Chapter –III
METHODOLOGY
Chapter – III

METHODOLOGY

This chapter describes the methodology employed in the selection of subjects, selection of variables, experimental design of the study, administration of the tests, administration of the training programme, collection of data and statistical technique employed for the analysis of data are been described.

Selection of subjects

Total 240 high schools boys of 13 to 15 years were selected at random as subjects for this study. Four groups were constituted with 60 boys each on random basis, out of which three groups were the experimental groups and one group was the control group.

Selection of the variables

Exercises are the primary means of the improvement of physical fitness. Physical exercises can be classified in to various categories for instance, according to the muscle groups involved, equipment being used, or according to the effect of exercise. Calisthenics exercises are the most commonly used exercises for the improvement of general health and physical fitness. These exercises are usually performed without any equipment and normally known as free hand exercises. Aerobic exercises
are also of similar nature, but usually used for the development of cardio respiratory endurance development. Combination of these exercises can be for the development of different components of physical fitness.

Calisthenics and aerobic exercises are easy to perform and without any sophisticated instruments, but at the same time, very powerful and effective for the development of different fitness components. In a school setting, these kinds of exercises are known to the students and easy for them to execute during the physical education classes. Moreover, these exercises are interesting and fun filled by nature. In addition to this, more number of subjects can be engaged at a time in the exercise programme. Keeping in view of all these points, the research scholar selected calisthenics, aerobic exercises and the combination of both as experimental variables.

To find out the effect of twelve weeks callisthenic exercises, aerobic exercises and combination of callisthenic and aerobic exercises programmes on the physical fitness variables, the following components and tests were selected and presented in the table – 3.1 here below.
TABLE-3.I
PHYSICAL FITNESS VARIABLES AND TESTS

<table>
<thead>
<tr>
<th>Physical Fitness Variables</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cardio respiratory endurance</td>
<td>1 mile run /walk test</td>
</tr>
<tr>
<td>2. Muscular endurance</td>
<td>Bent Knee Sit ups for one minute</td>
</tr>
<tr>
<td>3. Muscular strength</td>
<td>Pull ups (Maximum)</td>
</tr>
<tr>
<td>4. Flexibility</td>
<td>Sit and reach test</td>
</tr>
<tr>
<td>5. Body composition</td>
<td>Impedance fat analysis</td>
</tr>
</tbody>
</table>

Design of the study

The selected 240 subjects were divided into four equal groups as ‘A’, ‘B’, ‘C’ and ‘D’ at random. A twelve week training programme was designed, consisting of selected calisthenics exercises, aerobic exercise, and combination of calisthenics and aerobic exercises. After taking the pretest for variables of physical fitness, the training programme was given to experimental groups ‘A’, ‘B’, and ‘C’ at random basis. Group ‘D’ was kept as control group. The experimental group ‘A’ underwent callisthenic exercises, group ‘B’ had aerobic exercise programme, and group ‘C’ had a combination of training programme in Calisthenics and aerobic exercises, four times in a week for a duration of 12 weeks. The group D, which was acting as control group did not have any training programme. List of Calisthenics, Aerobic and Combination of Calisthenics and Aerobic Exercises selected for 12 weeks Training is
presented in table – 3.2. A post test was conducted after 12 weeks of training in each variable for all the subjects. After every three weeks the training load was increased for progression in order to have required physiological adaptation. The training protocol of Calisthenics, Aerobic and Combination of Calisthenics and Aerobic Exercises selected for 12 weeks Training is presented in table – 3.3.

**TABLE – 3.2**

**LIST OF CALISTHENICS, AEROBIC AND COMBINATION OF CALISTHENICS AND AEROBIC EXERCISES SELECTED FOR 12 WEEKS TRAINING**

<table>
<thead>
<tr>
<th>Calisthenics</th>
<th>Aerobic Exercises</th>
<th>Combination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Arm Rotation</td>
<td>1. Spot marching with arm swings</td>
<td><strong>Calisthenics</strong></td>
</tr>
<tr>
<td>2. Trunk forward bend and back</td>
<td>2. Heel, toe, heel step (Alternate leg movement)</td>
<td>1. Arm Rotation</td>
</tr>
<tr>
<td>3. Trunk bend sideways (Left and Right)</td>
<td>3. Crossed side steps taps alternate</td>
<td>2. Trunk forward bend and back</td>
</tr>
<tr>
<td>4. Legs stretching sideways from crouch sit position with a hop (Alternate - Left and Right)</td>
<td>4. Side kick: tap, kick, step (Left and right side alternate)</td>
<td>3. Full squatting</td>
</tr>
<tr>
<td>6. Full squatting</td>
<td></td>
<td>5. Sit ups with straight legs</td>
</tr>
<tr>
<td>7. Dips</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Front Kicks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Sit ups with straight legs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Jumping jacks</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Aerobic Exercises</strong></th>
<th><strong>Combination</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Spot marching with arm swings</td>
<td><strong>Aerobic Exercises</strong></td>
</tr>
<tr>
<td>2. Heel, toe, heel step (Alternate leg movement)</td>
<td>1. Spot marching with arm swings</td>
</tr>
<tr>
<td>3. Crossed side steps taps alternate</td>
<td>2. Heel, toe, heel step (Alternate leg movement)</td>
</tr>
<tr>
<td>4. Side kick: tap, kick, step (Left and right side alternate)</td>
<td>3. Side steps – two left – back – two right – back</td>
</tr>
<tr>
<td>5. Legs shuffling with spot jumps</td>
<td>4. Side kick: tap, kick, step (Left and right side alternate)</td>
</tr>
<tr>
<td></td>
<td>5. Split Jumps</td>
</tr>
</tbody>
</table>
DESCRIPTION OF EXERCISE USED IN THE TRAINING PROTOCOL

CALISTHENICS EXERCISES

Basically all these exercises are freehand movements in nature and done with two counts or four counts to complete one movement.

Exercises No. 1

Arm rotation

Starting position: Feet astride

Procedure: Both arms circling, backside upward, forward, downward. The subject was asked to repeat the movements continuously as per the protocol counts and presented in PLATE-I.

Exercises No. 2

Trunk forward bending and back

This is a four count exercise, which is depicted by PLATE-II, II-A and II-B.

Procedure:

Starting position: Attention

Count-1: Raise arms forward, raise heels

Count-2: Bend the trunk forward with arms flinging downwards and fingers only touching the ground, keeping knees straight.

Count-3: Return to Count-1 position.

Count-4: Return to Attention position.
PLATE I: Diagram of Arm rotation

PLATE II: Diagram of Trunk forward bending and back
PLATE- II A: Starting position for Trunk forward bending

PLATE- II B: Trunk bending – forward
Exercises No. 3

Trunk bending – Sideways: Left and Right:

This exercise was performed with two count movements and presented in PLATE – III, III-A and III-B.

Procedure:

Starting position: Short astride, with arms stretched sideways at shoulder level.

Count-1: Bend trunk sideways with left hand sliding down the leg; right hand under fully stretched up.

Count-2: Slowly reverse the movement by bending trunk sideways right and repeat the exercise alternately.

Exercises No. 4

Legs stretching sideways from crouch sit position with a hop (Alternate - Left and Right)

This exercise was performed with four count movements and presented in PLATE – IV, IV-A and IV-B.

Procedure:

Starting position: Crouch position with knees out side the arms.

Count-1: Spring slightly upward and straighten left leg full sideways.

Count-2: Hop on right foot and return to starting position.

Count-3: Repeat stretching right foot.

Count-4: Hop on left foot and return to starting position.
PLATE - III: Diagram of Trunk bending – Sideways: Left and Right

PLATE III A: Trunk bending – Initial position

PLATE- III B: Trunk bending – Sideways: Left and Right
PLATE - IV: Diagram of Legs stretching sideways from crouch sit position with a hop (Alternate - Left and Right)
PLATE – IV-A: Legs stretching sideways from crouch sit position with a hop – Initial position

PLATE – IV-B: Legs stretching sideways from crouch sit position with a hop (Alternate - Left and Right)
Exercises No. 5

Back curling

This exercise was performed with two count movements and presented in PLATE – V and V-A.

Procedure:

Starting position: Prone lying with arms bent at elbows.

Count-1: Raise the trunk and stretch arms sideways.

Count-2: Back to the starting position.

Exercises No. 6

Squatting

This exercise was performed with four count movements and presented in PLATE – VI and VI-A.

Procedure:

Starting position: Attention

Count-1: Raise heels and take hands on the hips.

Count-2: Squat with knees full bent and heels rose with hip firm position.

Count-3: Return to the count -1 position.

Count-4: Return to the starting position.
PLATE - V: Back curling

PLATE -V-A: Back curling
PLATE - VI: Diagram of Squatting

PLATE - VI-A: Squatting
Exercises No. 7

Dips: This exercise was performed with two count movements and presented in PLATE – VII, VII-A and VII-B.

Procedure:

Starting Position: Prone support position by keeping ground contact only at two points, i.e., one at tip of toes and another at palms. Head to the heel should remain straight in one line.

Count-1: Bend arms at elbows and support weight on the palms and toes. Forehead should come close to the floor.

Count-2: Keeping body straight, straightening arms and return to starting position.

Exercises No. 8

Front kick: This exercise was performed with four count movements and presented in PLATE – VIII and VIII-A.

Procedure:

Starting Position: Attention

Count-1: Kick with the left foot forward to shoulder height touching the right hand, keeping upper body erect and head extended in front.

Count-2: Back to the starting position.

Count-3: Kick with right foot, touching left hand.

Count-4: Back to the starting position.
PLATE - VII: Dips Diagram

PLATE VII-A: DIPS (INITIAL POSITION)

PLATE - VII-B: DIPS
PLATE – VIII: Front kick Diagram

PLATE – VIII -A: Front kick
**Exercises No. 9**

**Sit ups with straight legs:** This exercise was performed with four count movements and presented in PLATE – IX and IX -A.

**Procedure:**

**Starting Position:** Supine lying with hands along side the body

**Count-1:** Raise trunk slowly from supine lying position and reach long sit position.

**Count-2:** Further bend forward with arms reaching test.

**Count-3:** Return back to count-1 position.

**Count-4:** Back to the starting position.

**Exercises No. 10**

**Jumping jacks:** This exercise was performed with four count movements and presented in PLATE – X, X-A and X-B.

**Procedure:**

**Starting Position:** Attention

**Count-1:** Jumping feet astride, raising arms sideward, and palm facing the ground, fingers together.

**Count-2:** Flinging arms upward above head with a clap and jumping feet together.

**Count-3:** Return to Count-1 position.

**Count-4:** Returning to position of attention.
PLATE – IX: Diagram Sit ups with straight legs

PLATE - IX-A: Sit ups with straight legs
PLATE – X: Diagram of Jumping jacks

PLATE X-A: Jumping Jacks Initial Position

PLATE X-B: Jumping jacks
AEROBIC EXERCISES

Five aerobic dance movements were selected for the purpose of this study. Aerobic dance sessions are presented in PLATE- XI, XII, XIII, XIV and XV.

1. Spot marching with arm swings

This exercise was performed with a cadence of 90 steps per minute for prescribed duration, continuously without any break in movement.

Procedure:

The subject was asked to perform on the spot walking (marching) with full range of arm swing with bend in the elbows, and high knees lift to make thigh to reach a height which is parallel to the ground. The range of the movement was emphasized throughout the exercise and care was taken to see every subject perform in a synchronized manner to the preset cadence of 90 steps per minute.

2. Heel, toe, heel step (Alternate leg movement)

This exercise was performed with a cadence of 90 steps per minute for prescribed duration, continuously without any break in movement.

Procedure:

Starting Position: Attention

Movement-1: Bring left leg forward and make ground contact with heel and fling arms upward above head with a clap.

Movement-2: Bring the legs and hand back to the starting position.
PLATE: XI: Aerobic Dance Session
Movement-3: Bring left leg backward and make ground contact with the toe and fling arms upward above head with a clap.

Movement-4: Returning to position of attention.

To continue with the movements, the subjects were asked to carry out the same movements on right leg. These four movements were done alternatively on left and right leg, till the completion of prescribed time.

3. **Crossed side steps tap alternatively on left and right leg.**

This exercise was performed with a cadence of 90 steps per minute for prescribed duration, continuously without any break in movement.

**Procedure:**

**Starting Position:** Attention

**Movement-1:** Lift the left leg, bring across the right leg in front and tap on the floor with the foot, along with the arms lift and swing at shoulder height in palm facing ground position.

**Movement-2:** Reach back to attention position.

**Movement-3:** Repeat the action with right leg, by taping the floor with foot.

**Movement-4:** Back to attention position.
PLATE: XII: Aerobic Dance Session
These four movements were done continuously by the subjects till the completion of prescribed time.

4. Side kick: tap, kick, step (Left and right side alternate)

This exercise was performed with a cadence of 90 steps per minute for prescribed duration, continuously without any break in movement.

Procedure:

Starting Position: Attention

Movement-1: Lift the left leg and tap on the floor with the foot. Hands fold at elbows.

Movement-2: Lift the left foot and kick sideways to the hip height, stretching arms sideways at shoulder level, and then bring the foot back and step back to attention position.

Movement-3: Repeat the action with right leg, by taping the floor with foot.

Movement-4: After a side kick of right leg, step back to attention position.

These four movements were done continuously by the subjects till the completion of prescribed time.

5. Legs split shuffles with spot jumps

This exercise was performed with a cadence of 90 steps per minute for prescribed duration, continuously without any break in movement.
PLATE: XIII: Aerobic Dance Session
Procedure:

Marking: Two lines marked parallel on soft and even floor, as long as possible to accommodate more number of subjects, keeping one meter inter-space between them.

Starting Position: Attention

Exercise movement: Bounce on the spot and make split landing with a distance of one foot length apart, once leading left leg and for the next right leg. This movement of leg should be coordinated with the arm forward rotation in full orbit, just like in skipping. The movement was continued till the completion of stipulated time. Lift the left leg and tap on the floor with the foot. Hands fold at elbows.

These movements were done continuously by the subjects till the completion of prescribed time.
PLATE: XV: Aerobic Dance Session
CALISTHENICS AND AEROBIC EXERCISES

Exercises No. 1

Arm rotation

Starting position: Feet astride

Procedure: Both arms circling, backside upward, forward, downward. The subject was asked to repeat the movements continuously as per the protocol counts and presented earlier in PLATE - I.

Exercises No. 2

Trunk bending – forward and back

This is a four count exercise, which is depicted earlier in PLATE-II, II-A and II-B.

Procedure:

Starting position: Attention

Count-1: Raise arms forward, raise heels

Count-2: Bend the trunk forward with arms flinging downwards and fingers only touching the ground, keeping knees straight.

Count-3: Return to Count-1 position.

Count-4: Return to Attention position.
**Exercises No. 3**

**Squatting:** This exercise was performed with four count movements and presented in PLATE-VI and VI-A.

**Procedure:**

**Starting position:** Attention

**Count-1:** Raise heels and take hands on the hips.

**Count-2:** Squat with knees fully bent and heels rose with hip firm position.

**Count-3:** Return to the count -1 position.

**Count-4:** Return to the starting position.

---

**Exercises No. 4**

**Dips:** This exercise was performed with two count movements and presented earlier in PLATE-VII, VII-A and VII-B.

**Procedure:**

**Starting Position:** Prone support position by keeping ground contact only at two points, i.e., one at tip of toes and another at palms. Head to the heel should remain straight in one line.

**Count-1:** Bend arms at elbows and support weight on the palms and toes. Forehead should come close to the floor.

**Count-2:** Keeping body straight, straightening arms and return to starting position.
Exercises No. 5

Sit ups with straight legs

This exercise was performed with four count movements and presented in PLATE- VIII and VIII-A.

Procedure:

Starting Position: Supine lying with hands along side the body

Count-1: Raise trunk slowly from supine lying position and reach long sit position.

Count-2: Further bend forward with arms reaching test.

Count-3: Return back to count-1 position.

Count-4: Back to the starting position.

AEROBIC EXERCISES:

6. Spot marching with arm swings

This exercise was performed with a cadence of 90 steps per minute for prescribed duration, continuously without any break in movement.

Procedure:

The subject was asked to perform on the spot walking (marching) with full range of arm swing without bend in the elbows, and high knees lift to make thigh to reach a height which is parallel to the ground. The range of the movement was emphasized throughout the exercise and care was taken to see every subject perform in a synchronized manner to the preset cadence of 90 steps per minute.
7. **Heel, toe, heel step (Alternate leg movement)**

This exercise was performed with a cadence of 90 steps per minute for prescribed duration, continuously without any break in movement.

**Procedure:**

**Starting Position:** Attention

**Movement-1:** Bring left leg forward and make ground contact with heel and fling arms upward above head with a clap.

**Movement-2:** Bring the legs and hand back to the starting position.

**Movement-3:** Bring left leg backward and make ground contact with the toe and fling arms upward above head with a clap.

**Movement-4:** Returning to position of attention.

To continue with the movements, the subjects were asked to carry out the same movements on right leg. These four movements were done alternatively on left and right leg, till the completion of prescribed time.

8. **Crossed side steps tap alternatively on left and right leg.**

This exercise was performed with a cadence of 90 steps per minute for prescribed duration, continuously without any break in movement.

**Procedure:**

**Starting Position:** Attention
Movement-1: Lift the left leg, bring across the right leg in front and tap on the floor with the foot, along with the arms lift and swing at shoulder height in palm facing ground position.

Movement-2: Reach back to attention position.

Movement-3: Repeat the action with right leg, by taping the floor with foot.

Movement-4: Back to attention position.

These four movements were done continuously by the subjects till the completion of prescribed time.

9. Side kick: tap, kick, step (Left and right side alternate)

This exercise was performed with a cadence of 90 steps per minute for prescribed duration, continuously without any break in movement.

Procedure:

Starting Position: Attention

Movement-1: Lift the left leg and tap on the floor with the foot. Hands fold at elbows.

Movement-2: Lift the left foot and kick sideways to the hip height, stretching arms sideways at shoulder level, and then bring the foot back and step back to attention position.

Movement-3: Repeat the action with right leg, by taping the floor with foot.
Movement-4: After a side kick of right leg, step back to attention position.

These four movements were done continuously by the subjects till the completion of prescribed time.

10. Legs split shuffles with spot jumps

This exercise was performed with a cadence of 90 steps per minute for prescribed duration, continuously without any break in movement.

Procedure:

Marking: Two lines marked parallel on soft and even floor, as long as possible to accommodate more number of subjects, keeping one meter inter-space between them.

Starting Position: Attention

Exercise movement: Bounce on the spot and make split landing with a distance of one foot length apart, once leading left leg and for the next right leg. This movement of leg should be coordinated with the arm forward rotation in full orbit, just like in skipping. The movement was continued till the completion of stipulated time. Lift the left leg and tap on the floor with the foot. Hands fold at elbows.

These movements were done continuously by the subjects till the completion of prescribed time.
**TABLE – 3.3**

**TRAINING PROTOCOL**

<table>
<thead>
<tr>
<th>Week No</th>
<th>Calisthenics Exercises</th>
<th>Aerobic Exercises</th>
<th>Combination of Calisthenics &amp; Aerobic Exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Exercise No.1 to 10 x 6 reps x 2 set</td>
<td>5 different movement pattern with cadence of 90 steps per minute for 2 min. duration x 2 sets (10 min. x 2 set)</td>
<td>Callisthenic exercise No.1 to 5 x 6 reps x 2 set Aerobic exercises: 5 different movement pattern with cadence of 90 steps per minute for 2 min. duration x 1 set</td>
</tr>
<tr>
<td>2</td>
<td>Exercise No.1 to 10 x 6 reps x 2 set</td>
<td>5 different movement pattern with cadence of 90 steps per minute for 2 min. duration x 2 sets (10 min. x 2 set)</td>
<td>Callisthenic exercise No.1 to 5 x 6 reps x 2 set 5 different movement pattern with cadence of 90 steps per minute for 2 min. duration x 1 set</td>
</tr>
<tr>
<td>3</td>
<td>Exercise No.1 to 10 x 6 reps x 2 set</td>
<td>5 different movement pattern with cadence of 90 steps per minute for 2 min. duration x 2 sets (10 min. x 2 set)</td>
<td>Callisthenic exercise No.1 to 5 x 6 reps x 2 set 5 different movement pattern with cadence of 90 steps per minute for 2 min. duration x 1 set</td>
</tr>
<tr>
<td>4</td>
<td>Exercise No.1 to 10 x 8 reps x 2 set</td>
<td>5 different movement pattern with cadence of 90 steps per minute for 2 ½ min. duration x 2 sets (12 ½ min X 2 set)</td>
<td>Callisthenic exercise No.1 to 5 x 8 reps x 2 sets 5 different movement pattern with cadence of 90 steps per minute for 2 ½ min. duration x 1 set</td>
</tr>
<tr>
<td>5</td>
<td>Exercise No.1 to 10 x 8 reps x 2 set</td>
<td>5 different movement pattern with cadence of 90 steps per minute for 2 ½ min. duration x 2 sets (12 ½ min X 2 set)</td>
<td>Callisthenic exercise No.1 to 5 x 8 reps x 2 sets 5 different movement pattern with cadence of 90 steps per minute for 2 ½ min. duration x 1 set</td>
</tr>
</tbody>
</table>
### TRAINING PROTOCOL Contd.,

<table>
<thead>
<tr>
<th>Week No</th>
<th>Calisthenics Exercises</th>
<th>Aerobic Exercises</th>
<th>Combination of Calisthenics &amp; Aerobic Exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Exercise No.1 to 10 x 8 reps x 2 set</td>
<td>5 different movement pattern with cadence of 90 steps per minute for 2 ½ min. duration x 2 sets (12 ½ min X 2 set)</td>
<td>Callisthenic exercise No.1 to 5 x 8 reps x 2 sets 5 different movement pattern with cadence of 90 steps per minute for 2 ½ min. duration x 1 set</td>
</tr>
<tr>
<td>7</td>
<td>Exercise No.1 to 10 x 8 reps x 2 set</td>
<td>5 different movement pattern with cadence of 90 steps per minute for 2 ½ min. duration x 2 sets (12 ½ min X 2 set)</td>
<td>Callisthenic exercise No.1 to 5 x 8 reps x 2 sets 5 different movement pattern with cadence of 90 steps per minute for 2 ½ min. duration x 1 set</td>
</tr>
<tr>
<td>8</td>
<td>Exercise No.1 to 10 x 10 reps x 2 set</td>
<td>5 different movement pattern with cadence of 90 steps per minute for 3 min. duration x 2 sets (15 min. x 2 set)</td>
<td>Callisthenic exercise No.1 to 5 x 10 reps x 2 sets 5 different movement pattern with cadence of 90 steps per minute for 3 min. duration x 1 set</td>
</tr>
<tr>
<td>9</td>
<td>Exercise No.1 to 10 x 10 reps x 2 set</td>
<td>5 different movement pattern with cadence of 90 steps per minute for 3 min. duration x 2 sets (15 min. x 2 set)</td>
<td>Callisthenic exercise No.1 to 5 x 10 reps x 2 sets 5 different movement pattern with cadence of 90 steps per minute for 3 min. duration x 1 set</td>
</tr>
<tr>
<td>10</td>
<td>Exercise No.1 to 10 x 10 reps x 2 set</td>
<td>5 different movement pattern with cadence of 90 steps per minute for 3 min. duration x 2 sets (15 min. x 2 set)</td>
<td>Callisthenic exercise No.1 to 5 x 10 reps x 2 sets 5 different movement pattern with cadence of 90 steps per minute for 3 min. duration x 1 set</td>
</tr>
</tbody>
</table>
## TRAINING PROTOCOL Contd.,

<table>
<thead>
<tr>
<th>Week No</th>
<th>Calisthenics Exercises</th>
<th>Aerobic Exercises</th>
<th>Combination of Calisthenics &amp; Aerobic Exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Exercise No.1 to 10 x 10 reps x 2 set</td>
<td>5 different movement pattern with cadence of 90 steps per minute for 3 min. duration x 2 sets (15 min. x 2 set)</td>
<td>Callisthenic exercise No.1 to 5 x 10 reps x 2 sets 5 different movement pattern with cadence of 90 steps per minute for 3 min. duration x 1 set</td>
</tr>
<tr>
<td>12</td>
<td>Exercise No.1 to 10 x 10 reps x 2 set</td>
<td>5 different movement pattern with cadence of 90 steps per minute for 3 min. duration x 2 sets (15 min. x 2 set)</td>
<td>Callisthenic exercise No.1 to 5 x 10 reps x 2 sets 5 different movement pattern with cadence of 90 steps per minute for 3 min. duration x 1 set</td>
</tr>
</tbody>
</table>

After performing each set of calisthenics exercises one minute rest interval was given in between.

For Aerobic Exercise, the movement pattern was changed after every 2 minutes, and continued up to 10 minutes duration for a combination of 5 different movement pattern. After duration of 10 minutes continuous aerobic workout, a five minutes rest interval was given before the commencement of next set of the same duration.

After the third week, the aerobic exercise duration was increased to 12.5 minutes duration continuously for one set. A five minutes break was given in between the set. A total two sets of aerobic exercises were given
up to seventh week. On eight week again the load was increased by increasing the duration up to 15 minutes per set in between a rest interval of five minutes between two sets.

In combination of calisthenics and aerobic exercises protocol, five calisthenics exercises were performed continuously in a series followed by five different movement pattern of aerobic exercises in one set was given as combination of calisthenics and aerobics. Similar progression of load was made every after three weeks of training.

Administration of test

An initial test was conducted for all the subjects before administering the training programme to the experimental groups. After the completion of 12 weeks training programme, the same test battery was repeated on all the subjects as the final test. Prior to the administration of tests, the subjects were given necessary instruction and orientation about the conduct of the test. They were asked to put up their best effort during the test. A brief warm-up was given to the subjects before conducting the test.

1. One mile run/walk test

Purpose: To measure cardio respiratory endurance.

Equipment: Stopwatch

Markings: Standard 400 meters running track.
**Description:** The subjects were asked to line up at the starting point of one mile run on a standard 400 meters running track. Bunch start with a whistle was given to the subjects and they were asked to complete the distance either by run or by walk with minimum possible time.

**Scoring:** Time was taken by each subject to complete one mile was recorded to the nearest one tenth of second.

2. Bent Knee Sit Ups

**Purpose:** To measure muscular endurance.

**Equipment:** Mats and a stopwatch

**Description:** The subjects were asked to take supine lying position on the mat with their knee flexed. A scale was kept in between the calf and hamstring muscles and they were asked to move the feet slowly forward. The position in which the scale fell down was fixed for performing the bent knee sit-ups. From this position the subjects were asked to keep their hands interlocked and placed at back head. The subjects were asked to lift their upper body till they touch their thighs with the chest. A test partner was asked to holds the feet of the test performer to keep in contact with the mat. The subject was to perform as many sit-ups as possible in 60 seconds (**PLATE XVI- A and B**).

**Scoring:** Maximum number of correctly executed sit-ups in 60 seconds was taken as score.
PLATE-XVI: Bent Knee Sit Ups

PLATE-XVI-A: Bent Knee Sit Ups
3. Pull-Ups Test

**Purpose:** To measure arm and shoulder girdle strength.

**Equipment:** Metal or wooden bar approximately 1 1/2 inches in diameter.

**Description:** The subject was asked to hang from the bar using the overhand grip with his legs and arms fully extended. His feet were not allowed to touch the floor. He was asked to pull himself upward until his chin goes over the bar and then to lower his body to a full hand extended position (PLATE-XVII and XVII-A). Subject was asked to repeats the exercise as much time as possible. Only one trial was administered.

**Scoring:** The score was the number of completed pull-ups. While performance, the subject was asked to keep his knees without any flexion and kicking motions, swinging, and snap-up motion were not permitted. Maximum number of full pull ups performed by the subjects was the score of the test.

4. Sit and Reach Test

**Equipment:** Flexomeasurer.

**Purpose:** To measure the development of hip and back flexion as well as extension of hamstring muscles of the leg.

**Description:** A calibrated modified flexomeasurer was used for the purpose of testing flexibility. The subject was asked to sit down in long sitting position and line up heels with the "0" (zero) line marker of the
PLATE XVII: Pull Ups – Initial Position

PLATE XVII-A: Pull Ups
flexomeasurer and slide the seat back beyond the zero end of the
flexomeasurer. Keeping both the knees locked straight, the flexomeasurer
case has been pushed by the subject from the fingertips as far as possible
without any jerk movement (PLATE-XVIII and XVIII-A).

Scoring: The best of three trials measured to the nearest centimeter was
considered as the test score.

5. Body composition

Purpose: To measure body composition through the measurement of
subcutaneous body fat.

Equipment: Impedance body fat percent analyzer (PLATE-XIX).

Description: After updating the body height, weight, age, sex input of
each subject in to the fat analyzer, the subject was asked to hold the body
fat percent analyzer in standing erect position, extending both hands in
front at shoulder height (PLATE-XX).

Scoring: Digital out put on the screen of the body fat analyzer was noted
and which served as the score of each subject.

STATISTICAL TECHNIQUE

The analysis of covariance (ANCOVA) was employed to compare
the significance of difference from pre to post test among the
experimental and control groups followed by post hoc test, wherever the
F-value was found significant. The level of significance chosen was 0.05.
PLATE- XVIII: Flexomeasurer

PLATE- XVIII-A: Sit and Reach Test
PLATE-XIX: OMRON BODY FAT MONITOR

PLATE-XX: Measuring Percent Body Fat using OMRON Body fat Monitor