

CHAPTER – III

METHODOLOGY

3.1 INRODUCTION

In this chapter the selection of subjects, that experimental variables, pilot study, experimental design, training programme, criterion measures, reliability of the data, test administration, collection of data and statistical treatment of data are explained in detail.

3.2 SELECTION OF SUBJECTS

The study was designed to find out the effects of different circuit training with yogic practices on selected motor fitness attributes and physiological variables of school girls students. For the purpose of this investigation the researcher randomly selected sixty school girls student from Presidency girl's higher secondary school, Chennai Egmore, Tamilnadu, India, at random as subjects. Their age was between fifteen to seventeen years.

3.3 EXPERIMENTAL DESIGN

The study was formulated as pre and post test random group design, in which sixty students were divided into four equal groups. The experimental group -1 (n = 15 ESBC-YP) underwent explosive strength based circuit with yogic practices, the experimental group -2 (n=15 SEBC-YP) underwent strength endurance based circuit with yogic practices, the experimental group -3 (n = 15 CES and SEBC-YP) underwent combined explosive strength and strength endurance based circuit with yogic practices and the group -4 served as control group (n = 15 CG) did not undergo any specific training.

3.4 SELECTION OF VARIABLES

Based on the relevant literature reviewed and in accordance with views of professional experts in Physical Education and personal understanding by researcher, the following motor fitness attributes and Physiological variables were selected.

3.4.1 Dependent Variables

“A dependent variable is that condition that is observed and measured that is expected to be affected in some way as a result of the manipulation of independent variable” (Morehouse,1975).

The following motor fitness attributes and physiological variables were selected as dependent variables.

- 1) Speed
- 2) Explosive Power
- 3) Muscular Strength Endurance
- 4) Flexibility
- 5) Resting Pulse Rate
- 6) VO2 max
- 7) Breath holding time

3.4.2 Independent Variables

“Main variable is one under consideration that is manipulated by the researcher with subjects randomly assigned to various groups or testing conditions” (Jenson, 1979). In the study, three different training approaches were adopted as independent variables.

G1- (ESBCYP) Explosive strength based circuit with yogic practices

G2- (SEBC-YP) Strength endurance based circuit with yogic practices

G3- (CES- SEBCYP) Combined explosive strength and strength endurance based circuit with yogic practices

G4- Control group

3.5 CRITERION MEASURES

The following test items as criterion measures. The chosen tests are highly standardized, appropriate and ideal to assess. The criterion variables are briefly explained here:

3.5.1 Speed

The nature of speed was measured by 50 metres dash. The time taken to cover the distance was recorded to the nearest 1/10th seconds.

3.5.2 Explosive power

The explosive power of the subjects was measured by standing broad jump test. The covered distance was recorded in meters.

3.5.3 Muscular Strength endurance

The muscular strength endurance was measured by using modified sit-ups and the performance recorded in numbers.

3.5.4 Flexibility

The flexibility was measured by using sit and reach test and measured in centimeters.

3.5.5 Resting Pulse Rate

Resting pulse rate was measured by using auscultation (bell of the stethoscope) method and counted for 30 seconds and then multiplied by two. The measurement was recorded in beats/minutes.

3.5.6 VO_2 max

VO_2 max was measured by using three minute step test to evaluate the maximum oxygen intake during the recovery period. For that purpose the palpitation method was used and counted for 30 seconds and then multiplied by two to get beats per minute. From this data the VO_2 max was computed in $ml/kg/min^{-1}$.

3.5.7 Breath holding time:

The maximum capacity of the breath holding time was observed and measured by 1/10th seconds.

3.6 ORIENTATION OF SUBJECTS

Before collection of the data, the subjects were oriented about the purpose of the study. The investigator explained the procedure of assessing different methods of circuit training with yogic practices. The subjects had a standard warm-up prior to the test and, during a preliminary visit to the field, they had been familiarized with all the test protocols. The students had experienced these testing procedures several times before the commencement of the experiment.

3.7 INSTRUMENTS RELIABILITY

Instruments such as stethoscope, measuring tape and stop watches and sit and reach box were used for this study. All instruments were in good and working condition. The calibrations were tested and found to be accurate enough to serve the purpose of the study.

3.8 SUBJECTS' RELIABILITY

The subjects' reliability was established by test-retest method. Five subjects were selected in the total populations and they were tested twice by the same tester under similar conditions on each criterion variable. The intra class correlation was used to find out the subjects' reliability with test-retest scores on each criterion variable separately.

3.9 RELIABILITY OF THE DATA

Reliability was established by test and retest process. Test and retest method was followed in order to establish the reliability of the data by using two groups each with five subjects. All the variables selected in the present study were tested twice for the subjects by the same personal under similar conditions. The intra class co-efficient correlation was used to find out the reliability of the data. The reliable value for the selected criterion variables were found as speed (0.91), explosive power (0.92), muscular strength endurance (0.95), resting pulse rate (0.97), $VO_{2\text{ max}}$ (0.91) and breath holding time (0.96) respectively.

3.10 COMPETENCY OF THE TESTER

The investigator learned the procedures and methods to handle and operate the instruments to administer the tests. Measurements were taken by the investigator herself using standard equipment.

3.11 COLLECTION OF THE DATA

The pre and post test data on the selected criterion variables were collected by administering the test as per the standardized procedures at prior and after ten weeks of the training programme.

3.12 ADMINISTRATION OF TEST

The following test items were adopted to test the selected criterion variables and these tests were highly standardised one.

3.12.1 Speed

Purpose: To measure speed of the subjects. **Equipments and Facilities:** Stopwatches, clappers and the distance were marked with 50 meters. **Procedure** The subjects (two at time) stood behind the starting line. On getting signal (the clap), the subjects ran as fast as possible and crossed the finishing line. **Scoring:** The time elapsed between the start and the moment the subject crossed the finish line was recorded to the nearest one-tenth of a second.

3.12.2 Explosive Power

Purpose: To measure explosive power of the Subject. **Equipment:** Measuring Tape, Outdoor, Broad Jump Pit. **Procedure:** The subject was asked to stand with feet apart and toes just behind the take off line. Prior to jumping, the arms are swing backward and the knees bent. The jump is done by extending the knees and swinging the arms forward simultaneously. Measurement is taken from the take off line to the heel or part of the body that touches the floor nearest the take off line. Three trials were permitted in succession. Best performance was taken into account. **Scoring:** The distance of all jumps was measured to the nearest centimeter and the best one was recorded in meters.

3.12.3 Muscular Strength Endurance

Purpose: The purpose of the sit-up test is to measure strength and endurance of abdominal muscles. **Facilities and Equipments:** any large flat area (preferably indoors). A stopwatch and exercise mat or a piece of carpet. **Procedure:** Students are positioned on their backs with legs flexed at the knees, feet flat on the floor, and the heels 12 to 18 inches from the buttocks. The arms should be crossed and in contact with chest with the hands on opposite shoulders. The hands must remain in contact with the shoulders during the complete curl. The head should be tucked (curled) with the chin to chest. A partner holds the feet on the floor and counts the number of correctly executed sit-ups. On the signal to begin, the student's curls to a sitting position until the forearms touch the thigh. One sit-up is complete when the midback makes contact with the testing surface on the down portion. The student is instructed to execute as many sit-ups as possible in 60 seconds. A signal to stop should be given at the end of 60 seconds. **Scoring:** The number of successfully completed sit-ups in one minute is recorded as score.

3.12.4 Flexibility

Purpose: To measure the abdomen, lower back and hamstring musculoskeletal function. **Equipments and Facilities:** The test apparatus consisted of a specially constructed box (30 cm by 30 cm by 53 cm) with a measuring scale where 23 centimetres was at the level of the feet. **Procedure:** The subject was made to sit on the floor with his hips, back and head against a wall, legs fully extended, and the bottom of his feet against the sit- and – reach box. To perform the test, the subject extended the arms forward, with hands placed on top of each other and reached forward as far as possible without letting the hips, back, or head come off the wall. The examiner should then slide the reach indicator touché the tips of the subject's fingers. The subject's head and back came off the wall and he gradually reached forward three times, the third time stretching forward

as far as possible on the indicator (scale), holding the final position for at least two seconds. He was sure that during the test the backs of the knees were kept flat against the floor. Scoring: Four trials were given to each subject. The score was the farthest point reached by the subject and recorded to the nearest centimetre.

3.12.5 Resting Pulse Rate

Purpose: To measure the subjects resting pulse rate. Equipments and Facilities: Stethoscope and stop watch. Procedure: The resting heart rate of each subject was recorded early morning after the subject got out of bed and sat at rest comfortably in a chair for few minutes. The resting heart rate was obtained through auscultation i.e., using the bell of the stethoscope placed to the left of the sternum just above the level of the nipple. Then the stop watch was started with the heart beat. The subject counted the first beat as zero and continued counting for 30 seconds. This procedure was repeated on three separate mornings. Scoring: Resting heart of the subject was recorded on three successive mornings. The average of the three recordings was arrived at and recorded as the subject's resting heart rate. The unit of measurement was initially taken for 30 seconds and the beats per minute of the subjects were calculated by doubling the number of beats to arrive at per minute calculation. (Nieman, 1995).

3.12.6 VO₂ max

Purpose: To measure the VO₂ max. Equipments and Facilities: A bench 40cm high. Procedure: The subjects were asked to perform to a four – step cadence (up-up-down-down) and then begin the test and perform the step-ups for exactly three minutes. After completion of the three minutes the subjects remained standing and took the pulse rate for a fifteen second interval, from five to twenty seconds into recovery. The pulse rate was converted to recovery pulse rate to beats per minute. That is, the pulse rate was

multiplied by four. The following formula was used to find out the Maximal oxygen consumption. $111.33 - (0.47 \times \text{Recovery pulse rate in beats per minute})$.

3.12.7 Breath Holding Time

Purpose: To measure the ability of the subjects to hold the breath for longer time.
Equipments and Facilities: Stop watch with calibration of 1/10 second. **Procedure:** The subject stood at ease and inhaled deeply after which he held his breath for a length of time possible to him. The index finger of the respondent served as an indicator for the investigator to know the start and end of the recording time. The thumb and centre fingers were used to hold the nose to avoid letting the air through the nostrils. The subjects were requested not to let the air out by opening the mouth while recording the breath holding time. **Scoring:** The time of holding the breath till the subject let the air out was recorded by using stopwatch, to the nearest one-tenth of a second as breath holding time (Astrand and Rodhal, 2003).

3.13 YOGIC PRACTICES USED IN THIS STUDY (ASANAS , PARNAYAMA AND MUDRA)

The following asanas, pranayama and mudra were used for the practical use of this study.

3.13.1 Surya Namaskar - The Sun Salutation.

Surya Namaskar or the Sun Salutation is considered the 'king' of asana practice. It is a beautiful weave of the physical, emotional/psychological, spiritual aspects of our being. It comprises 12 vital postures that work on the spine and the major muscles of the body to give strength and flexibility. When combined with appropriate breathing, it works on the deeper physiology of the body, the very endocrine system, whose synchronised functioning is responsible for the health of our body and emotions.

12-Steps

1. Girls students were asked to stand erect with feet together and palms in the prayer position in front of their chest. The investigator made sure that their weights were evenly distributed. (Exhaled).
2. They were asked to stretch their arms up and arch back from the waist, push their hips out, legs straight and their necks in relaxed position. (Inhaled).
3. The subjects were made to push their trunk forward, and were asked to press their palms down, fingertips in line with toes. (They could bend their knees if necessary.) (Exhaled).
4. They were asked to bring the right (or left) leg back and place the knee on the floor. Then they arched their back and looked up, with chin lifted. (Inhaled).
5. The breath was retained by them in this stage and they brought the other leg back and supported their weights on hands and toes. They kept their head and body in line and looked at the floor between their hands.
6. In this stage they lowered their knees, chest and forehead, kept their hips up and toes curled under. (Exhaled).
7. Then they lowered the hips, pointed toes and bent back. They kept legs together and shoulders down, and then looked up and back. (Inhaled).
8. In this stage they curled their toes under, raised their hips and pivot into an inverted "V" shape. They tried to push the heels and head down by shoulders back. (Exhaled).

9. Next they stepped forward and placed the right (or left) foot between the hands. Rested the other knee on the floor and looked up, as in position 4. (Inhaled).
10. Then they were asked to bring the other leg forward and bend down from the waist and kept the palms as in position 3. (Exhaled).
11. They were asked to stretched their arms forward, then up and back over the head and bend back slowly from the waist, as in position 2. (Inhaled).
12. Finally they came back to an upright position and dropped their arms down by their side. (Exhaled).

3.13.2 Asanas

In this study the following asanas, pranayama and mudra were selected and incorporated in the training programme along with different circuit training.

3.13.3 Paschimottasanam

Sit on the floor, leg stretched forward and together. Claps the hands rise above the head. Bend forward; grasp the big toes, elbows touching the floor. Touch the knees with forehead keep the asana position for a comfortable period of the time and observe the breath. Raise the hand and head and lower the hands. Relax

3.13.4 Vajra asanam

Kneel on the floor, sit over soles of the feet or onto the inside curved surface. Let thumb fingers of the feet touch each other. The beginners can support with a pillow under the ankles. The thighs must be parallel. The head neck and back can be straight but not tensed. Keep the hands-on the lap, palms facing down.

3.13.5 Dhanurasanam

Lie flat on the stomach with legs and feet together, hands by the side of the body. Bend the knees, raise the leg and clasp the ankles with hands. Lift the thighs at the back, raise chest and head an arch on the back. Keep the arms straight tilt the head backward. Let the abdomen alone is the floor supporting the entire body.

3.13.6 Navasanam

Lie down, facing upward, leg straight, hands by the side of your body. Raise the legs together one from the ground, raise the body also to the same height, and stretch the hands sideways to the knees. Keeps eyes sight straight, balance the position, expecting the buttocks all the body is raised to shape like boat.

3.13.7 Bhujangasanam

Lie on your chest with palm down to the sides of the shoulders; stretch the legs and feet straight and together. Let chin rest on the floor. Raise the head, neck, shoulders and trunk up to the pubic bone. Use the back muscles than the arm muscles. Support the arm muscles to lift the trunk and arc back. Raise and lift the head up and backward.

3.13.8 Vipareetha karani

Lie flat on the back, with legs stretched, arms by the side. Raise both the legs, straight and together, along with hip and back. Support the hip and buttocks with the hands, elbows on the floor. The trunk 45 degree angle from the floor, legs are vertical.

3.13.9 Bhastrika Pranayama

The students were asked to be seated in comfortable sitting posture (sukasanam). They were asked to breathe in by inhaling forcefully through both the nostrils, so that their lungs were fully filled with air. And then they were made to exhale

forcefully through both the nostrils without any holding in-between. Thus they successfully completed Bhastrika pranayama.

3.13.10 Chin Mudra or Gyan Mudra

The students were asked to be seated in comfortable sitting posture (sukasanam). Both the hands were used to practice this gesture. They made a circle by joining their thumb and forefinger. They placed the nail of their index finger against the soft pad of the thumb by extending the last three fingers of their hands; the palm-side facing upward. They were made to place their hands on their knees to stimulate the “Nadi”.

3.14 TRAINING GUIDELINES (ACSM)

3.14.1 Intensity

Exercise intensity dictates the specific physiological and metabolic changes in the body during exercise training. Exercise prescription depends on the subjects program goals; age, capabilities, preferences, and fitness level and should stress, but not overtax, the cardiopulmonary and musculoskeletal system.

3.14.2 Duration

Duration and intensity of exercise are inversely related, the higher the intensity, the shorter the duration of the exercise. Exercise duration depends not only on the intensity of exercise but also on the subject’s health status, initial fitness level, functional capability, and program goals. For improved health benefits, the American College of Sports Medicine (ACSM) and the American Heart Association (Nelson et al. 2007) recommend that every individual accumulate, 150 min / wk or more of moderate – intensity aerobic exercise. This amount of physical activity can be achieved in either one continuous bout (30 min) of exercise on each of 5 days or in multiple bouts of shorter duration throughout the day (e.g. 10 min bouts, three times a day) depending on the

subject's functional capacity and time constraints. ACSM (2010) recommends increasing exercise duration, rather than intensity, in the initial stages of the exercise program. For most subjects, the duration of aerobic, resistance, and flexibility exercise workouts should not exceed 60 min. This will lessen the chance of overuse injuries and exercise "Burnout"

3.14.3 Frequency

Frequency typically refers to the total number of weekly exercise sessions. Research shows that exercising 5 days a week is sufficient to improve various components of physical fitness. However, frequency is related to the duration and intensity of exercise and varies depending on the subject's program goals and preferences. Sedentary subjects with poor initial fitness levels may exercise more than once a day. When improved health is the primary goal of the exercise program. ACSM and the American Heart Association (AHA) recommend either 3 days/wk of vigorous – intensity exercise or 5 days / wk of moderate – intensity exercise.

3.14.4 Progression of Exercise

Throughout the exercise program, physiological and metabolic changes enable the individual to perform more work. For continued improvements the cardiopulmonary and musculoskeletal systems, must be progressively overloaded through periodic increases in the frequency intensity, and duration, of the exercise.

3.14.5 Pilot Study

Pilot study was conducted to assess the initial capacity of the subjects to fix the load and to design the training program. 15 subjects were selected at random and they were divided into 3 groups of 5 subjects each. Group 1 explosive strength based circuit with yogic practices (ESBC-YP); group 2, strength endurance based circuit with yogic

practices (SEBC-YP) and group 3, combined explosive strength and strength endurance based circuit with yogic practices (CES and SEBC-YP) for 5 sessions. The initial load of the subjects was fixed and the training programme for selected training was designed separately based on the performance in the pilot study. While constructing the training programme the basic principles of sports training were followed.

3.15 TRAINING APPROACHES OF THE PRESENT STUDY

3.15 Training approaches of the present study

The selected training programmes were accomplished by the different training groups. The group one, underwent explosive strength based circuit with yogic practices, group two, underwent strength endurance based circuit with yogic practices and group three underwent combined explosive strength and strength endurance based circuit with yogic practices for the period of 10 weeks in three alternative days. The total duration of the training programme was 60 to 75 minutes in a day. No students were reported any type of injury while perform the training programme. The entire training group performs the selected yogic practices after completion of the circuit training. The selected circuit trainings groups received the same amount of load for 1 to 3, 4 to 5, 6 to 9 and 10th week, along with the respective yogic practices. The entire trainings group performs the 8 station circuit with three sets. The difference for group 1 and 2 mentioned here. The group 1 underwent the explosive strength based circuit with yogic practices. During their training the subjects were allowed for recovery period of 30 seconds in between each station, but in the case of group 2, i.e, strength endurance based circuit with yogic practices was not allowed to take the rest in between the each station. They perform complete circuit without the rest period. This approach was adapted to entire training

durations by the researcher. As far as the experimental group 3 is concern they perform combined explosive strength and strength endurance based circuit with yogic practices.

During their programme the subjects undergo first 4 stations of circuit with rest period in between 30 seconds, but they won't allow for take the rest in-between the station of last four station. **Note:** While perform the selected circuit with yogic practices, the load, number of circuit, duration of each circuit, the selected circuit exercises, the selected asanas, pranayama, and mudra common for all the training groups. After finish the circuit training ten minutes allow to the subjects to take rest, for perform yogic practices.

3.15.1 Training programme for group -1

Explosive strength based circuit with yogic practices (ESBCYP) 1 to 3rd weeks

Days	Exercise	Duration	Sets	Rec. In between sets
Monday Wednesday Friday	Half squats Push-ups Bent –knee sit-ups Two-legged low hops on the spot Back extensions Pull-ups Burpees Shuttle run	Each exercises 20 sec	Three	Three minutes

- Repetitions** : As Many As Possible In 20seconds
- Rest** : 30 Seconds
- Stations/Circuit** : 8 Exercise Station – Clock Wise Order
- Time/Circuit** : 2minutes and 40 Seconds
- Circuits/Session** : 3
- Time/Session** : 8 Minutes
- Frequency** : 3 Days/Week
- Load of the Week** : 24 Minutes
- Recovery In Between Circuits:** 3 Minuets

Yogic practices - for 1 to 3rd weeks

The selected asanas were performed by the subjects after completion of the circuit training programme. For 1-3 weeks, the subjects underwent the selected asanas ,pranayama and mudra as per the training programme was given below. The final posture was held up to 20 sec in each asanas. Totally three sets were given in each asanas and the recovery in between the set was 3min. The simple pranayama was selected and performed by the subjects for 1 min of 2 sets. The recovery period in between the pranayama was 1 min. Then they performed mudra for 3 mins continuously with 1 set. The rest period was asanas to pranayama was 2 min, and pranayama to mudra was 2 min.

Activities	Duration	Sets	Recovery In between set
Suryanamaskar (12 steps)	3 min	2	2min
Asanas			
Pachimottaasana	20 Sec	3	3 min
Vajrasana	20 Sec		
Dhanurasana	20 Sec		
Navasana	20 Sec		
Bhujangasana	20 Sec		
Vipareethakarani	20 Sec		
			2 min
Pranayama			
Bhastrika	1 min	2	1 min
			2 min
Mudra			
Chin or Gyan	3min	1	-

Training programme for group -1

Explosive strength based circuit with yogic practices (ESBCYP) 4 to 6th weeks

Days	Exercise	Duration	Sets	Rec. In between sets
Monday	Half squats	Each exercises 30 sec	Three	Three minutes
Wednesday	Push-ups			
Friday	Bent –knee sit-ups			
	Two-legged low hops on the spot			
	Back extensions			
	Pull-ups			
	Burpees			
	Shuttle run			

Repetitions : As Many As Possible In 30seconds

Rest : 30 Seconds

Stations/Circuit : 8 Exercise Station – Clock Wise Order

Time/Circuit : 4minutes

Circuits/Session : 3

Time/Session : 12 Minutes

Frequency : 3 Days/Week

Load of the Week : 36 Minutes

Recovery In Between Circuits : 3 Minuets

Yogic practice (asana, pranayama and mudras) for 4 to 6th weeks

The selected asanas were performed by the subjects after completion of the circuit training programme. For 4-6 weeks, the subjects underwent the selected asanas ,pranayama and mudra as per the training programme was given below. The final posture was held up to 30 sec in each asanas. Totally three sets were given in each asanas and the recovery in between the set was 3min. The simple pranayama was selected and performed by the subjects for 1 min of 2 sets. The recovery period in between the pranayama was 1 min. Then they performed mudra for 3 mins continuously with 1 set. The rest period was asanas to pranayama was 2 min, and pranayama to mudra was 2 min.

Activities	Duration	Sets	Recovery In between set
Suryanamaskar (12 steps)	3 min	2	2min
Asanas			
Pachimottaasana	30 Sec	3	3 min
Vajrasana	30 Sec		
Dhanurasana	30 Sec		
Navasana	30 Sec		
Bhujangasana	30 Sec		
Vipareethakarani	30 Sec		
			2 min
Pranayama			
Bhastrika	1 min	2	1 min
			2 min
Mudra			
Chin or Gyan	3min	1	-

Training programme for Group -1

Explosive strength based circuit with yogic practices (ESBCYP) 7to 9th weeks

Days	Exercise	Duration	Sets	Rec. In between sets
Monday Wednesday Friday	Half squats Push-ups Bent –knee sit-ups Two-legged low hops on the spot Back extensions Pull-ups Burpees Shuttle run	Each exercises 40 sec	Three	Three minutes

- Repetitions** : As Many As Possible In 40seconds
- Rest** : 30 Seconds
- Stations/Circuit** : 8 Exercise Station – Clock Wise Order
- Time/Circuit** : 5minutes and 20 Sec
- Circuits/Session** : 3
- Time/Session** : 16minutes
- Frequency** : 3 Days/Week
- Load of the Week** : 48 Minutes
- Recovery In Between Circuits:** 3 Minuets

Yogic practice (asana, pranayama and mudras) for 7 to 9th weeks

The selected asanas were performed by the subjects after completion of the circuit training programme. For 7-9 weeks, the subjects underwent the selected asanas ,pranayama and mudra as per the training programme was given below. The final posture was held up to 40 sec in each asanas. Totally three sets were given in each asanas and the recovery in between the set was 3min. The simple pranayama was selected and performed by the subjects for 1 min of 2 sets. The recovery period in between the pranayama was 1 min. Then they performed mudra for 3 mins continuously with 1 set. The rest period was asanas to pranayama was 2 min, and pranayama to mudra was 2 min.

Activities	Duration	Sets	Recovery In between set
Suryanamaskar (12 steps)	3 min	2	2min
Asanas			
Pachimottaasana	40 Sec	3	3 min
Vajrasana	40 Sec		
Dhanurasana	40 Sec		
Navasana	40 Sec		
Bhujangasana	40 Sec		
Vipareethakarani	40 Sec		
			2 min
Pranayama			
Bhastrika	1 min	2	1 min
			2 min
Mudra			
Chin or Gyan	3min	1	-

Training programme for group -1

Explosive strength based circuit with yogic practices (ESBCYP) 10th week.

Days	Exercise	Duration	Sets	Rec. In between sets
Monday	Half squats	Each exercises 20 sec	Three	Three minutes
Wednesday	Push-ups			
Friday	Bent –knee sit-ups			
	Two-legged low hops on the spot			
	Back extensions			
	Pull-ups			
	Burpees			
	Shuttle run			

- Repetitions** : As Many As Possible In 20seconds
- Rest** : 30 Seconds
- Stations/Circuit** : 8 Exercise Station – Clock Wise Order
- Time/Circuit** : 2 Minutes and 40 Seconds
- Circuits/Session** : 3
- Time/Session** : 8 Minutes
- Frequency** : 3 Days/Week
- Load of the Week** : 24 Minutes
- Recovery In Between Circuits:** 3 Minuets

Yogic practice (asana, pranayama and mudras) for 10th week

The selected asanas were performed by the subjects after completion of the circuit training programme. For 10 week, the subjects underwent the selected asanas ,pranayama and mudra as per the training programme was given below. The final posture was held up to 20 sec in each asanas. Totally three sets were given in each asanas and the recovery in between the set was 3min. The simple pranayama was selected and performed by the subjects for 1 min of 2 sets. The recovery period in between the pranayama was 1 min. Then they performed mudra for 3 mins continuously with 1 set. The rest period was asanas to pranayama was 2 min, and pranayama to mudra was 2 min.

Activities	Duration	Sets	Recovery In between set
Suryanamaskar (12 steps)	3 min	2	2min
Asanas			
Pachimottaasana	20 Sec	3	3 min
Vajrasana	20 Sec		
Dhanurasana	20 Sec		
Navasana	20 Sec		
Bhujangasana	20 Sec		
Vipareethakarani	20 Sec		
			2 min
Pranayama			
Bhastrika	1 min	2	1 min
			2 min
Mudra			
Chin or Gyan	3min	1	-

Training programme for group -2

Strength Endurance based circuit with yogic practices (SEBCYP) 1 to 3rd weeks

Days	Exercise	Duration	Sets	Rec. In between sets
Monday Wednesday Friday	Half squats Push-ups Bent –knee sit-ups Two-legged low hops on the spot Back extensions Pull-ups Burpees Shuttle run	Each exercises 20 sec	Three	Three minutes

Repetitions : As Many As Possible In 20seconds

Rest : Nil

Stations/Circuit : 8 Exercise Station – Clock Wise Order

Time/Circuit : 2minutes and 40 Seconds

Circuits/Session : 3

Time/Session : 8 Minutes

Frequency : 3 Days/Week

Load of the Week : 24 Minutes

Recovery In Between Circuits: 3 Minuets

Yogic practices - for 1 to 3rd weeks

The selected asanas were performed by the subjects after completion of the circuit training programme. For 1-3 weeks, the subjects underwent the selected asanas ,pranayama and mudra as per the training programme was given below. The final posture was held up to 20 sec in each asanas. Totally three sets were given in each asanas and the recovery in between the set was 3min. The simple pranayama was selected and performed by the subjects for 1 min of 2 sets. The recovery period in between the pranayama was 1 min. Then they performed mudra for 3 mins continuously with 1 set. The rest period was asanas to pranayama was 2 min, and pranayama to mudra was 2 min.

Activities	Duration	Sets	Recovery In between set
Suryanamaskar (12 steps)	3 min	2	2min
Asanas			
Pachimottaasana	20 Sec	3	3 min
Vajrasana	20 Sec		
Dhanurasana	20 Sec		
Navasana	20 Sec		
Bhujangasana	20 Sec		
Vipareethakarani	20 Sec		
			2 min
Pranayama			
Bhastrika	1 min	2	1 min
			2 min
Mudra			
Chin or Gyan	3min	1	-

Training programme for group -2

Strength Endurance based circuit with yogic practices (SEBCYP) 4 to 6th weeks

Days	Exercise	Duration	Sets	Rec. In between sets
Monday	Half squats	Each exercises 30 sec	Three	Three minutes
Wednesday	Push-ups			
Friday	Bent –knee sit-ups			
	Two-legged low hops on the spot			
	Back extensions			
	Pull-ups			
	Burpees			
	Shuttle run			

- Repetitions** : As Many As Possible In 30seconds
- Rest** : Nil
- Stations/Circuit** : 8 Exercise Station – Clock Wise Order
- Time/Circuit** : 4minutes
- Circuits/Session** : 3
- Time/Session** : 12 Minutes
- Frequency** : 3 Days/Week
- Load of the Week** : 36 Minutes
- Recovery In Between Circuits** : 3 Minuets

Yogic practice (asana, pranayama and mudras) for 4 to 6th weeks

The selected asanas were performed by the subjects after completion of the circuit training programme. For 4-6 weeks, the subjects underwent the selected asanas ,pranayama and mudra as per the training programme was given below. The final posture was held up to 30 sec in each asanas. Totally three sets were given in each asanas and the recovery in between the set was 3min. The simple pranayama was selected and performed by the subjects for 1 min of 2 sets. The recovery period in between the pranayama was 1 min. Then they performed mudra for 3 mins continuously with 1 set. The rest period was asanas to pranayama was 2 min, and pranayama to mudra was 2 min.

Activities	Duration	Sets	Recovery In between set
Suryanamaskar (12 steps)	3 min	2	2min
Asanas			
Pachimottaasana	30 Sec	3	3 min
Vajrasana	30 Sec		
Dhanurasana	30 Sec		
Navasana	30 Sec		
Bhujangasana	30 Sec		
Vipareethakarani	30 Sec		
			2 min
Pranayama			
Bhastrika	1 min	2	1 min
			2 min
Mudra			
Chin or Gyan	3min	1	-

Training programme for group -2

Strength Endurance based circuit with yogic practices (SEBCYP) 7 to 9th weeks

Days	Exercise	Duration	Sets	Rec. In between sets
Monday	Half squats	Each exercises 40 sec	Three	Three minutes
Wednesday	Push-ups			
Friday	Bent –knee sit-ups			
	Two-legged low hops on the spot			
	Back extensions			
	Pull-ups			
	Burpees			
	Shuttle run			

- Repetitions** : As Many As Possible In 40seconds
- Rest** : Nil
- Stations/Circuit** : 8 Exercise Station – Clock Wise Order
- Time/Circuit** : 5minutes and 20 Sec
- Circuits/Session** : 3
- Time/Session** : 16minutes
- Frequency** : 3 Days/Week
- Load Of The Week** : 48 Minutes
- Recovery In Between Circuits:** 3 Minuets

Yogic practice (asana, pranayama and mudras) for 7 to 9th weeks

The selected asanas were performed by the subjects after completion of the circuit training programme. For 7-9 weeks, the subjects underwent the selected asanas ,pranayama and mudra as per the training programme was given below. The final posture was held up to 40 sec in each asanas. Totally three sets were given in each asanas and the recovery in between the set was 3min. The simple pranayama was selected and performed by the subjects for 1 min of 2 sets. The recovery period in between the pranayama was 1 min. Then they performed mudra for 3 mins continuously with 1 set. The rest period was asanas to pranayama was 2 min, and pranayama to mudra was 2 min.

Activities	Duration	Sets	Recovery In between set
Suryanamaskar (12 steps)	3 min	2	2min
Asanas			
Pachimottaasana	40 Sec	3	3 min
Vajrasana	40 Sec		
Dhanurasana	40 Sec		
Navasana	40 Sec		
Bhujangasana	40 Sec		
Vipareethakarani	40 Sec		
			2 min
Pranayama			
Bhastrika	1 min	2	1 min
			2 min
Mudra			
Chin or Gyan	3min	1	-

Training programme for group -2

Strength Endurance based circuit with yogic practices (SEBCYP) 10th week.

Days	Exercise	Duration	Sets	Rec. In between sets
Monday	Half squats	Each exercises 20 sec	Three	Three minutes
Wednesday	Push-ups			
Friday	Bent –knee sit-ups			
	Two-legged low hops on the spot			
	Back extensions			
	Pull-ups			
	Burpees			
	Shuttle run			

- Repetitions** : As Many As Possible In 20seconds
- Rest** : Nil
- Stations/Circuit** : 8 Exercise Station – Clock Wise Order
- Time/Circuit** : 2 Minutes and 40 Seconds
- Circuits/Session** : 3
- Time/Session** : 8 Minutes
- Frequency** : 3 Days/Week
- Load of the Week** : 24 Minutes
- Recovery In Between Circuits:** 3 Minuets

Yogic practice (asana, pranayama and mudras) for 10th week

The selected asanas were performed by the subjects after completion of the circuit training programme. For 10 week, the subjects underwent the selected asanas ,pranayama and mudra as per the training programme was given below. The final posture was held up to 20 sec in each asanas. Totally three sets were given in each asanas and the recovery in between the set was 3min. The simple pranayama was selected and performed by the subjects for 1 min of 2 sets. The recovery period in between the pranayama was 1 min. Then they performed mudra for 3 mins continuously with 1 set. The rest period was asanas to pranayama was 2 min, and pranayama to mudra was 2 min.

Activities	Duration	Sets	Recovery In between set
Suryanamaskar (12 steps)	3 min	2	2min
Asanas			
Pachimottaasana	20 Sec	3	3 min
Vajrasana	20 Sec		
Dhanurasana	20 Sec		
Navasana	20 Sec		
Bhujangasana	20 Sec		
Vipareethakarani	20 Sec		
			2 min
Pranayama			
Bhastrika	1 min	2	1 min
			2 min
Mudra			
Chin or Gyan	3min	1	-

Training programme for group -3

Combined explosive strength and strength endurance based circuit with yogic practices (CES and SEBCYP) 1 to 3rd weeks

Days	Exercise	Duration	Sets	Rec. In between sets
Monday	Half squats	Each exercises 20 sec	Three	Three minutes
Wednesday	Push-ups			
Friday	Bent –knee sit-ups			
	Two-legged low hops on the spot			
	Back extensions			
	Pull-ups			
	Burpees			
	Shuttle run			

Repetitions : As Many As Possible In 20seconds

Rest : 30 seconds rest for in between stations 1 to 4.
No rest in between stations 5 to 8.

Stations/Circuit : 8 Exercise Station – Clock Wise Order

Time/Circuit : 2minutes and 40 Seconds

Circuits/Session : 3

Time/Session : 8 Minutes

Frequency : **3 Days/Week**

Load of the Week : **24 Minutes**

Recovery In Between Circuits: 3 Minuets

Yogic practices - for 1 to 3rd weeks

The selected asanas were performed by the subjects after completion of the circuit training programme. For 1-3 weeks, the subjects underwent the selected asanas ,pranayama and mudra as per the training programme was given below. The final posture was held up to 20 sec in each asanas. Totally three sets were given in each asanas and the recovery in between the set was 3min. The simple pranayama was selected and performed by the subjects for 1 min of 2 sets. The recovery period in between the pranayama was 1 min. Then they performed mudra for 3 mins continuously with 1 set. The rest period was asanas to pranayama was 2 min, and pranayama to mudra was 2 min.

Activities	Duration	Sets	Recovery In between set
Suryanamaskar (12 steps)	3 min	2	2min
Asanas			
Pachimottaasana	20 Sec	3	3 min
Vajrasana	20 Sec		
Dhanurasana	20 Sec		
Navasana	20 Sec		
Bhujangasana	20 Sec		
Vipareethakarani	20 Sec		
			2 min
Pranayama			
Bhastrika	1 min	2	1 min
			2 min
Mudra			
Chin or Gyan	3min	1	-

Training Programme for Group -3

Combined explosive strength and strength endurance based circuit with yogic practices (CES and SEBCYP) 4 to 6th weeks

Days	Exercise	Duration	Sets	Rec. In between sets
Monday	Half squats	Each exercises 30 sec	Three	Three minutes
Wednesday	Push-ups			
Friday	Bent –knee sit-ups			
	Two-legged low hops on the spot			
	Back extensions			
	Pull-ups			
	Burpees			
	Shuttle run			

- Repetitions** : As Many As Possible In 30seconds
- Rest** : 30 seconds rest for in between stations 1 to 4.
No rest for in between stations of 5 to 8.
- Stations/Circuit** : 8 Exercise Station – Clock Wise Order
- Time/Circuit** : 4minutes
- Circuits/Session** : 3
- Time/Session** : 12 Minutes
- Frequency** : 3 Days/Week
- Load of the Week** : 36 Minutes
- Recovery In Between Circuits** : 3 Minuets

Yogic practice (asana, pranayama and mudras) for 4 to 6th weeks

The selected asanas were performed by the subjects after completion of the circuit training programme. For 4-6 weeks, the subjects underwent the selected asanas ,pranayama and mudra as per the training programme was given below. The final posture was held up to 30 sec in each asanas. Totally three sets were given in each asanas and the recovery in between the set was 3min. The simple pranayama was selected and performed by the subjects for 1 min of 2 sets. The recovery period in between the pranayama was 1 min. Then they performed mudra for 3 mins continuously with 1 set. The rest period was asanas to pranayama was 2 min, and pranayama to mudra was 2 min.

Activities	Duration	Sets	Recovery In between set
Suryanamaskar (12 steps)	3 min	2	2min
Asanas			
Pachimottaasana	30 Sec	3	3 min
Vajrasana	30 Sec		
Dhanurasana	30 Sec		
Navasana	30 Sec		
Bhujangasana	30 Sec		
Vipareethakarani	30 Sec		
			2 min
Pranayama			
Bhastrika	1 min	2	1 min
			2 min
Mudra			
Chin or Gyan	3min	1	-

Training programme for Group -3

Combined explosive strength and strength endurance based circuit with yogic practices (CES and SEBCYP) 7to 9th weeks

Days	Exercise	Duration	Sets	Rec. In between sets
Monday	Half squats	Each exercises 40 sec	Three	Three minutes
Wednesday	Push-ups			
Friday	Bent –knee sit-ups			
	Two-legged low hops on the spot			
	Back extensions			
	Pull-ups			
	Burpees			
	Shuttle run			

- Repetitions** : As Many As Possible In 40seconds
- Rest** : 30 seconds rest for in between stations 1 to 4.
No rest for in between stations of 5 to 8.
- Stations/Circuit** : 8 Exercise Station – Clock Wise Order
- Time/Circuit** : 5minutes and 20 Sec
- Circuits/Session** : 3
- Time/Session** : 16minutes
- Frequency** : 3 Days/Week
- Load of the Week** : 48 Minutes
- Recovery In Between Circuits:** 3 Minuets

Yogic practice (asana, pranayama and mudras) for 7 to 9th weeks

The selected asanas were performed by the subjects after completion of the circuit training programme. For 7-9 weeks, the subjects underwent the selected asanas ,pranayama and mudra as per the training programme was given below. The final posture was held up to 40 sec in each asanas. Totally three sets were given in each asanas and the recovery in between the set was 3min. The simple pranayama was selected and performed by the subjects for 1 min of 2 sets. The recovery period in between the pranayama was 1 min. Then they performed mudra for 3 mins continuously with 1 set. The rest period was asanas to pranayama was 2 min, and pranayama to mudra was 2 min.

Activities	Duration	Sets	Recovery In between set
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Asanas			
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Vajrasana	40 Sec		
Dhanurasana	40 Sec		
Navasana	40 Sec		
Bhujangasana	40 Sec		
Vipareethakarani	40 Sec		
			2 min
Pranayama			
Bhastrika	1 min	2	1 min
			2 min
Mudra			
Chin or Gyan	3min	1	-

Training Programme for Group -3

Combined explosive strength and strength endurance based circuit with yogic practices (CES and SEBCYP) 10th week.

Days	Exercise	Duration	Sets	Rec. In between sets
Monday Wednesday Friday	Half squats Push-ups Bent –knee sit-ups Two-legged low hops on the spot Back extensions Pull-ups Burpees Shuttle run	Each exercises 20 sec	Three	Three minutes

Repetitions : As Many As Possible In 20seconds

Rest : 30 seconds rest for in between stations 1 to 4.
No rest for in between stations of 5 to 8.

Stations/Circuit : 8 Exercise Station – Clock Wise Order

Time/Circuit : 2 Minutes and 40 Seconds

Circuits/Session : 3

Time/Session : 8 Minutes

Frequency : 3 Days/Week

Load of the Week : 24 Minutes

Recovery In Between Circuits: 3 Minuets

Yogic practice (asana, pranayama and mudras) for 10th Week

The selected asanas were performed by the subjects after completion of the circuit training programme. For 10 week, the subjects underwent the selected asanas ,pranayama and mudra as per the training programme was given below. The final posture was held up to 20 sec in each asanas. Totally three sets were given in each asanas and the recovery in between the set was 3min. The simple pranayama was selected and performed by the subjects for 1 min of 2 sets. The recovery period in between the pranayama was 1 min. Then they performed mudra for 3 mins continuously with 1 set. The rest period was asanas to pranayama was 2 min, and pranayama to mudra was 2 min.

Activities	Duration	Sets	Recovery In between set
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Vajrasana	20 Sec		
Dhanurasana	20 Sec		
Navasana	20 Sec		
Bhujangasana	20 Sec		
Vipareethakarani	20 Sec		
			2 min
Pranayama			
Bhastrika	1 min	2	1 min
			2 min
Mudra			
Chin or Gyan	3min	1	-

3.16. STATISTICAL APPLICATIONS

The pre and post - test random group design was used as experimental design in which sixty school girls were selected as subjects. The selected subjects were divided into four groups of fifteen subjects each. Ancova was used to find out significant adjusted post - test mean difference of four groups with respect to each parameter and Scheffe's post hoc test was used to find out pair-wise comparisons between groups with respect to each parameter.