycerides 0.200}
\]
Experimental Design

The experimental design used for this study was pre and post test random group design involving forty-five subjects, who were divided at random into three groups of fifteen each. This study consisted of two experimental groups. Group I underwent aerobic training (ATG) and Group II underwent yogic practices (YPG), and Group III acted as control group (CG). All the subjects were tested prior to and after the training on selected variables.

Statistical Techniques

The data collected from the three groups before and after the experimental period were statistically examined for significant improvement by using analysis of covariance (ANCOVA). The data collected from the three groups before and after the experimental period were statistically examined for significant improvement by using analysis of covariance (Clarke and Clarke, 1972). Whenever the 'F' ratio was found to be significant, Scheffe’s test was used as post-hoc test to determine which of the paired means differed significantly. In all cases the criterion for statistical significance was set at 0.05 level of confidence (P<0.05).

Justifications for Using ANCOVA

Analysis of covariance was used to determine how each dependent variable is influenced by independent variables while controlling for a covariate (Clarke and Clarke, 1972). Analysis of covariance adjusts the mean of each
dependent variable to what they would be if all groups started out equally on the covariate. Analysis of covariance gives results preferable to those of a direct comparison of gain scores i.e., post-test minus pre-test for the two groups, because gains are limited in size by the difference between the test’s ceiling and the magnitude of the pre-test score (Tuckman, 1999). In this study, pre-test scores of the selected variables have been shown to correlate with the post test scores and thus they were considered as appropriate covariates.