CHAPTER – III

METHODOLOGY
This chapter describes the procedures adapted for the selection of subjects, selection of variables, collection of data and statistical techniques employed for analysing the data. The study was designed to deal with the effect of two exercise regiments on selected motor ability components, physiological and haematological variables among college women students.

3.1. SELECTION OF THE SUBJECTS

Ninety women students were selected from the Agricultural and Research Institute Killikulam at random and their age was between 18-22 years. They were divided into 3 groups. First group was considered as experimental group I, second group was experimental group II and the third group was called as control group.

The experimental group I (low impact group) underwent aerobic exercises for thirty minutes of three times per week for a period of eight weeks. The experimental group II (high impact group) underwent aerobic exercises for forty five minutes of alternate days in a week for a period of eight weeks.

3.2. SELECTION OF THE VARIABLES

The research scholar reviewed the available scientific literature pertaining to motor ability components, physiological and haematological variables from various journals, research papers presented by various authors in the magazines journals and books. Taking into considerations of the criteria, feasibility, and availability of instrument and the relevance of variables to the present study, the following variables were selected.
3.3. DEPENDENT VARIABLES

Motor Ability Components

1. Speed
2. Cardio Respiratory Endurance
3. Leg Explosive Power
4. Agility

Physiological Variable

1. Breath Holding Time
2. Resting Pulse Rate

Hematological Variables

1. Red blood corpuscles count
2. Hemoglobin Content

3.4. INDEPENDENT VARIABLES

1. Low Impact of aerobic exercises (short duration thirty minutes)
2. High impacts of aerobic exercises (long duration forty five minutes)

3.5. PILOT STUDY

A pilot study was conducted before finalizing the training programme. The purpose of the pilot study was to find out the suitability of the effect of two exercise regiments on selected motor ability component, physiological and haemotological variables among college women students.

Five students each for thirty minutes and forty five minutes respectively were tested to find out whether they were able to do it for the specified time and to find out if there was any problem in conducting the tests.
It was analysed whether the exercises prescribed in this test were within the ability of the students, and no problem was realised during the conduct of the tests.

**3.6. CRITERION MEASURES**

The following criterion measures were chosen for testing the hypothesis

1. Speed was measured in 1/100 of the seconds by 50 meters run.

2. Cardio respiratory endurance was measured in meters by twelve minutes run / walk test (Cooper’s test)

3. Leg explosive power was measured by standing broad jump and the unit of measurement was in metre.

4. Agility was measured by conducting the 4 x 10 yards shuttle run test. It was recorded in one tenth of a second of the stop watch.

5. Breath Holding time was measured in seconds by the duration from the time of holding her breath until the moment she let air out.

6. Resting pulse rate was measured in beats/minute by radial artery with the help of pulse monitor.

7. Red Blood Corpuscles count was measured in cu.m.m. by Ramansky method.

8. Hemoglobin content was measured in Cubic Millimeters by Shahili Adam’s Method.

**3.7. RELIABILITY OF DATA**

The reliability of data was ensured by establishing the instrument reliability, tester competency, reliability of the tester and subjects reliability.
3.7.1. Subject Reliability

The college students were selected as subjects and was given clear instruction about the reliability of the subjects. Test retest procedure was used and intra class correlation was used to find the consistence of the students.

3.7.2. Instrument Reliability

To facilitate the test administration the research scholar made use of the following instruments.

1. Measuring Tape
2. Stop Watch
3. Bio-Monitor
4. Wooden Clapper
5. Pulse Monitor

3.7.3. Tester's Reliability

To determine the reliability of tester, intra class correlation was used by using the test retest processes. Nine students selected from all the three groups were tested on the selected variables. The repeated measurements of individuals of the same test was done to determine reliability. It is an unvaried, not a bivariate situation. It makes sense then to use univariate statistic like the intra class correlation coefficient Baumgartner and Jackson (1975). The intra class correlation coefficient obtained for test retest are presented in Table I.
### TABLE I

**INTRA CLASS CORRELATION COEFFICIENT OF TEST RETEST SCORES**

<table>
<thead>
<tr>
<th>Test</th>
<th>r Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>.98</td>
</tr>
<tr>
<td>Cardio respiratory endurance</td>
<td>.97</td>
</tr>
<tr>
<td>Leg Explosive Power</td>
<td>.98</td>
</tr>
<tr>
<td>Agility</td>
<td>.98</td>
</tr>
<tr>
<td>Breath Holding Time</td>
<td>.98</td>
</tr>
<tr>
<td>Resting Pulse Rate</td>
<td>.96</td>
</tr>
<tr>
<td>Red Blood Corpuscles Count</td>
<td>.97</td>
</tr>
<tr>
<td>Hemoglobin Content</td>
<td>.98</td>
</tr>
</tbody>
</table>

3.8. EXPERIMENTAL DESIGN

The study was formulated as a true random group design consisting of a pre test and post test. For this purpose the subjects were randomly assigned to three equal groups. The groups were assigned as experimental group I (Low impact aerobic exercise) experimental group II (high impact aerobic exercise) and control group respectively. Pre test were conducted for all the three groups on selected motor ability components, physiological and haemotological variables. The experimental groups participated in their respective aerobic exercise programmes for a period of eight weeks on three times per week.

The post tests were conducted on the above said dependent variables after eight weeks of the training period. The training programme was scheduled at 6.30 to 7.30 A.M. on alternate days of a week.
3.9. AEROBIC EXERCISE

The purpose of the study was to estimate, the effect of two exercise regiments on selected motor ability components, physiological and haematological variables among the college women students. For this purpose, the research scholar followed the following procedure.

The subjects of the study were selected at random and divided into three homogeneous groups. Among the three groups, the control group was strictly under control, without undergoing any special activity. The experimental groups were subjected to the experimental treatment.

The experimental treatments were given for thirty minutes for the low impacts group and forty five minutes for high impacts group for three times per week for a period of eight weeks.

The experimental groups were well acquainted with their assigned duties and performed only the experiments allotted to them for a period of eight weeks under the personal supervision of the research scholar.

It was essential to warm up before every session to make sure one does not strain one’s muscles. One should not make the mistake of thinking that one can just plunge straight in to harder exercises later on and one do not need to warm up. The muscles were used to working at a particular rate and when an individual work out would be expecting them to work harder than normal.

Warm Up Sequence

1. Standing comfortably with legs apart, rotate one shoulder in a circular motion, moving the shoulder up, back and round, rotate several times, then rotate with the other shoulder (4 each).

➢ Repeat the exercise, this time rotating each shoulder forward in a circular motion (4 each).
1. Rotate both shoulders together, first circuiting forward several times, then backward (4 each).

2. Stand tall with feet slightly apart, shoulders relaxed and head straight, holding fingers, raise both hands over head and push the arms back several times, keeping the arm straight all the time. Relax and repeat (4)

3. Stand with both feet apart and hands on hip. Bending from the waist, rotate the top of your body in a circular motion all the way round.

Bend low as you come forward and back as you move up. Repeat the exercise in other ways (4 each way).

4. Standing with your feet comfortably apart hold your arms at your sides in an L-shape.

1. Clench the fists tight, raise the shoulders and tense all the muscles. Hold for a few seconds, then release (4).

5. Stand with feet comfortably apart, arms straight and out to the sides, palms flat with the fingers pointing upwards. Make eight small circles forward with the arms, moving from the shoulders then make eight back and circles (4 each way).

3.10. AEROBIC WORKOUTS

Now you are ready for the work out routines. The most important thing to remember is to stop whenever feel like it. You will certainly need to do this in the first five weeks until you become accustomed to the routine. It does not matter how often you stop for a break you will gradually improve.
Workout Sequence 1

1. Interlock your fingers, palms down, arms straight. Hop from one foot to the other, kicking out to the side, with your toes pointing upwards.
   - The sequence is kick, hop, kick alternating legs (8).

2. Keeping your fingers interlocked, raise your hands above your head and kick out to the front with alternate legs.
   - Remember to land flat on your foot each time with your heels down (8). Repeat Exercise 1 and 2 (8).

3. Kick out alternate legs to the front, this time swinging your arms at your sides, your right arm forward with your left leg, and vice versa (16).

4. Jump on both feet, then kick on leg high out in front, keeping your knee bent, and touch the knee with the opposite elbows.
   - land on both feet, then kick with other leg. Try to raise the leg to the elbow and keep upright, do not bend forward at the waist, but try to twist at the waist (16).

5. Keeping your feet almost together, jump and point your feet to the right, twisting at the wrist to keep the top half of your body facing forward. Hold your arms out at the sides for balance.

6. Continue to jump and twist your lower body from side to side but bend your legs and push your bottom up to one side as you twist (16).

7. Lift your heels up behind you, touching your left foot with your left hand and vice versa. Look over your shoulder as you touch each foot (16).

8. Kick your feet up in front touching your foot with the opposite hand and raising the other arm (16).

9. Lift your heels feet up behind you, touching your foot with the opposite hand and raising the other arm (16).
Workout Sequence 2

1. With your hands on your hips and feet together, jump from side to side, landing flat on both feet.
   - Bend your knees as you land and straighten them as you jump (16).

2. Again jumping with your feet together, keep turning right, first to face right, then to face the back, then jump right again to face the other side, then right again to face forward so you have done a full square. Repeat jumping to your left (8 each way).

3. With your hands on your hips, legs slightly up and jump from one foot to the other, holding the opposite leg out in front.

Workout Sequence 3

1. Run on the spot, leaning forward, kicking your legs up behind you and really using your arms (16).

2. (a) Jog on the spot, reaching up with one hand, placing the other hand on your hip.
   
   (b) Continue jogging, change arms and reach up with the opposite hand continue this, alternating, for 32 counts.

3. Continue to jog on the spot, reaching up with both hands at the same time, then bringing them down to clap (16).

4. With your feet slightly apart, jump and twist your lower body from side to side, leaning with your feet pointing to the left and then to right, and keeping the top of your body facing forwards. Hold your arms out for balance (8).

5. Repeat the same jump, and twist from the waist, holding your arms above head with your fists tight (8).
Cooling Down Sequence

1. After they finished the aerobics the cooling down sequence was monitored. They are as follows.

2. Breath in deeply through the nose, slowly raising your arms as you inhale. Expand your abdomen.

3. Exhale through the mouth, lowering your arms as you empty your lungs.

- Stand with your feet apart, one in front of the other. Holding the arms out, straight for balance, lunge forward, bending the front knee and keeping the back leg straight. Keep the body upright and the back straight. Hold for our counts.

- Keeping your feet in the same position and your arms out stretched, straighten your legs and move into a flat back. Hold for four counts then go back to the first position. Repeat the sequence four times (4).

4. Bend down, with one leg fully bent beneath you and the other stretched out behind with the heels raised. Spread your fingers and touch the floor for balance. Bounce your body gently up and down for four times.

- Keeping your feet and hands in the same position, but placing both heels on the floor, straighten your legs and bend the hips and touching your chest to your knee if you can. Hold for four counts. Go back to 4a and repeat the sequence four time (4) walk your hands through the centre of the other side and repeat exercise 4 times then exercises 1 four times.

5. Feet apart bend down and hold your left ankle with your right hand with the right elbow slightly bent, raise the left arm straightly up and twist to look at the raised hand. Hold for four counts.
Stay down and swing to the other side, holding your right ankle with your left hand for four counts (8 each side).

6. Relax completely and let everything flop.

- Keeping your back rounded, gradually uncurl, letting your head hang down until last. Give your arms and legs a gentle shake to relax the muscles.

7. Stand tall with your legs apart. Tummy and bottom tight and back straight.

- Squat down, keeping your back straight and your knees out.
- Bounce gently, getting slightly lower as you get used to the exercise. You may find it easier to hold your arms out for balance when you start, or you can put end of the music, coming up for a shakeout whenever you need to. Finally relax and shake your arms and legs to loosen the muscles.

3.11. COLLECTION OF DATA

3.11.1. Test Procedures of Dependent Variables

Administration of Test for Motor Ability Components

3.11.1.1. Speed

To measure speed 50 yards run was administrated.

**Purpose**

To measure the speed of the subjects.

**Equipment**

Electronic stop watch and wooden clapper.
Procedure

The subject was asked to take crouch position behind the starting line. Then she was asked to run the fifty meters with maximum speed after hearing the clapper sound. The time taken between the starters signal and the instant of which the subject crossed the finishing line was recorded as the score.

Scoring

The time taken was recorded in seconds as the score.

3.11.1.2. Cardio Respiratory Endurance

To measure the cardio respiratory endurance 12 minutes run / walk Cooper’s test was administered.

Purpose

To measure the cardio respiratory endurance of the subjects.

Equipment

Stop watch, measuring tape score cards and pencils 400 meters track marked at 50 meters interval.

Procedure

The group was divided into three for resting purpose. Each student works with a partner, while one student is running the other checks the lap. The partner is instructed to count the laps which are run within the allotted time. When eleven minutes have elapsed the instructor called out the time left to run. The observing partner gives the runners the number of completed laps he has run. The runner then reports his score in terms of number of laps plus the number of 50 meter zone passed on the last lap.

Scoring

The observing partner gives the runner the number of completed laps he has run in 12 minutes. The runner then reports his score in terms of number of laps plus the number of 50m zone passed on the last lap with the help of the norms the performance is recorded.
3.11.1.3. Leg Explosive Power

To measure the leg explosive power standing broad jump test was administered.

**Purpose**

To measure the leg explosive power of the subject.

**Equipment**

One long jump pit and measuring tape.

**Procedure**

The Subject was asked to stand on the take off board with his feet parallel, to each other. From this position the subject took a preliminary movement by flexing his knees and swinging his arms back, jumped outward as far as possible. Three trails were permitted in succession, best performance was taken into account. The distance of all the jumps were measured to the nearest centimeters.

**Scoring**

The distance of the best performance was recorded in centimeters as score.

3.11.1.4. Agility

**Shuttle Run**

To measure agility 4 x 10 yards shuttle run test was administered.

**Purpose**

The purpose of this test was to measure agility.

**Materials Used**

Stop watch, whistle, score sheet, measuring tape, Chunnam powder, two wooden blocks, (2"x2"x4") score card and pencil.
Procedure

Two parallel lines were drawn on the floor 30 feet apart. The blocks were placed behind one of the lines. The subject was instructed to start from behind the other line. To start the shuttle run a whistle was blown and the subject ran to the blocks picked up one block, ran back to the starting lines and placed the block on the ground beyond the line. Then the subject ran back picked up the other block and ran across the starting line as fast as possible. The stop watch was started as the whistle and stopped when the subject crossed the starting line. The trails were administered with a best period of five minutes in between the best of the two time were recorded as the score in seconds.

Scoring

The best timing was recorded in seconds as score.

Administration of Test For Physiological Variables

3.11.1.5. Breath Holding Time

Purpose

To find out the breath holding capacity.

Equipments

Stop watch and nose clip.

Procedure

The subject was instructed to stand at ease and to inhale deeply after which she held her breath for a length of time possible by her. A nose clip was placed on nose avoid letting the air through nostrils. The duration from the time of holding her breath until the moment she let air out was clocked by using the stop watch to the nearest one tenth of a second as breath holding time. The co-operation of the subject to let out the air by opening the mouth was sought to block the exact breath holding time.
Scoring

The time is recorded in seconds which is the best of two trials. Mathews (1968).

3.11.1.6. Resting Pulse Rate

To measure the resting pulse rate Bio-monitor was used.

Purpose

To measure the Resting pulse rate and to record the number of pulse rate per minute of the subjects.

Equipment

Bio - monitor.

Procedure

The resting pulse rate of the subject was monitored by the bio-monitor. It monitored the resting pulse rate using the method of finger plythesmography with the help of an opto-electronic transducer on finger. The subject was asked to sit and rest himself comfortably on a chair. The investigator fixed on optosensor unit to the thumb of the right hand of the subject using velcrostraps. It was fixed in such a way that the light on the opto-sensor unit was at the distal end of the finger tips and the LDR was nearer to the finger tip. The velcro strap on the LDR side was fastened firmly while the strap on the lamp side was loosely fastened.

The PCG / Pulse on-off switch of the Bio-monitor was kept in the pulse position. Then the heart rate monitor was switched on by pressing the pulse push button switch. After about 30 seconds, the pulse LED indicator flashed and the beeps started and stabilised. After that, the flashes and beeps occurred rhythmically with respect to the subject’s pulse. The pulse rate per minute was indicated by the three digital meter. After about a minute the digital meter showed the subject’s pulse rate under rest. The accuracy of equipment was + 3 percentage of reading, Author’s Guide (1984).
Scoring

The number of pulse beats per minute were recorded as the scores.

Administration of Test for Haematological Variables

3.11.1.7. Red Blood Corpuscles Count

Purpose

The purpose of this test was to measure the subjects red blood corpuscles per cu.milli.meter.

Equipment

Improved Neubacer haemocytometer

Procedure

The pipette with the large bulb was used for counting red cells and it had inside it a red glass bead. It had got three mark 0.5, 1 and 101. The blood was drawn up to the mark and then diluting fluid was also drawn upto the mark 101. The pipette was rotated rapidly between the fingers allowing the fluid to mix well. Mixing was helped by the pressure of glass bead inside. Care was taken to see that the fluid did not run out the pipette till the mixing was completed by closing the end of the pipette and also kept perfectly horizontal during mixing. By rotating the pipette air bubbles were avoided and the fluid was kept on an even level as it was being sucked upto the pipette. The pipette was not shaken in the direction of long axis, since the cells would be thrown into the capillary bore and the resulting count would not be accurate. The dilution of blood contained was 1/200. This was because fluid in the stem of the pipette below the mark 1 and did not mix the drop of blood in the bulb. Hence this volume was discarded and taken into account when calculating the dilution. The volume of the bulb was 100. Hence 5 volume of blood was taken into this 100 volume thus giving a dilution of 1/200.
In this counting chamber the ruling areas consisted of nine square millimeters. The central square millimeter was ruled into 25 groups of 16 small squares, each group separated by triple lines. The side of each small square was 1/20th m.m.

One drop of diluted blood from the red cell counting pipette was introduced in the counting chamber under the cover slip. As the under surface of the cover slip was 1/10th mm high from the surface of the counting chamber the volume of each small square was 400th cu.mm. The cells were counted in the five groups of 16 small squares. While counting only the cells contained within the squares and those cells touching or lying on the lines of any two adjacent sides were included in the count. By doing so all the cells in a square were counted, none was omitted or counted twice.

**Formula**

\[
\text{Total Red Blood Cells/Cubic mm} = \frac{\text{No. of Cells Counted} \times \text{dilution} \times \text{Factor} \times \text{Depth}}{\text{Area Counted}}
\]

### 3.11.1.8. Estimation of Hemoglobin Content

**Method**

Cyanmet hemoglobin (hemoglobin cyanide) method was applied. Sysmex TM:K-1000 (Japan made) auto analysis was used to estimate the hemoglobin content of the blood.
Test Principle

In the cyanmethemoglobin (hemoglobin cyanide) method, surfactant lyses the red blood cell membrane releasing hemoglobin. Hemoglobin iron is converted from the ferrous (Fe+2) to the ferric (Fe+3) state to form methemoglobin, which combines with potassium cyanide to produce the stable cyamethoglobin, or haemiglobincyanide (HICN). In the SLS-Hb method, surfactants lyse the red blood cell membrane releasing hemoglobin. The globin group of the hemoglobin molecule is altered by the hydrophilic alkyl group of sodium laurel sulphate. This induces the conversion of hemoglobin from the ferrous (Fe+2) to the ferric (Fe+3) state forming methemoglobin which combines with sodium laurel sulfate to become the SLS-Hb hemichrome molecule.

Test Procedure

A 6ml aliquot of whole blood is measured by the sample Rotor Valve and is diluted 1.500 with 2.0 ml of dilute and 1.0 ml of hemoglobin reagent. The 1:500 sample dilution is measured in the hemoglobin flow cell by a cyanmethemoglobin (hemglobincyanide) method with Stromatolyser-C as a hemoglobin reagent or by the sodium lauryl sulfate hemoglobin (SLS-Hb) method when using Sulfolyser hemoglobin reagent.

The concentration of the hemoglobin compound by the cyanmethemoglobin (hemoglobincyanide) method or by the SLS-Hb method is then measured by light absorbance methods, at 540mm wavelength center frequency. The Hb value is computed by subtracting blank absorbance from sample absorbance.

Calculation

\[(\text{Sample Absorbance}) - (\text{Blank Absorbance}) = (\text{Hb Absorbance})\]

The unit of reporting is grams per deciliter (g/dl)
3.11.2. Procedure of Independent Variables

3.11.2.1. Low Impacts of Aerobic Exercises (Short Duration)

Aerobic exercise was given for thirty minutes for the low impact group. The exercise was given to the subjects for eight weeks. The exercise was done on three times per week.

3.11.2.2. High Impacts of Aerobic Exercises (Long Duration)

Aerobic exercise was given for forty-five minutes for the high impact group. The exercise was given to the subjects for eight weeks. The exercise was done on three times per week.

3.12. STATISTICAL TECHNIQUES

The following Statistical techniques were used to find out the effects of two exercise regiments on selected motor ability components, physiological and hematological variables among college women students.

Analysis of covariance statistical technique was used to test the adjusted mean differences among the treatment groups. If the adjusted post test result was significant, the Scheffe’s post hoc test was applied to determine the paired mean significant difference. Thirumalaisamy (1997).