Chapter III

METHODOLOGY

This chapter deals with the procedure followed in the selection of subjects, selection of variables, orientation to the subjects, design of the experimental programme, collection of data, and statistical procedures applied for analysing the data.

Selection of Subjects

The purpose of the present study was to analyze the effects of aerobic training, anaerobic training, and yogasanas on the selected blood lipid profiles i.e. LDL, HDL and triglycerides which normally considered as risk factors in the coronary heart diseases. For the present study, sixty young men studying different graduation courses out of one thousand eight hundred and eighty four students (N = 1884) were selected randomly as subjects from Government College for Men, Anantapuramu and Sathya Sai Baba National Degree College, Anantapuramu, Andhra Pradesh, India. The selected subjects were divided into three experimental groups and one control group with fifteen subjects (n=15) in each group. Experimental Group-I (ATG=15)) underwent aerobic training, Group-II (ANTG=15) underwent anaerobic training, Group-III (YG=15) underwent yogasanas training and Group-IV served as control group (CG=15). The age group of the subjects ranged between 18 and 22 years. 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. The subjects were free to withdraw their consent in case they felt any discomfort during the period of their participation, but there no dropouts. A qualified physician examined the subjects medically and declared them fit for the study.

**Selection of Variables**

Physical fitness being the prime factor of consideration for the physical educationists and coaches around the world, as it is essential for the participation in health related physical fitness activities and in highly skilled sporting activities.

Sedentary life style of current generation is due to improved transportation and technology. The people are not showing much interest in physical activities, this leads to cause obesity and coronary heart diseases. Any planned exercises tune the body and reduces the obesity. Thus keeping the body away from the diseases.

This research aimed to analyze the effects of aerobic training, anaerobic training, and yogasanas on the selected blood lipid profiles, i.e. LDL, HDL and triglycerides which normally considered as risk factors in the coronary heart diseases. The investigator had gone through the relevant literature in the area of aerobic training protocols, anaerobic training protocols and yogasanas and their 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**

Higher level of lipid circulation than the desired level in person’s blood circulation may be a strong cause for the incidence of cardiovascular disease (CVD) among such people. The circulating lipids in the blood may be categorized into five types of lipoproteins according to their density, composition and size. Very low density lipoproteins (VLDL), low density lipoprotein (LDL), intermediate density lipoprotein (IDL) and high density lipoproteins (HDL) and chylomicrons. Again there are subfractions in HDL like HDL-1, HDL-2, and HDL-3. Total cholesterol is the sum total of cholesterol carried by VLDL, LDL, HDL and chylomicrons.

The percentage of LDL is most significant risk factor in the development of coronary heart disease (CHD). LDL cholesterol is the main component in atherosclerotic plaque formed in the term of blood arteries, causing blockage of blood stream. Incidentally, the HDL cholesterol acts as reverse cholesterol transfer stem that resist the development of atherosclerosis.

Based on the above facts the following physiological factors / blood lipid profiles were selected as dependent variables:

1. Low Density Lipoprotein (LDL)

2. High Density Lipoprotein (HDL)
3. Triglycerides

Physical exercises may be performed in many forms like running, dancing, playing games, weight training and recreational activities. The kind of metabolic pathways that is used primarily decides the kind of exercise performing. The kind and type of exercise are not alone influence the kind of biological adaptations in the human body. The load dynamics like density and intensity of exercise may target for different kinds of biological adaptations in the human body. As soon as the physical exercise is commenced, the additional energy requirements are to be triggered and the type of fuel used to release the energy depends on the metabolic pathway that is initiated by the human body for the energy. Apart from this, the presence or absence of oxygen during the type of physical exercise is another important factor to classify the physical exercises into different kinds like aerobic activities and anaerobic activities.

Yogasanas have been practiced in India since, time immemorial to maintain the physical fitness and also to cure certain ailments or diseases. It is identified that each asana in yoga has a different curative effect and can be practiced to get specific relief.

Throughout the world the researches are conducted to know the various exercises or exercise protocols which could prevent and cure the deadly ailments like coronary heart diseases, hypertension, diabetes, etc. Hence, the following training protocols were selected as the independent variables:
1. Aerobic Training
2. Anaerobic Training
3. Yogasanas

**Orientation to the Subjects**

All the sixty student subjects were oriented through group explanation as well as personal counseling about the importance and the detailed programme of the experimentation by the investigator. Before the commencement of the training programme, the aerobic training exercises, anaerobic training exercises and yogasanas were taught to groups I, II, and III.

**Design of the Experimental Programmes**

The following exercise protocols have been designed and implemented for the period of experimentation by following the procedure explained below.

**Aerobic Training Protocols**

The experimentation period was lasted for six months, in the first month the subjects were kept under conditioning, consolidation process to develop minimum cardio-respiratory and muscular fitness and to acquire the knowledge of intensity of exercises. Hence only five months were the actual experimentation with the intended physical exercise. During this initial one month the subjects were asked to walk and slowly jog for five to ten minutes before going to light calisthenics and stretching exercises. Then the subjects took an easy and comfortable jog for 15 minutes and by the end of the month,
the subjects jogged for twenty minutes. All the time the subjects were asked to monitor their pulse rates to see that their pulse rate may not go beyond 60% to 70% of their maximum heart rate. After this initial one month period the protocol of aerobic exercises were done. To initiate and maintain the utility of oxygen during the each training session and also throughout the experimental period the following physical exercises were incorporated in each training session. Walking for ten minutes slowly increasing the pace.

1. Calisthenics and light stretching immediately after walk.

2. Slow and continuous jogging for four kilometers keeping their heart rate at 60% to 70% of maximum heart rate.

3. Warm down and cooling the body slowly.

The above routine work was done five times per week and for five months continuously.

**Anaerobic Training Protocols**

Anaerobic training group went through the following protocol of exercises, which require anaerobic metabolic energy pathway as a major source of energy. Hence fast and vigorous exercise protocol was implemented for this group, before they started their experimentation exercise regime they underwent one month conditioning and consolidation of fitness programme. During this period the subjects in each session jogged for five to ten minutes and then did light stretching and calisthenics exercise. After the subjects did acceleration sprints up to 60 to 80 meters with full recovery in between four
times initially and improving them to 8 to 10 times for the month end. After the first month conditioning program the subjects took to the actual experimentation protocol for five months as follows in each session.

1. Slow jogging for one kilometer and then for stretching and calisthenics.

2. Acceleration sprints with a speed of 70% to 80% of the maximum speed for 10 times with a recovery period of 3 minutes for each repetition while walking back slowly.

3. Cool down the body by slow limbering down exercises.

4. This group did this anaerobic protocol for five times a week and for five months continuously.

**Yogasanas**

The researcher selected yogasanas in such a way that the intensity was medium. After extensive reading and also after extensive consultations with yoga experts, the researcher came to know that the protocol of yogasanas developed by Pujya Swami Chidanand Saraswathi of Paramarth Niketan, Rishikesh, India would serve the purpose of research. Hence, the series taught in Rishikesh Paramarth Niketan of Pujya Swami Chidanand Saraswathi consisting of nine asanas and one Banda apart from breathing exercises was selected for the experimentation. This series developed by Pujya Swami Chidanand Saraswathi takes nearly 30 minutes and all the asanas are
moderately difficult asana. Even the timings suggested by the Pujya Swami Chidanand Saraswathi were of moderate time intensity hence highly suitable for the experimentation. Most of the asanas in the series control the diseases that are influenced by the selected dependent factors like L.D.L, H.D.L and Triglyceride cholesterol levels. The yogasanas selected for experimentation are presented below in Table-I.
<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Name of the Asana</th>
<th>Time/Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sarvangasana or Candle Posture</td>
<td>1 minute</td>
</tr>
<tr>
<td>2</td>
<td>Halasana or Plough Posture</td>
<td>2 minutes including dynamic stage.</td>
</tr>
<tr>
<td>3</td>
<td>Matsyasana or Fish Posture</td>
<td>1 minute</td>
</tr>
<tr>
<td>4</td>
<td>Paschimothasana or Forward bend posture</td>
<td>2 minutes including dynamic stage.</td>
</tr>
<tr>
<td>5</td>
<td>Bhujangasana or Cobra Posture</td>
<td>1 minute including dynamic stage.</td>
</tr>
<tr>
<td>6</td>
<td>Shalabasana or Locust Posture</td>
<td>1 minute</td>
</tr>
<tr>
<td>7</td>
<td>Dhanurasana or Bow posture</td>
<td>½ minute</td>
</tr>
<tr>
<td>8</td>
<td>Artha-Matsyendrasana or Spinal twist</td>
<td>1 minute</td>
</tr>
<tr>
<td>9</td>
<td>Shirshasana or Head stand</td>
<td>1 to 10 minutes</td>
</tr>
<tr>
<td>10</td>
<td>Uddiyana Banda</td>
<td>1 to 2 minutes</td>
</tr>
<tr>
<td>11</td>
<td>Breathing</td>
<td>3 minutes</td>
</tr>
<tr>
<td>12</td>
<td>Shavasana</td>
<td>3 minutes</td>
</tr>
</tbody>
</table>

The subjects of the Yogasana’s group were oriented on the above series of yogasanas and were given one month conditioning period to gain sufficient experience and physical fitness to go through the series.
The following important points were followed during their entire five months period of actual yogasanas training.

1. The yogasanas were practiced in the morning after cleaning teeth with empty stomach.

2. Asanas were performed in highly ventilated place where ample air and light is available.

3. Light cotton clothing was preferred for practicing asanas.

4. Warm shower bath was taken after half an hour of the asana session.

5. The asanas were practiced without application of violent movements or jerky movements, slow pace of movements were stressed.

6. The final posture was held for the prescribed length of time.

7. Did not tense any muscle, which are not essential in supporting the asana and simultaneously relaxed the other muscles.

8. Concentrated mentally and physically on the assigned region of the body for each asana as explained by the researcher in orientation.

9. Slow returning to the starting position.

10. During transition from one posture to another posture rest and relax period was thirty seconds.
11. Always the asanas were practiced in the same order.

12. Always session was ended with two to three minutes of breathing in padmasana and followed by shavasana for one to two minutes.

**Description of Yogasanas**

After sitting in padmasana for few minutes and chanting ‘OM’ for two to three times the series of yogasanas begin.

**Sarvangasana (shoulder stand) - 1 minute**

The sarvangasana is one of the most treasured asanas, said to benefit the whole body. In this asana the whole body weight rests on the shoulders and the neck and upper back regions are stretched to the limit. Beginners should practice the sarvangasana in a moderate way and gradually attempt the full posture.

Lie straight on your back on the floor. Palms should be on the floor close to the body, the heels and the toes should be together.

Inhale and raise both the legs slowly up in a vertical position (90 degrees). Rising of the legs should be synchronized with the breathing.

Exhale and again raise the legs upward from the second position. Bring both palms underneath the hips and should be used to assist in raising the body upwards. The hands should always work as a support to the body weight.

Try to raise the body as straight as possible.

At the final stage of this asana you will be resting on your shoulders, chin touching the chest. In this position the legs should be stiff hard and
together and the toes is pointing towards the ceiling. Do not shake. Be firm and keep breathing normally.

For returning to the first position, first fold the legs on the knees. Your heels should be now on the thighs and above the buttock. Then slowly let the body return to the floor while the palms are supporting the body weight.

Now stretch out the legs forwards and relax. You have completed one round of the sarvangasana.

**Halasana (the plough posture) - 2 minutes**

Halasana or the plough posture is a valuable asana as it has some unique qualities and excellent benefits. It is an extreme forward bending exercise which promotes strength and flexibility in all the regions of the back and neck.

Lie flat on the back with your body straight and stretched out. Bring the heels and toes together. Put the palms on the floor and keep them close to the body on both sides.

Stretch out the legs and toes. Inhale and simultaneously raise both heads upwards till they come to a vertical position.

Exhale and simultaneously start lowering the legs towards the head area. Try to touch the floor in front of the head with the toes. Go only as far as possible for you. After exhaling, keep breathing normally till the whole posture is completed. Remain in this position for about 8 seconds.
Start returning the back to the floor. Let the back roll down on the floor inch by inch. This should be done very slowly and smoothly. Keep the legs and toes quite tight all along during the returning phase.

**Matsyasana (the fish posture) - 1 minute**

Matsyasana means fish posture. It is called fish, as this position fills the lungs with air, improving the ability to float in water. Matsyasana gives a backward stretch to the cervical thoracic and lumbar regions of the spine and the chest fully. Values of certain asanas are maximized when done one after the other. This asana gives maximum benefit when performed after the sarvangasana (shoulder stand posture).

Sit in the lotus posture, with your right foot on the left thigh and left foot on the right thigh as shown in figure. Sit erect with the knees touching the floor.

Lie down on the floor, pull your palms backward a little and fold your elbows to support the body weight. Move one elbow at a time further to allow the whole back to come to the floor. Breathe normally.

Bring your palms underneath the hips and the buttock. At the same time fold your elbows.

Lift the head and bend it towards the floor, so that only upper portion of the head (crown) touches the floor.

Try to make an arch between the crown and the flank (upper area of the hip and waist) by giving a pull with your palms to the hip. In this position your body weight is resting at two points - head and the hip.
Bring your palms to the feet and hold the toes. Now you are in the perfect fish posture. Breathe normally and remain in this position for 6 to 8 seconds.

For returning, leave the toes and bring your palms to the hips. Fold your elbows and support the body weight on them. Lift the head upward, straighten the neck and put them back on the floor.

Unfold the legs from the lotus posture and stretch them out straight. Bring your hands on the floor and relax.

**Paschimothanasana (the forward bend) - 2 minutes**

Paschimothanasana or the forward bend gives a complete stretch to the entire back of the body, from the skull down to the heels. In Sanskrit, 'Paschim' means back and 'Uthan' means stretch. It is a simple yet powerful position to practice.

Sit on the floor with your legs stretched and heels together. Back, neck and head should be held straight. Bring both the hands with the palms down, parallel to the legs.

Inhale and proceed towards the toes and try to touch them. If you cannot touch the toe, proceed only as far as they can.

Exhale and slowly bring your head down in between the hands; stretch out the hands, toes and head as far as you can. Retain for 6 seconds.

Inhale and return to the first position. While returning the palms should touch and dragged through the legs.

**Bhujangasana (cobra posture) – 1 minute**
The pose is called as bhujangasana, because the full display of this asana gives one the appearance of a `hooded snake` under irritation with its neck expanded like a hood, however, `Bhujanga` means a `cobra` in Sanskrit.

Lie on your belly, while your head rests on your lower arms. Raise your forehead, look upwards and stretch your hands backwards.

Let your weight rest on your chest. The head falls a little backwards towards your back and the backward movement proceeds from the neck and the chin.

Move your belly further backward as if someone is pulling your arms. The weight is more and more shifted towards the belly and the lower back does the real work.

If you cannot raise your chest any further, you put your hands and your arms next to your chest on the mat without losing the bend.

Stretch your arms so that they stand perpendicular on the floor and at the same time turn your arms a little inward.

Relax your lower back and bear your weight with your arms. The buttock muscles remain relaxed during the exercise.

Move your chest further upwards with every breathing out. Do this in a relaxed way instead of using force. At the same time move your head backwards. The shoulders are broad in front and the shoulder blades remain low.

**Salabhasana (the locust posture) - 1 minute**
Salabhasana is a reverse posture to the cobra posture, which gives a backward bend to the spine. Values of certain asanas are maximized when done one after the other. Cobra posture activates the upper area while locust activates the lower waist down area of the body. So this asana gives maximum benefit when done after the cobra posture.

Lie face down on the floor on your stomach, hands stretched backwards close to the body and the legs straight. Making fists of the hands bring them together beneath the thighs with the wrists touching.

Inhale as much air as you can. Holding your breath make your head straight and put the chin on the floor (on a folded blanket or towel). Tighten both the legs and lift them up as high as you can. Do not bend the knees.

Remain in the same posture for a few seconds.

Exhale and simultaneously lower the legs slowly to the floor. Do not drop the legs. By the time the legs touch the floor you should finish exhaling.

**Dhanurasana (the bow) – ½ minute**

Dhanurasana gives a full backward bend to the whole of the spine and all the muscles of the back from the neck to the lower back or lumber region. Bhujanga, locust and dhanur form a series of exercises beneficial to the body when practiced together. As the forward bend flexes the spine, the bow extends it.

Lie on your stomach with your arms stretched on both sides. Place your right or left cheek on the floor. Bend the knees, bringing the feet up. Bring the
heels close to the buttock area. Reach back to hold the ankles with your hands. The knees and the ankles should be closer to one another.

Inhale as much air as you can. Straighten up your neck and head. Holding the breath and keeping the arms straight, arch the entire body upwards. Lift the head, chest and thighs off the floor. Remain in this position for 5 to 6 seconds.

Exhale and return to the floor smoothly. Keep holding the ankles while you return to the first position. Put the cheek back on the floor and breathe normally.

Leave the ankles and let the legs gradually return to the floor. Bring the arms and hands to the floor on both sides and relax for 6 to 8 seconds.

**Ardha-matsyendrasana (the twist posture) - 1 minute**

Placing the right foot at the root of the left thigh, encircling the (right) knee by the left leg, holding (the two feet by the opposite hands), twisting the body and staying in this posture.

For the beginners this asana is made easy and named Ardha-matsyendrasana. The only difference is that in matsyendrasana the folded leg is placed at the root of the thigh below abdomen, in Ardha-matsyendrasana it is placed by the side of the opposite buttock.

Sit extending both the legs together in front, hands by the side, palms resting on the ground. Fingers should remain together pointing forward. Fold the right leg at knee. Slowly set the right heel at the perineum. Now folding the
left legs, bringing it from above the right knee, place it on the ground. The knee of the left leg should remain towards sky. Now bring the right hand on the left side of the left knee. The left knee should remain at the left side of the right armpit. Now straighten the right hand and hold the toe or ankle of the left leg. Twisting the body to the left side, look backwards, place the left hand bringing it from the back on the right thigh. Gaze should be towards back.

While returning to the original position first release the hand from the thigh and turn head forward. Now bring the back to normal position after loosening the right hand. Bring the both legs in to original position. Repeat it similarly from the other side by folding the left leg first.

**Shirshasana (the head stand posture) – 1 to 10 minutes**

Sit on soles. Place knees on the ground. Frame finger lock with both hands. Making a triangle from finger-lock and elbows, place it on ground. Bending forward, place middle of the head on the ground near finger-lock. Now straighten your legs. Slowly bring the legs neck your body. Soles will automatically leave the ground by practice and thighs and knees will touch the abdomen. Now keeping the balance straighten your legs from thigh-joint, knees will remain folded. Now straighten the knees also and completely balance your body on head. While returning to the original position fold your knee first. Then fold your legs from thigh and let the thigh and knee touch your abdomen. Now slowly place the soles on the ground. Slowly raise your head also and sit on soles.
**Uddiyana Bandha (standing) - 1 to 2 minutes**

Spread out the legs. The distance between two legs should be 15" to 18".

Lean forward, place hands on the thighs or knees and now exhale fully, hold the breath out.

Expand the chest so that the abdomen would be drawn 'in and you will feel that the upper portion of the abdomen is being pulled towards the ribs.

After pulling it completely maintain for 5-10-15-20 seconds (according to your capacity). Now return.

Now slowly relax the abdomen and stand erect after inhalation.

After completion of series practice breathing for two to three minutes in Padmasana posture. Finally relax well in the shavasana posture for three to five minutes.

**Collection of Data**

The data on selected dependent variables viz. LDL cholesterol, HDL cholesterol and triglycerides levels were collected by conducting pre-test and post-test measurement in a very standard medical technology laboratory, by well trained and graduated testers one day prior to and after the training protocols respectively. The subjects were asked to be present at the appointed hour in the Rayalaseema Diagnostic Centre, Anantapuramu, where the blood samples were drawn from the subjects and further processing was done immediately. This procedure was adopted for both pre-test and post-test measurements of the variables. The laboratory used the very standard and
costly equipment for the administration of the various medical tests and been recognized as standard laboratory by various corporate hospitals in the Anantapuramu town, Andhra Pradesh.

**Statistical Techniques**

To find out the significant differences if any due to the experimental variables in the selected criterion variables, analysis of covariance (ANCOVA) was applied the procedure through which pre-test mean differences are adjusted to the post-test means. Whenever ‘F’ ratio for adjusted post-test 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).