CHAPTER – III

METHODOLOGY

3.1 Introduction

In this chapter the selection of the subjects, selection of the variables, selection of tests, reliability of the instrument, reliability of the data, competence of the tester, orientation of subjects, pilot study, training programme, collection of data, test administration, experimental design and statistical procedure have been explained.

3.2 Selection of Subjects

The purpose of the study was to find out the effect of Periodized Aerobic Training (PAT), Periodized Resistance Training (PRT) and Periodized Concurrent Aerobic and Resistance Training (PCART) on selected physical, physiological and haematological variables of pre – adolescent girls. To achieve this purpose of the study, 60 pre-puberty girls studying in VI to VII standard from Arulmigu Maruthamalai Subramania Swami Devasdhana Higher Secondary School, Coimbatore, were randomly selected as subjects by lot method from a total of 300 students. The age, height and weight of the selected subjects were ranged from 10 to 12 years, 120 to 130cms and 30 to 35 kg respectively.

3.3 Experimental design

Selected subjects for the present study were divided into four groups randomly. Each group was consisting of fifteen subjects. Group I underwent Periodized Aerobic Training (PAT), Group II underwent Periodized Resistance
Training (PRT) Group III underwent Periodized Concurrent Aerobic and Resistance Training (PCART) group and Group IV acted as control group. The periodized aerobic training (group -I), the periodized resistance training (group – II) and the periodized concurrent aerobic and resistance training (group – III) underwent their respective training programmes for five days a week for twelve weeks, whereas the subjects of the control group (group IV) did not undergo any special training programme apart from their regular physical education programme of the curriculum. All the subjects gave written informed consent and no compulsion was made to take part in the training programme. A qualified physician examined the subjects and declared that they were medically and physically fit to participate in the training programme. Since all the selected subjects were the students of Arulmigu Maruthamalai Subramania Swami Devasdhana Higher Secondary School, Coimbatore, Tamilnadu and they were mature enough do the resistance and aerobic training.

3.4 Selection of Variables

The research scholar reviewed the available scientific literature pertaining to physical, physiological and haematological variables from various journals, books and after consulting with the experts. Taking into consideration of the criteria, feasibility, availability of instrument and the relevance of variables to the present study, the following variables were selected.

Physical Variables

1. Strength
   a. Right Grip
b. Left Grip
2. Muscular Endurance
3. Flexibility
4. Cardiovascular endurance
5. Percent body fat
6. Body weight

Physiological Variables
7. Resting heart rate
8. Maximum oxygen consumption

Haematological Variables
9. Haemoglobin
10. Red blood cells
11. White blood cells

3.5 Selection of Tests

The researcher had consulted with experts, physical education professionals, reviewed various literatures accessible and selected the following test items, which are standardized, appropriate and ideal for the selected variables. The criterion variables are represented in Table – 1.

Table – 3.1 : Test Selection

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Criterion Variables</th>
<th>Test Items</th>
<th>Unit of Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Strength – Right, Left</td>
<td>Handgrip dynamometer.</td>
<td>Kilograms.</td>
</tr>
<tr>
<td>02</td>
<td>Muscular Endurance</td>
<td>Bent – knee Sit - ups</td>
<td>Numbers</td>
</tr>
<tr>
<td>03</td>
<td>Flexibility</td>
<td>Sit and Reach</td>
<td>Centimeter</td>
</tr>
<tr>
<td>04</td>
<td>Cardio-vascular endurance</td>
<td>1.5. mile run</td>
<td>Minutes</td>
</tr>
</tbody>
</table>
### 05 Body Composition

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent body fat</td>
<td>Skinfold caliber mm</td>
</tr>
<tr>
<td>Body weight</td>
<td>Weighing machine Kg</td>
</tr>
<tr>
<td>Resting heart rate</td>
<td>Stethoscope Beats / minute</td>
</tr>
<tr>
<td>Maximum oxygen consumption</td>
<td>3 Minutes Step test ml / kg / min</td>
</tr>
<tr>
<td>Haemoglobin</td>
<td>Grams %</td>
</tr>
<tr>
<td>Red blood cells</td>
<td>Million cells/ Cumm</td>
</tr>
<tr>
<td>White blood cells</td>
<td>Cells/ Cumm</td>
</tr>
</tbody>
</table>

### 3.6 Reliability of the Instrument

The following instruments were used to test the selected criterion variables such as hand grip dynamometer, skinfold caliber and stethoscope. They were procured from the S.R.M.V Maruthi College of Physical Education, Coimbatore. All the instruments used in this study were in good condition and purchased from reputed and reliable companies. Their calibration were tested and found to be accurate enough to serve the purpose of the study.

### 3.7 Reliability of the Data

The reliability of the data was established through test and retest method. The subjects were randomly selected from Arulmigu Maruthalamalai Subramania Swami Devasdhana Higher Secondary School, Coimbatore, Tamilnadu, India. They were tested twice by the same testers on selected criterion variables. The intra class correlation was used to find out the reliability of the data with test – retest scores on each criterion variables separately and they are presented in table – II.
Table – 3.2: Intra Class Co-efficient of Correlations on Selected Criterion Variables

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Criterion Variables</th>
<th>r-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Handgrip Dynamometer</td>
<td>0.92</td>
</tr>
<tr>
<td>02</td>
<td>Modified Sit ups</td>
<td>0.90</td>
</tr>
<tr>
<td>03</td>
<td>Sit and Reach</td>
<td>0.89</td>
</tr>
<tr>
<td>04</td>
<td>1.5 mile Run</td>
<td>0.90</td>
</tr>
<tr>
<td>05</td>
<td>Skinfold Caliper</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Triceps</td>
<td>0.84</td>
</tr>
<tr>
<td></td>
<td>Supra iliac</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td>Abdominal skin fold</td>
<td>0.87</td>
</tr>
<tr>
<td>06</td>
<td>Body weight</td>
<td>0.92</td>
</tr>
<tr>
<td>07</td>
<td>Resting Heart Rate</td>
<td>0.89</td>
</tr>
<tr>
<td>08</td>
<td>Three minutes step test</td>
<td>0.88</td>
</tr>
</tbody>
</table>

3.8 Orientation of the Subjects

The researcher explained the subjects regarding the purpose of the study to and their part during the training programme. In addition to this, testing procedures on tests used to measure the criterion variables and instructions to be followed while measuring were explained to the subjects clearly. To have the clarity and to make the subjects to perform the exercises properly on varied training modules used in the present study, the selected subjects were inducted into four sessions with the techniques involved in executing the periodized aerobic training exercises and periodized resistance training exercises and periodized concurrent aerobic and resistance training exercises. The subjects
were verbally motivated to attend the training session regularly. The periodized aerobic training and the periodized resistance training exercises and periodized concurrent aerobic and resistance training exercises were fixed for the pre-adolescent girls for capable of executing the exercises.

3.9 Pilot Study

The present study was mainly concerned with effects of various modes of periodized training such as periodized aerobic training and the periodized resistance training exercises and periodized concurrent aerobic and resistance training on physical, physiological and haematological variables of pre-adolescent girls. The present study is mainly conceived with the varied types of training. Hence the investigator has to determine the intensity, frequency, specificity, recovery and type of periodized aerobic exercises and periodized resistance exercise in order to easily accommodate the subjects into the treatments used in the present study. For this purpose the investigator has conducted the pilot study using 60 girls of pre-adolescence who were the school going students. They were inclined to treatments specifically designed for the present study of periodized aerobic training, periodized resistance training, periodized concurrent aerobic and resistance training exercises. The heart rate reserve method was used to determine the training intensity. The heart rate reserve method was made popular by Karvonen. The intensity (training heart rate) was determined as follows. First maximum heart rate was estimated by the following formula. HR max = 220 – age. Resting heart rate was subtracted from maximal HR to obtain the HR reserve. From the reserve heart rate 50 % to 60 % was taken as the intensity. This value was added to the resting heart rate to obtain the target heart rate (THR) (ie) the target heart rate.
(THT) was determined as a percentage (50 % to 60 %) of the HRR plus the HR rest.

3.10 TEST ADMINISTRATION

The method of administration and procedures adopted in the tests used to measure the criterion variables were as follows.

3.10.1 Grip Strength (Right and Left Hand)

Equipment: Biosco Grip Dynamometer

Procedure:

The Biosco Grip Dynamometer was used to measure the static strength of the finger flexors of right and left hands. The point was set to zero and placed in the subject’s right hand adjustment was made in the dynamometer so that the thumb touches the first finger. When force is applied to the dynamometer, a steel spring is compressed and moves a pointer along a scale. By calibrating the dynamometer with known weights, one can determine how much force is required on the scale. The scores were read to the nearest kilograms. Three trials were given for each hand and the better scorers were recorded.

3.10.2 Muscular Endurance

Bent – knee sit ups

Equipment: Mat, Stop watch
Procedure

The subjects were asked to lie in supine with knees flexed and feet flat on the floor with the heels 12 and 18 inches from the buttocks. The angle of the knee was kept at 90 degrees. The arms were crossed over the chest with the hands on opposite shoulders. A partner held the feet securely. The subjects then curls up to a sitting position and touched the elbows to the thighs and returned to starting the until their mid back contacted to the floor. One point was scored for each correct sit ups. The score was the maximum number of sit-ups completed in 60 seconds.

3.10.3 Sit and Reach

Equipment: The test apparatus consisted of a specifically constructed box with a measuring scale where 23cms is at the level of the feet.

Description

The subjects were asked to remove their shoes. They were asked to sit on a mat with their legs extended. Their feet rested against the base of the box on which a yard stick was mounted with the 23 centimeter on the near side of the box. After the general warm up that included stretching of lower back and posterior thighs, slowly reached forward with both hands as far as possible and held the position momentarily. The distance reached on the yards stick by their fingertips was recorded as the test score. The distance reduced on the yardstick by their finger tips on the four trails was reached as the score to the nearest centimeter.
3.10.4 **Body Weight**

**Purpose**

To measure the body weight.

**Equipment:** Weighing machine and score sheet.

**Procedure**

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

3.10.5 **1.5 mile Run and Walk Test**

**Purpose**

To measure the cardio vascular endurance.

**Equipment:** Stop watch, Measuring tape, score card, pencils.

**Procedure**

For this test, the subjects were divided into five groups. Each subject worked with an assigned tester. The testers were instructed to count the laps, which are run within the quoted distance. When the last laps had elapsed the instructor gave the signal to the runners. The observing partner informed the runners the number of completed laps then and then.
Scoring

The scoring was the amount of time elapsed between the starters signal and the subject crosses the finishing line and the time was recorded to the nearest tenth of a second.

3.10.6 Percent Body Fat

Equipment: Skinfold Caliper.

Procedure

Pinching of tissues known is an skin fold, which included a double layer of skin plus subcutaneous fat to obtain a rough estimate of the leanness or farness of a subject is an old clinical procedure. The validity of the skin fold as a measure of subcuataneous fat is satisfactory, the skinfold in the present investigation were measured with Harpenden skinfold caliper. All the skinfold measurements were taken on the left side of the body as recommended by McColy.

The skinfold taken in the vertical plane, was grasped between thumb and forefingers with span of the grasp determined by the thickness of the fold. The size of the skinfold held was great enough to include two thickness of skin and the adhering subcutaneous fat. Care was taken to avoid unnecessary compression of the skinfold while measurements were being made. An attempt was made to apply the caliper jaws in such a way that the critical pressure on the skinfold was exerted by the contact surfaces of the instrument and not by the operator’s fingers. The skinfold was held up about 1 to 1.5 cm from the side where the fold was to be measured. Each skinfold was measured two times.
and the average reading recorded to the nearest millimeters. These three skinfold were also used for estimate body density (Women) using the Jackson and Pollock, and ward equation.

\[
\text{Density} = 1.089733 - 0.000245 (x_1) + 0.0000025 (x_1)^2 - 0.0000979 (x_2)
\]

where \( x_1 \) = sum of Triceps, Suprailium, and abdominal skinfolds. and \( x_2 \) = age in years.

The body density value obtained is used in the siri equation to calculate % body fat

\[
\text{Percent body fat} = (495 + D \text{ body}) - 450
\]

Triceps

Triceps skinfold measurement was taken with the help of skinfold caliper at the mid way of landmarks acromion and radial on the posterior side of the upper arm. A vertical skinfold was lifted at this site with thumb and forefinger and the caliper was applied one centimeter below the finger and the grip of the caliper was slowly released so that a full tension of the caliper was applied on the lifted skinfold.

Suprailiac

A vertical skinfold was lifted with the thumb and the forefinger just superior to the iliac crest at the mid auxiliary line. A skinfold was lifted at this site was thumb and forefinger and the caliper was applied one centimeter below the finger and the grip of the caliper was slowly released so that the full tension of the caliper was applied on the lifted skinfold.
Abdominal skinfold

The site is located 4 cm laterally to right of the umbilicus and was taken vertically. Each site was measured three lines and the average of the three reading was recorded as the final score.

3.10.7 Resting Heart Rate

Equipment: Stethoscope

Procedure

To determine the resting heart rate, the subject was asked to lie down on the table comfortably. The chest - piece of the stethoscope was applied on the 5th left intercostals space of the body. The heart rate was recorded by hearing the sounds lub, dub which was taken as one beat. It was expressed as beats per minute. The number of beats per minute was recorded as the resting heart rate.

3.10.8 Maximum Oxygen Consumption (VO₂max)

Step Test:

Equipment: 16¼ inches height of the bench.

Procedure

The subjects were asked to perform to a four-step cadence (up-up-down-down). To begin the test and perform the step-ups for exactly three minutes. After completion of the three minutes the subjects remain standing and take the heart rate for a fifteen second interval from five to twenty seconds into recovery. The heart rate was converted to recovery heart rate to beats per
minute. (ie) Multiply fifteen seconds heart rate by four. The following formula were used to find out the Maximal oxygen consumption.

\[ 65.81 - (0.1847 \times \text{Recovery heart rate in beats per minute}) \]

### 3.10.9 Haematological Variables

**Haemoglobin**

The cyanmethaemoglobin method was adopted for determining the concentration of hemoglobin.

**Reagents**

1. Ferricyanide – Cyanide reagent.

Two hundred mg potassium ferricyanide 50 mg potassium cyanide and 140 mg potassium dihydrogen phosphate were dissolved in water. Then 1 ml nonidet p40 was added to it and made upto a litre with water.

**Cyanmethaemoglobin standard.**

**Procedure**

Four ml of Ferricyanide – cyanide reagent was added to 20 ml blood. The tube containing the solution was stopped with a rubber bung and inverted several times. The solution was left to stand for 4 minutes and then read against reagent blank at 540 milli microns.

Haemoglobin concentrations were expressed as grams / deciliter as explained by Dacie and Lewis.
3.10.10 Red Blood Cells

Materials

A red blood corpuscle pipette diluting fluid, improved neubar's counting chamber and microscope were used.

Procedure

A 1:200 dilution of blood was made in formal literate solution. This was done by washing 20 ul of blood taken into the micropipette into 4 ml of diluting fluid, contained in a glass 75 x 12 mm tube. After sealing the tube with a tightly fitting rubber cork the diluted blood was mixed by hand for atleast two minutes by tilting the tube through an angle of about 120° combined with rotation, thus allowing the air bubble to mix the suspension. The improved neubauer counting character, with its cover glass already in position, was filled without delay. This was simple accomplished with the aid of a Pasteur pipette. The chamber was left undisturbed for two minutes for the cells to settle the cells were counted using a 4mm dry objective and x 10 eyepieces. The cell counting was done from the four corners and one central smaller square of the red blood corpuscles counting area. So eighty smallest squares of 1/400 square millimeter area each were counted. The total number of red blood corpuscles were expressed as N x 10^{12} / liter of blood.

3.10.11 White Blood cells

Their number was estimated with an improved neubauer haemocytometer as explained by Dacie and Lewis.
Materials

A white blood corpuscle pipette diluting fluid improved neubauer’s counting chamber and microscope were used.

Procedure

A 1 in 20 dilution of blood was made of adding 20 μl of blood into .38 millilitre of diluting fluid in a 75 x 10 mm glass tube. After tightly corking the tube, the suspension was mixed by rotating the tube for at least one minute. The improved neubauer counting chamber with its cover glass already in position was filled by means of a Pasteur pipette. The red cells were analyzed by the diluting fluid but the leucocytes remained intact, their nuclei staining deep violet black. The cells were counted with 16 mm objective x 10 eye pieces. The counting was done from all the smaller squares of the four corner white blood corpuscles counting areas. Thus the total area counted was 4 square millimetre.

3.11 TRAINING PROGRAMME

The structure of the training program used in the present study is as follows.

3.11.1 Aerobic training (Group I)

Aerobic training is the central feature of any effective training programme. The term aerobic refers to an organism’s ability to function in the presence of oxygen. The degree to which an endurance athlete can efficiently move oxygen.
The following schedule was followed for Aerobic training group (I)

The subjects in the group I were asked to do combination of walking and running continuously for a period of 30 minutes. They were made to walk and run all their mileage at a pace that feels very comfortable using the same course each time which was conductive goal setting. The researcher chose five days per week of training to allow the subject to perform a high volume of work and to give them some variation in their programme design. The Monday and Wednesday training sessions were performed using a high volume (3 kilometers) low intensity 50 to 60 % of maximum heart rate Tuesday and Friday training sessions were performed using a low volume (2 Kilometers) high intensity 60 to 70 % of maximum heart rate. On Saturday sessions the subjects performed longer runs to add appropriate to their ability to absorb the training effectively. We began each individuals training with aerobic low volume and increased about 10 % every two weeks.

3.11.2 Resistance training (Group II)

The subjects in the resistance training group trained on 5 days each week. Their workout were done in a multiple – set circuit, periodized programme of high – volume, low intensity with low – volume, high intensity to provide a satisfactory stimulus / recovery for the different types of muscles fibers, minimizing the possibility of experiencing the exhaustion phase of the G.A.S. The systematic training approach of periodized programme also provides a satisfactory overload to specific muscle fiber types while other fibers are getting necessary recovering (kreaner, Fleck & Evans). Thus the recovery is inbuilt in periodization training design.
The researcher chose five days per week of training to allow the subjects to perform a high volume of work and to give them some variations in their programme design.

For the first four weeks Monday and Thursday exercise sessions were performed in 50% – 60% of 1 RM for 1 set of 12 to 15 repetitions. Tuesday and Friday exercise sessions were performed in 60% - 70% of 1 RM for 1 set of 6 – 8 repetitions.

For the second four weeks Monday and Thursday exercise sessions were performed in 60 – 70 % of 1 RM for 3 sets of 12 – 15 repetitions for 2 times. Tuesday and Friday exercise sessions were performed in 70% – 80 % of 1 RM for 2 sets of 6 – 8 repetitions for two times.

For the last four weeks, Monday and Thursday exercise sessions were performed in 70% – 80% of 1 RM for 2 sets of 12 – 15 repetitions. Tuesday and Friday exercise sessions performed in 80% – 90 % of 1RM for 2 sets of 6 – 8 repetitions for two times.

This is an undulating periodization design scheme. During the exercise sessions, if the subjects could perform more repetitions than their target zone, the weight was increased for the following training session. The tempo of each set was modified with the sub maximal resistance workout incorporating more explosive movement speeds, between each set, the subjects had a rest period of 1 -2 minutes on light days, and 3 – 4 minutes on heavy days.

Resistance training group exercised the following exercise on Monday and Thursday: Shoulder press, Bench press, Sit – ups, Heel raise, Half squat.
Arm curl, Bend over row and Standing calf raise were performed. Tuesday and Friday the following exercises were performed: Military press, Triceps push down, Lunge, Bench press, Sit ups, Seated calf raise, Upright row and Dead lift.

The subjects were divided into two groups of seven in each. When one group performed the exercise the other group assisted the subjects in loading the weight.

On a start signal from the researcher, each subject begins performing the exercise for her particular station. At the end of the work period, the researcher signals to stop and move to the next station. The researcher begins timing the rest period, which lasted 1 – 2 minutes and 3 -4 minutes for low intensity and high intensity respectively. At the end of the rest period the subjects begin to exercise at the next circuit station and so on. In this study, eight circuit stations were used. In this format, the subjects completed entire circuits once with single set for 4 weeks, in the second four weeks the subjects performed all the eight exercise with single set and the find four weeks the entire circuit was done twice with two sets of each exercise.

Resistance training programme was preceded with 10 minutes warm – up and included with 10 minutes of cool – down component.

During the resistance training proper exercise technique and safety precautions were followed.

The resistance training programme was addressed with all major muscle groups and exercised through the complete range of motion.
Before beginning a formal resistance training programme, a medical evaluation was performed by a pediatrician.

3.11.3 Periodized concurrent aerobic training and resistance training (Group III)

The subjects in the group III trained for five days a week. The training programme comprised of combination of resistance training and aerobic training on alternate days. The nature of the resistance training of the Group III was similar to that of Group II in duration and volume Group III practiced resistance training on Mondays with high volume low intensity on Wednesdays low volume high intensity and on Saturdays high volume with medium intensity in the evening. Group III also practiced aerobic training on Tuesday with high volume low intensity Fridays with low volume high intensity and Saturdays with high volume in the mornings.

Table: 3.3 Periodized high and low volume training programme

<table>
<thead>
<tr>
<th>Week</th>
<th>Monday &amp; Thursday</th>
<th>Tuesday &amp; Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High volume</td>
<td>Low volume</td>
</tr>
<tr>
<td></td>
<td>Intensity</td>
<td>Repetitions</td>
</tr>
<tr>
<td>1</td>
<td>50%</td>
<td>12 - 15</td>
</tr>
<tr>
<td>2</td>
<td>52%</td>
<td>12 - 15</td>
</tr>
<tr>
<td>3</td>
<td>54%</td>
<td>12 - 15</td>
</tr>
<tr>
<td>4</td>
<td>56%</td>
<td>12 - 15</td>
</tr>
<tr>
<td>5</td>
<td>60%</td>
<td>12 - 15</td>
</tr>
<tr>
<td>6</td>
<td>62%</td>
<td>12 - 15</td>
</tr>
<tr>
<td>7</td>
<td>64%</td>
<td>12 - 15</td>
</tr>
<tr>
<td>8</td>
<td>66%</td>
<td>12 - 15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>9</td>
<td>70%</td>
<td>12-15</td>
</tr>
<tr>
<td>10</td>
<td>72%</td>
<td>12-15</td>
</tr>
<tr>
<td>11</td>
<td>74%</td>
<td>12-15</td>
</tr>
<tr>
<td>12</td>
<td>76%</td>
<td>12-15</td>
</tr>
</tbody>
</table>

**Periodized resistance training exercise programme**

- Shoulder press
- Bench press
- Sit-ups
- Heel raise
- Half squat
- Arm curl
- Bend over row
- Standing calf raise

**Period – II**

- Military press
- Triceps push down
- Lunges
- Bench press
- Sit ups
- Seated calf raise
- Upright row
- Dead lift

**Shoulder press**

The subjects were asked to sit erect, bending their elbows, with palms facing toward at chest level, and hands spread shoulder width apart and feet
spread. They also tightened the abdominal and back muscle. The bar was moved to overhead position (arms straight and then lowered to chest position.) The exercise was repeated for 30 seconds.

**Bench press**

The subjects were asked to lie supine on bench with the knees bent and feet flat on the floor in stride position, bar grasped at the shoulder level. The bar was raised over the head until arms were straight and returned to the starting position. The exercise was repeated for 30 seconds.

**Sit – ups**

The subjects were asked to lying on the back with knees bent, feet flat on the floor, and arms folded across the chest, bend at his waist and raise the subjects head and shoulders toward the knees until the hands touch the subject’s thighs. Return to the starting position. Return to the starting poison. This exercise was repeated for 30 seconds.

**Heel raise**

The subjects were asked to stand erect with palm facing forward, hands wider than shoulder width apart and bar resting behind neck on shoulders. The subjects were instructed to rest balls of feet on 2 inch block with heels apart, and then they raise the body on their toes quickly. Holding the position for 1 second. This exercise was repeated for 30 seconds.
Half squat

The subjects were asked to stand erect with the weight balanced comfortably across the top of the shoulders. Using an overhand grip hands spread shoulder width apart, the weight was lowered by bending the knees to a 90 degree angle and return to the starting position by keeping back straight. This exercise was repeated for 30 seconds.

Arm curl

Using a palms up grip, start with the arm completely extended, and with the aid of a sand bag with sand, curl up as far as possible, then return to the initial position. Repeat the exercise with the other arm. This exercise was repeated for 30 seconds.

Bent over row

Lie face down on a flat or slightly inclined bench. Hold two dumbbells and let arms hang down. Pull dumbbells up towards chest. Slowly lower dumbbells back down and repeat.

Standing Calf Raises

Stand on the edge of the bench with barbell weighted, feet flat on the floor about 12 inches apart. The barbell should lie on back of the neck while keeping hold of it. While staying standing raise heels by just using the toes. Lower your heels to the ground and repeat.
Period II

Military press

Stand with feet shoulder width apart and knees slightly bent. Grasp bar with palms facing outward approximately hip width apart and allow arms to hang down at sides. Elbows should be close to sides. Raise the bar above the head level. Flex the arms and bring the bar to the neck level then starts to move upward and the movements were doing by continuously.

Triceps push down

Sit in upright position on a flat bench. Lie onto back and bring the Dumbbell to your chest. Press dumbbell up so that it is directly over upper chest. Lower DB towards forehead by bending elbows to 90°. Elbows should remain pointing forward. Return to start position. Remember to keep back and head straight in a neutral position - hyperextension or flexion may cause injury. Keep shoulder stabilized throughout movement.

Lunges

Stand with feet hip width apart. Grasp dumbbell’s hang arms down at sides. Step forward 2-3 feet forming a 90° bend at the front hip and knee. Do not allow front knee to extend past the big toe - may cause injury. Push off the front foot and return to start position. Continue with same leg or alternate as prescribed. Remember to keep head and back upright in a neutral position. Shoulders and hips should remain squared at all times.

Watch for proper knee alignment - do not let front knee extend past big toe or deviate laterally or medially. Back knee should not come in contact with floor.
**Bench press**

The subjects were asked to lie supine on bench with the knees bent and feet flat on the floor in stride position, bar grasped at the shoulder level. The bar was raised over the head until arms were straight and returned to the starting position. The exercise was repeated for 30 seconds.

**Sit – ups**

The subjects were asked to lying on the back with knees bent, feet flat on the floor, and arms folded across the chest, bend at his waist and raise the subjects head and shoulders toward the knees until the hands touch the subject’s thighs. Return to the starting position. Return to the starting poison. This exercise was repeated for 30 seconds.

**Seated Calf Raise**

Sit on the edge of the bench, feet flat on the floor about 12 inches apart. Rest dumbbells on thighs while keeping hold of them. While staying seated raise the heels by just using the toes. Lower your heels to the ground and repeat.

**Upright row**

The subjects were asked to stand erect holding the weights in front of the thighs with palms facing the in front of the thighs. Leading with the elbows, pull the weights up the front of the body until the weights are approximately level with the chest and elbows which are at shoulder height. Slowly lower the weights back down to the starting position.
Dead lift

Stand tall, holding the weights in each hand in front of the thighs.

Because the weights are in front of the thighs, and sure to focus on pulling the shoulders back to counteract the tendency to sand the back

The weights in front of all times. They should stay as close to the body as it can get them without hitting the knees to lower them down and to lower the weights, follow this mental check list. Chest lifted, abdominals braced and hips back.

Reverse this process for lifting backup and like the squat, try to keep the subjects weights on the heels.

3.11.4 Collection of Data

At the end of the treatment period, as post test, the subjects belong to the treatment groups namely periodized aerobic training group (PATG), periodized resistance training group (PRTG), periodized concurrent aerobic and resistance training group (PCARTG) and control group were tested on criterion variables (strength, Muscular endurance, Flexibility, Cardio vascular endurance, percent body fat, body weight, resting heart rate, maximum oxygen consumption, Hemoglobin, red blood corpuscles, white blood corpuscles) as such in the pre-test of the same. The collected data were processed with appropriate statistical tool and the detailed procedure of the same is given below.
3.12 Statistical Analysis of Data

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