CHAPTER III

METHODOLOGY

The present study was conducted with a view to assess the efficacy of plyometric exercise training followed by yoga practices on specific physical fitness and sprinting performance among elite athletes. The methodology followed to conduct this scientific experiment has been presented below.

3.1 Research Design

This is a true experimental design with four parallel groups of elite male athletes, who were treated with three specialized training interventions for a total duration of eight weeks.

The Experiment

(a) Sampling

Eighty elite male athletes, age: 14-18 yrs., were selected as sample for the experimental study. For this, a purposive sampling technique was used to locate the elite sprinters from Thane District. Further, the sample subjects were assigned into four equal groups at random, viz., three experimental groups (Group I: \( n_1 = 20 \)); Group II: \( n_2 = 20 \); Group III: \( n_3 = 20 \)) and one control group (Group IV: \( n_4 = 20 \)). The researcher made sure that the entire subjects were ready to go through the experimental requirements.

Inclusion and Exclusion Criteria

- Male students aged 14 to 18 years were included.

- The subjects who agreed to sincerely attend the training programme were included in the study.
The subjects were examined by a physician to find out any health complications prior to study. Those who are having health complaints were excluded from the study.

**Drop outs**

It is important to note that 1 subject from group-II, 2 subjects from Group-III and 4 subjects from Group-IV were irregular in the experiment. Thus, total 7 subjects were dropped out from the experiment.

**(b) Allotment of training interventions and Phases of Experiment**

Group I received specially designed Yoga training, Group II received Plyometric exercise, Group III underwent Plyometric exercise plus yoga training while Group IV was treated as control. Further, sprint training was also administered to all the subjects of the four groups. The design of the experiment has been planned in three phases:

- Stage – I: Pretest.
- Stage – II: Training or Treatment, and
- Stage – III: Post test.

**Pre – Test (phase – I)**

All the subjects of experimental and control groups were assessed with the selected physical fitness variables and performance in four sprint events to record pre-test data.

**Treatment stimuli (phase – II)**

After the pre test was over, while all the subject of Group I, Group II and Group III underwent respective training, the Group IV was engaged in some recreational activities, library reading etc during the period of
experiment. All the training and treatment interventions were equated with 1 hour in the morning except Sunday and holidays for total period of eight weeks.

Thus, four groups involved in this experiment are as follows:

- Group I – Yoga
- Group II – Plyometric exercise
- Group III – Plyometric exercise + Yoga
- Group IV – Control

One yoga teacher and one expert in plyometric exercise were appointed to organize daily training programmes under the overall supervision of the present investigator for a total period of eight weeks.

Post test (phase III)

Finally, when the treatment or training period of eight weeks was over, all the subjects of experimental and control groups were assessed for the selected physical fitness and sprint performance variables as described in pretest.

3.2 Variables, Tools Used and Criterion Measures

3.2.1 Dependent Variables

Before and after the experiment, following tests for the subjects of treatment or training and no treatment groups were administered with the help of some standard tests:
<table>
<thead>
<tr>
<th>Variables</th>
<th>Tools</th>
<th>Criterion Measures (nearest to)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A) Fitness Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand grip strength</td>
<td>Hand grip dynamometer</td>
<td>± 0.05 kg.m</td>
</tr>
<tr>
<td>Strength of abdominal muscles</td>
<td>Sit ups</td>
<td>±1 No./min.</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Sit and reach</td>
<td>± 0.05 cm.</td>
</tr>
<tr>
<td>Anaerobic power</td>
<td>Vertical jump</td>
<td>± 0.05 cm.</td>
</tr>
<tr>
<td>Breath holding capacity</td>
<td></td>
<td>± 0.01 sec.</td>
</tr>
<tr>
<td>Body Fat</td>
<td>Body fat monitor</td>
<td>± 0.1 %</td>
</tr>
<tr>
<td>Cardiovascular endurance</td>
<td>1 mile run/walk</td>
<td>± 0.01 sec.</td>
</tr>
<tr>
<td>Muscular endurance</td>
<td>1 min Push up</td>
<td>± 1.0 no..</td>
</tr>
<tr>
<td>Body mass index</td>
<td>body wt. in Kg. divided by square of height in Meters</td>
<td>± 0.1 index.</td>
</tr>
<tr>
<td>Muscular strength (lower body)</td>
<td>Broad jump</td>
<td>± 0.1 cms.</td>
</tr>
<tr>
<td><strong>B) Sprint Performance Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100M run</td>
<td>Stop watch</td>
<td>± 0.01 sec.</td>
</tr>
<tr>
<td>200M run</td>
<td>Stop watch</td>
<td>± 0.01 sec.</td>
</tr>
<tr>
<td>400M run</td>
<td>Stop watch</td>
<td>± 0.01 sec.</td>
</tr>
<tr>
<td>800M run</td>
<td>Stop watch</td>
<td>± 0.01 sec.</td>
</tr>
<tr>
<td><strong>C) Physiological Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse Rate</td>
<td>Sphygmomanometer</td>
<td>± 0.1 beats/min.</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>Sphygmomanometer</td>
<td>± 1 mmHg.</td>
</tr>
<tr>
<td>Respiration rate</td>
<td></td>
<td>± 1 cycle/min.</td>
</tr>
<tr>
<td>PEFR</td>
<td>Peak flow meter</td>
<td>± 1 Lit.</td>
</tr>
</tbody>
</table>

The participants were found really encouraged and co-operative to conduct each of the above tests.

### 3.2.2 Designing Independent Variable

Yoga and Plyometric exercises were included as an independent variable in this study.
3.2.2.1 Designing Yoga Training Schedule

The Yoga training schedule was designed on the basis of following:

- Yoga is a thoroughly practical system and practical aspects of yoga e.g., asanas, pranayamas, dhyana etc. have been taken care of.

- Yoga practices have been designed in such a way so that they have been enjoyed as a fitness regime, successfully promoting health and physical well being. In its most profound form, it can awaken in people true wisdom, joy and compassion.

- It was considered that homeostasis approach of yoga balances the nervous and endocrine systems which directly influence all the other physiological organs of the body.

3.2.2.2 Designing Plyometric exercise Schedule

The plyometric exercise training was designed on the basis of following:

- Exercises are designed according the selected sports events.

- Exercises must be done from simple to complex manner.

- Sets are remained fixed, but repetitions vary.

- Intensity of training is fixed for progressive improvement.

- Rest period in between each set is reduced gradually.
### 3.3.2.3 Composition of Yoga Training Interventions

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Yoga practices</th>
<th>Sr. No.</th>
<th>Yoga practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Halasana</td>
<td>7.</td>
<td>Ugrasana</td>
</tr>
<tr>
<td>2.</td>
<td>Sarvangasana</td>
<td>8.</td>
<td>Hanumanasana</td>
</tr>
<tr>
<td>5.</td>
<td>Dhanurasana</td>
<td>11.</td>
<td>Shavasana</td>
</tr>
<tr>
<td>6.</td>
<td>Bhadrasana</td>
<td>12.</td>
<td>Tadasana</td>
</tr>
</tbody>
</table>

**PRANAYAMA**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Yoga practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Anulom-vilom</td>
</tr>
<tr>
<td>2.</td>
<td>Ujjayi</td>
</tr>
<tr>
<td>3.</td>
<td>Bhramari</td>
</tr>
<tr>
<td>4.</td>
<td>Bhastrika</td>
</tr>
</tbody>
</table>

**KAPALBHATI**
### 3.3.2.4 Composition of Plyometric Exercise

<table>
<thead>
<tr>
<th>Plyometric exercises</th>
<th>Repetitions and sets</th>
<th>1&lt;sup&gt;st&lt;/sup&gt; to 4&lt;sup&gt;th&lt;/sup&gt; week</th>
<th>5&lt;sup&gt;th&lt;/sup&gt; to 8&lt;sup&gt;th&lt;/sup&gt; week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standing long jump and sprint</td>
<td>Sets:4</td>
<td>Repetitions:2</td>
<td>Sets:4</td>
</tr>
<tr>
<td></td>
<td>Rest after each set:</td>
<td>3 mins</td>
<td>Rest after each set:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low intensity</td>
<td>2 mins</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low intensity</td>
<td>Medium intensity</td>
</tr>
<tr>
<td>Single - foot side to - side ankle hop</td>
<td>Sets:4</td>
<td>Repetitions:4</td>
<td>Sets:4</td>
</tr>
<tr>
<td></td>
<td>Rest after each set:</td>
<td>3 mins</td>
<td>Rest after each set:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low intensity</td>
<td>2 mins</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low intensity</td>
<td>Medium intensity</td>
</tr>
<tr>
<td>Alternate bounding with single arm action</td>
<td>Sets:4</td>
<td>Repetitions:4</td>
<td>Sets:4</td>
</tr>
<tr>
<td></td>
<td>Rest after each set:</td>
<td>3 mins</td>
<td>Rest after each set:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low intensity</td>
<td>2 mins</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low intensity</td>
<td>Medium intensity</td>
</tr>
<tr>
<td>Multiple box-to-box jumps with single leg landing</td>
<td>Sets:4</td>
<td>Repetitions:1</td>
<td>Sets:4</td>
</tr>
<tr>
<td></td>
<td>Rest after each set:</td>
<td>3 mins</td>
<td>Rest after each set:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low intensity</td>
<td>2 mins</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low intensity</td>
<td>Medium intensity</td>
</tr>
<tr>
<td>Combination bounding with vertical-jump</td>
<td>Sets:4</td>
<td>Repetitions:1</td>
<td>Sets:4</td>
</tr>
<tr>
<td></td>
<td>Rest after each set:</td>
<td>3 mins</td>
<td>Rest after each set:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low intensity</td>
<td>2 mins</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low intensity</td>
<td>Medium intensity</td>
</tr>
<tr>
<td>Depth jump to prescribed height</td>
<td>Sets:4</td>
<td>Repetitions:1</td>
<td>Sets:4</td>
</tr>
<tr>
<td></td>
<td>Rest after each set:</td>
<td>3 mins</td>
<td>Rest after each set:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low intensity</td>
<td>2 mins</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low intensity</td>
<td>Medium intensity</td>
</tr>
</tbody>
</table>
3.3 Description of Tests Measuring Dependent Variables

Detailed techniques to measure each of the dependent variables have been presented below:

1) Hand grip strength

Purpose:

To measure the grip strength of the trainee. This in fact predicts the level of strength of one’s upper arm.

Facilities and equipment:

Grip dynamometer (Portable), Manpower (One helper and one scorer).

Procedure:

The investigator must set the instrument’s scale to zero prior to measurement. The instrument is kept on the palm of the trainees’ strong hand. The trainee takes this instrument in his/her grip, stands on a comfortable body position by keeping the legs apart from the body, and slightly bend the body forward. After completion of this posture, after holding the breath, the trainee is allowed to exert the maximum pressure on the bars of the instrument in squeezing the grip only once. For other trials, again the instrument is set to zero and then the same procedure is repeated. Like this, three trials are generally taken for consideration.

Score:

The needle of the instrument indicates the score, which was recorded in Kg-M.
2) **Vertical jump** (Anaerobic power)

**Objectives:**

To measure anaerobic capacity of leg muscles.

**Equipment:**

10 meters metal measuring tape.

**Direction:**

The subjects in the group were allotted numbers and called them by number to take their trial. When the subject was called by number, the subject starts his trial by standing near the wall and standing body-height was measured. Then by keeping the wall in front, the subject stands, dips the finger in lime and makes a spot jump with his highest capacity and lime-mark on the wall with fingers.

**Scoring:**

The measurement was taken from the standing body-height to the line-mark on the wall after jumping was over. Each subject was given 3 trials and best of 3 trials was taken into scoring in Cm..

3) **Sit and reach**

**Purpose:**

The sit and reach test is designed to evaluate the flexibility of the lower back and posterior thigh.

**Equipment:**

The test apparatus consist of specially constructed box with a measuring scale where 23 cm is at the level of the feet.
Procedure:

The examinee must remove their shoes before starting the test. The examinee sits in front of the test apparatus with feet flat against the end board. The knees should be fully extended and the feet, shoulder width apart. To perform the test, the examinee extends the arm forward with one hand placed on top of the other. The examinee reaches forward, palms down along the measuring scale on the testing apparatus. The reach is repeated three consecutive times and their average is taken into consideration. The maximum reach is held for one second. The distance of the maximum reach is recorded as the test score.

Scoring:

The score, measured to the nearest centimeter, is the most distant point reached in the three trial average. The finger tips of the both hands should reach this point. If the reach of this two hands are uneven, then the test should be done again.

4) Sit ups

Purpose:

The objective of this test is to complete as many partial curl-ups as possible at a rhythmic pace. Abdominal fitness is important to hood health because low levels are associated with bad posture and lower back pain.

Equipment:

Stopwatch, Mat, Evolution Sheet, Pencil.

Procedure:

To assume the starting position, the subject lies on his back with knees flexed, feet on floor, with the heels between 12 and 18 inches from the buttocks. The arms are inter locked and placed under the head. The feet are held by the partner to keep them in touch with the testing surface. The
subject, by tightening his abdominal muscles, curls to the sitting position. The sit-up is completed when the head touches the knees. To complete the sit-up the student returns to the down position until the back makes contact with the testing surface.

The timer gives the signal, ’Ready, go’. And the sit-up performance as started of the word “go” Performance is stopped on the word “stop”. The numbers of correctly executed sit-ups performed in 60 seconds are scored. Rest between sit-ups is allowed, and the student should be aware of this before initiation of the test.

**Scoring:**

Record the number of correctly executed sit-ups that are completed in 60 seconds.

5) **Breath holding time**

The subjects are asked to relax physically and mentally in a cross legged sitting posture. After a deep inhalation, the subjects are directed to hold the breath by closing mouth and nostrils. Time taken to hold the breath is measured in seconds.

6) **Muscular endurance : Push Ups**

This test is used to measure muscular endurance of upper limbs.

**Instructions:** Students sit on kneel down position. He then takes 24 inches front side measurement on the ground using right hand and mark with a chalk. Fixing palms on the ground at shoulder level apart, lift the body parallel to the ground in keeping the whole body weight distributed on toes and hands. Looking towards the ground, he folds the hands at elbows and pushes the upper body part downwards using gravity (see that whole body moves together like a stick) till the nose touches the slightly the ground. Then
immediately, the whole body is pushed up in straightening the hands at elbow. This down- and up- is called as one round. He then continues such rounds for a total period of 1 minute.

**Equipment Needed:** Mats or pieces of carpet and a stopwatch or watch with digital/sweep second hand.

**Scoring Procedures:** The number of correctly completed push-ups in one minute is recorded as the student’s score.

### 7) Body Mass Index (BMI):

The body mass index is calculated using a formula in which the scores of subject’s standing body-weight and standing body-height are needed.

\[
\text{BMI} = \frac{\text{Body Weight (Kg.)}}{\text{Body Height}^2 (\text{M.})}
\]

**Scoring Procedures:** The score is expressed in index.

### 8) Running Broad Jump

The broad jump is an athletics (track and field) event in which athletes combine speed, strength, and agility in an attempt to leap as far from the take-off point as possible.

**Procedure:**

The subjects were asked to run down a runway and jump as far as they can from behind a foul line into a pit filled with finely ground gravel or sand. The distance traveled by a jumper is often referred to as the "mark" because it is the distance to the nearest mark made in the sand from the foul line. If the
subject starts the leap with any part of the foot past the foul line, the jump is declared illegal and no distance is recorded. The subject was allowed to initiate the jump from any point behind the foul line; however, the distance measured from the foul line.

9) Body Fat Percentage

Purpose:

This test is used to assess the body composition, or more specifically the level of fatness in an individual.

Equipment:

Omron Fat monitor (HBF-402) is used for direct measurement. The instrument has two handles to catch hold the instrument and a monitor which displays digitally the score.

Procedure:

The trainee was instructed to stand in a normal standing position with legs apart 8 to 10 inches. Eyes towards front, spine straight, and hand by the side of the body. Then the age in years, height in centimeters, body weight in kilograms and sex of the trainee was feed through the available keyboard. When the instrument indicates its readiness, the trainee was directed to hold the handles of the instrument with the two respective hands. Hands are kept straight in front at the shoulder level so that the eyes can easily read the monitor display. The finger grip should be very firm in such a way that the instruments sensor can easily sense the skin voltage. Generally within 30-40 seconds the monitor displays the body fat percentage score. If there is any display with error signal, the data on age, height, body weight, sex (M/F) are to be entered again through the keyboard and the process to be repeated again till the monitor displays the score in body fat percentage.

The proper method for measuring the body fat percentage with this instrument plays very important role. The following points are to be remembered:
• Check the battery before making it ready for measurement.

• Get adjusted to this instrument and its functional procedure.

• Keep ready the data, such as age, height, weight, and sex of each volunteer before measuring the volunteers’ body fat percentage.

• Take care of the alignment of each body parts for an ideal standing posture. Finger grip should be checked so that they are kept with proper alignment as available in the handles of the instrument.

• Read the monitor’s display for recording the score.

Score:

The percentage of the body fat as registered on the dial of the instruments monitor is the score. Each measurement is taken three consecutive times and the average of the three scores is the final score.

PERFORMANCE RELATED VARIABLES

Sprint test (100 M, 200M, 400M & 800M run)

Objective:

To conduct 100M, 200M, 400M and 800M running event and to keep running performance time or record in 1/100second.

Equipment:

Swiss made stopwatch calibrated to measure 1/100second.

Directions:

The subject was asked to stand behind the starting line in starting position. The starter gives 'Ready' command, soon as the subjects gets ready, the starter sweeps his hand downward holding hand kerchief in his hand. The
time-keeper starts stop watch seeing hand kerchief downward swing. The moment the subject’s torso touches the finish line the time-keeper stops the stop watch.

**Scoring:**

The time was recorded in the record sheet in 1/100 second and converted this record in to decathlon scoring table.

**PHYSIOLOGICAL VARIABLES**

1) **PEFR (Peak Expiratory Flow Rate)**

Peak flow measurement is a procedure in which the maximum flow rate of expired air is measured. The measurement obtained is called the peak expiratory flow rate (PEFR). PEFR was measured with a peak expiratory flow rate meter, a portable, hand-held device.

**Instructions:**

Researcher explained the purpose of the test, technique to perform the test.

**Equipment:**

Peak Flow Meter, Disposable Mouth Piece

**Procedure:**

- Attach new disposable mouthpiece to the peak flow meter.
- Before each use, make sure the sliding pointer on the peak flow meter is reset to the 'zero' mark.
- Ask the subject to stand up & hold the peak flow in a horizontal position.
- Take care not to place the fingers over the scale.

- Ask the subject now to take a deep breath in & make a tight seal with their lips around the mouthpiece.

- Now ask the patient to blow out as hard & as fast as they can. Remember a “fast blast” is better than a “slow blow.”

- Note the number where the sliding pointer has stopped on the scale.

- Reset the pointer to ‘zero’.

- Repeat this process three times.

**Scoring:**

The lungs function ability (i.e., peak expiratory flow rate) is measured in litre.

**Reliability and validity:**

The reliability coefficient has been reported as 0.92, whereas the construct validity as 0.87.

2) Blood Pressure & Pulse Rate

**Description / procedure:**

The Digital blood pressure instrument was positioned in such a manner that the subject would not be able to see the display. Blood pressure was recorded after the subject has rested quietly for 5 minutes. The subject was asked to sit with the arm resting on the bench, the elbow approximately at the level of the heart. The cuff was attached, the pressure then increased to approximately 180 mm Hg.
**Scoring:**

Blood pressure was recorded in the units of millimeters of mercury (mm Hg). Normal blood pressure is approximately 120 systolic and 80 diastolic, for both men and women.

<table>
<thead>
<tr>
<th></th>
<th>acceptable</th>
<th>borderline</th>
<th>high</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systolic</td>
<td>&lt; 140</td>
<td>140 - 160</td>
<td>&gt; 160</td>
</tr>
<tr>
<td>Diastolic</td>
<td>&lt; 85</td>
<td>85 - 95</td>
<td>&gt; 95</td>
</tr>
</tbody>
</table>

Proper care was taken before blood pressure measurement as physical exertion and anxiety can cause rise in blood pressure substantially.

The digital blood pressure monitor of Omron Company was used to record systolic and diastolic blood pressure.

The Digital Blood Pressure Monitor of Omron Company was having facility to record pulse rate which was used to record it.

**3) Respiratory Rate**

**Purpose:**

The purpose is to measure rate of respiration. We are not aware that when we breathe whether our chest moves up and down or our abdomen. While breathing if our chest moves we call it chest breathing and if abdomen moves it is known as abdominal breathing.

**Method:**

The subjects were directed to lie down at supine condition. The researcher asked the subjects about those to whom he likes very much. This was done to divert the subject’s attention because they should never know that the researcher is measuring respiratory rate. Here the researcher observed indirectly the movement of chest.
Scoring:

The movement of chest as noted was recorded along with respiratory rate (RR) per minute in the score sheet.

3.4 Description of Training Interventions

3.4.1 YOGA PRACTICES

1) Halasana

Technique:

- Lie down on the back raise the legs to 30 degrees from the ground keeping the knees straight.

- Raise the legs to 60 degrees.

- Raise the legs to 90 degrees.

- Move the legs over the head.

- Place the big toes on the ground, toes pointing away from the body, interlock the hands at the back, exhale, take the stomach inside and stretch the legs away from the body.

- Move the hands to the top of the head and interlock them over the head.

Main Benefits of Asana:

- Every part of the spinal column is subjected to compression or tension with a beneficial effect on the vertebrae and the spinal nerves. Tensing
and flexing of the back muscles creates perfect body symmetry and strengthens the entire back.

- The abdominal contraction increases the blood supply to the organs of the abdominal cavity, strengthening them, reducing fatty deposits and alleviating digestive disorders.

- The thyroid and parathyroid glands are stimulated. The pressure on the carotid sinus lowers the blood pressure and slows down the heart rate.

- The forward bend brings an extra supply of blood to the spine thereby relieving tensions in the head and allowing the brain activity to be stimulated.

In halasana, the energy is ploughed back from the sacro-lumbar area to the heart and to the neck. Due to the constriction at the neck, breathing becomes rather shallow in this posture and concentration should be directed to the vishuddhi chakra.

2) Sarvangasana

Sarvangasana is composed of the word sarva meaning whole, complete and anga meaning limb. In this posture, commonly known as the candle, the entire body is benefited as the Sanskrit word itself indicates.

Execution of Asana

- Lie on the back, legs stretched out, with the arms alongside the body, palms down.

- Exhale, bend the knees and bring the legs towards the stomach.

- Breathe normally.
• Exhale again and raise the hips from the floor, resting the hands on them. Breathe normally.

• Exhale, raise the trunk perpendicularly to the ground until the chest touches the chin while supporting the middle of the spine with the hands. Stay in this posture with abdominal breathing.

• Exhale, gradually lower the trunk, release the arms, slide down the legs and feet.

• Rest on the ground and relax. Beginners should keep the posture for a very brief moment and then, gradually increase the time.

The practice of sarvangasana warrants a note of caution. The posture should be introduced in one’s regular practice once the muscles of the lumbar region have been sufficiently strengthened by the practice of other asanas and once the vertebrae are well aligned. The posture should be practiced without expending excessive energy, without loss of balance and without straining the vertebrae. It is advisable to practice sarvangasana at regular intervals in a plan of work so as to monitor its effects on the body. The posture should be followed by some rocking movement and by setubandhasana.

Main Benefits of Asana

Sarvangasana is among the most beneficial postures. It increases the flow of energy, helps to eliminate the toxins from the organism and produces overall harmony in the system.

• The effect of the force of gravity is reversed, which increases the blood flow to the organs of the upper trunk without exerting the heart unduly.
• The chin lock increases the blood supply to the neck and helps in regulating the thyroid and parathyroid functions.

• The blood flow to the head is regulated by the practice of the chin lock with consequent calming of the cranial nerves.

• The practice of abdominal breathing in this inverted posture greatly reduces the venous congestion in the legs and in the abdominal organs.

• The spine is strengthened with a relaxation of the lower back and a stretching of the neck.

Sarvangasna is an inverted posture in which the telluric current is minimized and the cosmic current strongly concentrated in the head and in the brain. In the posture, the energy is withdrawn from the leg chakras into the base of the spine and is then allowed to flow easily to the chest and to the neck. Due to the chin lock, there is a strong concentration of energy at the base of the neck. Vissuddhi chakra, as the nexus of cosmic and individual energies, is activated in this asana.

3) Shalabhasana

Posture:

Shalab means 'locust' as the position of the body in the asana appears to be like that of a locust. To facilitate easy learning first learn Ardha Shalabhasana.

Execution of Asana

• Lie full length on the stomach with the legs extended together and the feet flat on the ground.
• Lay the chin firmly on the ground and place the arms on the floor alongside the body.

• Clench the fists and place them under the pelvis, keeping the arms fully extended.

• Inhale deeply, retain the breath and raise the outstretched legs with a fairly quick motion.

• Hold the position for fifteen seconds with full lung retention.

• Still holding the breath, slowly lower the legs to the ground.

• Exhale and relax.

At an advanced stage of practice, the abdominal muscles are sufficiently strong and the legs can then be lifted up, with palms on the ground, and the trunk raised up to mid-chest. The posture then becomes somewhat the reverse of sarvangasana.

**Main Benefits of Asana**

This asana, like its complementary bhujangasana, has a powerful effect on the back. Whereas bhujangasana acts on the part of the spine directly above the small of the back, shalabhasana has a more concentrated effect on the lower part of the back. However, with practice, the technique of shalabhasana slightly changes and the posture becomes somewhat the reverse of sarvangasana or halasana.

• The stretching backwards of the spine renders it more elastic. Tensions are eased in the sacral and lumbar areas, the nerves of the
small of the back are strengthened, due to the increase of pressure in the abdominal cavity.

- The concentrated tensing of the abdominal muscles and the elongation of the lower spine improve the digestive functions. A highly beneficial effect has been noted for the relief of wind and constipation.

- With all extensor muscles tensed and flexor muscles relaxed, the chest expands and there is an increased blood flow in the dorsal and cervical areas with a positive effect on the breathing efficiency.

- The blood circulation in the legs is improved.

- The increase intra abdominal pressure, the retained breath and the inclination of the hip joints compress and immobilize the diaphragm while improving its tone.

Shalabhasana follows bhujangasana in the practice of postures and it precedes dhanurasana. In this postural triad, the energy is moved from the base of the spine to the second subtle spinal centre in order to reach the navel subtle centre. Since shalabhasana is the middle posture of the three, the centre, which is active, is the svadhishthana chakra. In this asana, the parasympathetic part of the nervous system is stimulated in two points. First, at the level of the shoulders, the vagus nerve is tones by the pressure of the upper part of the trunk on the ground and, secondly, the pelvic part of the parasympathetic system is stimulated by the contraction of the muscles in the lower back.

4) Bhujangasana

**Introduction:**

It is a traditional posture mentioned in the Gheranda Samhita (II 42) in which the body imitates the shape of a cobra. In Sanskrit “bujanga” means
“cobra” and “asana” indicates a stable and comfortable posture”. In the final position this asana resembles a hooded cobra standing straight. The snake is also a symbolic representation of the energy. A good complementary posture of Bujangasana can be Halasana.

**Stages:** Preparation- The starting position is resting on the chest (prone decubitus) with legs and toes together. The arms remain by the side of the body with the hands relaxed and the chin on the floor.

- Lie down on the stomach, legs together, arms close to the body, palms facing upward.
- Forehead resting on the floor.
- Flex the arms at the elbows and place the palm under the shoulder, elbow pointing upward, place the chin on the ground and face as forward as possible.
- Raise the chin then the chest up from the floor.
- Raise the palms of the floor.
- Raise the upper part of the body up to the navel region off the floor.
- Come back to the initial position slowly by reversing the steps.
- Relax in Makarasana.

**Main Benefits of Asana**

Bhujangasana is one of the main postures used for strengthening the back muscles and correcting the vertebral structure. It has a beneficial effect on the entire nervous system since it greatly improves spinal health.
• The spine is reinforced and rendered more flexible by the gradual sliding of the vertebrae on each other, from the cervical to the lumbar regions. An abundant flow blood reaches the backbone and the sympathetic nerves.

• The frontal part of the trunk is stretched, the chest fully expanded. This produces a reflex action on the lumbar area and stimulates the kidney function while improving the breathing capacity.

• The increase in intra-abdominal pressure affects a calming massage of the viscera with a consequential improvement of the digestion.

• Through gradual practice, the leg muscles are reinforced and can thus act as a strong support for the arching of the spine.

• The thyroid gland is stimulated and produces an overall regeneration of the system.

**Salient Points to remember:**

**Do’s:**

• All the exercise shall be done very smoothly, moving the chest up vertebra by vertebra.

• Use the back muscles (not the arms) to raise the head and trunk.

• Try to do all the movements very slowly stopping at different degrees for a while.

**Don’ts:**

• Do not jerk the body while lifting the chest up or while coming down.

• Do not go beyond your capacity to reach the final position.

• Do not open or raise the legs from the floor.
5) Dhanurasana

**Introduction:**

It is a posture in which the body is supposed to imitate the shape and stand of a bow. This traditional asana is mentioned in the Gheranda Samhita (II 18) and Hathapradipika (I 25) in Sanskrit “Dhanus” means “bow” and “asana” indicates “a stable and comfortable posture”. Dhanurasana can be considered as a combination of Bhujangasana and Shalabhasana.

**Stages:**

Preparation – The starting position is resting on the chest (prone) with the chin on the floor. Maintain the legs together and arms by the side of the body.

- Slowly bend the knees, bring the heels near to the back and hold both ankles with the hands.

- While pulling the ankles from the back raise the chest and legs till the body remain on the abdomen and the spine gets stretched backward.

- Try to maintain a normal breath during the practice. After some time you may try to relax in the posture.

- Remain in the posture for a while and come back to the initial position by reversing the steps. Relax.

**Main Benefits of Asana**

This posture produces the combined effects of bhujangasana and halasana. The neutrality of this asana favors the attitude of withdrawal.

- Extension of the rib cage area by muscular traction and abdominal pressure. This improves the breathing, tones the diaphragm and the abdominal organs and increases the intercostals mobility.
• Back stretching of the spine with a particular extension at the cervical and lumbar areas and a compression at the dorsal area owing to a narrowing of the space between the shoulder blades.

• Increased elasticity of the shoulder and hip joints due to the simultaneous lifting of the trunk and thighs and the full extension of the recti and abdominal muscles.

Dhanurasana allows practitioners to become aware of two important blocks to the free flow of energy in their systems, namely the shoulder joint and the hip joints. With diligent practice, these obstructions can be overcome and an abundant surge of energy will originate from the manipura chakra and will circulate in the trunk as well as in the arms and the legs.

**Salient points to remember:**

**Do’s:**

• Try to keep the knees together.

• Concentrate on the back muscles.

• Maintain a normal breath throughout the practice.

• Try to do all the movements very smoothly and slowly.

**Don’ts:**

• Do not force to reach the final position pulling the ankles too much.

• Do not jerk the body while moving it to avoid lesions and sprains.

**6) Bhadrasana**

• Sit on the ground.
• Bring the feet close to the perineum and allow the soles of the feet to touch each other.

• Gradually move the trunk towards the clasped feet and sit, with spine erect on the joined edges of the feet.

• Find the proper balance and keep the arms stretched with the hands, in adhi mudra, resting on the knees.

7) Ugrasana

Technique:

• Sit with legs extended, arms by the side of the hips, palms resting on the floor, keep spine straight and look forward.

• Split the legs wide apart.

• Catch the respective big toe with the respective hands and place the forehead on the ground.

Benefits:

• Increases the flexibility of spine, hip and hamstring.

• Stimulates the functions of abdominal organs.

• Soothes the nerve and energizes the body.

8) Hanumanasana

Steps:

• Start by kneeling upright; place your knees a bit apart. Place your right foot forward, around a foot or so in front of your left knee and turn your right thigh outward. To do this, you will need to lift your inner sole away from the floor, so that your foot rests on your outer heel.
• Breathe out and bending your torso forward, press your fingertips to the floor.

• Gradually, move your left knee backwards. Straighten the knee and simultaneously, lower your right thigh, towards the floor. Just before you feel you have reached the limit of your stretch, stop straightening your left knee.

• Next, start pushing your right heel away from your torso. Gradually, start turning the leg inward while you straighten it and bring your kneecap towards the ceiling. As your front leg becomes straight, start pressing the left knee backwards once again.

• Extend the heel of the front leg and lift the ball of the foot upwards.

• Repeat the exercise, using the other leg.

Precautions:

• Do not practice this yoga pose in case you are suffering from any injuries, especially in the hamstring or groin area.

• While practicing the pose, go slow and be careful at all times. This means that you should not push your body, beyond its limits of comfort. Forcing any yoga pose can lead to an injury and the Monkey Pose, being such an advanced one, is no different.

• With regular practice, you should be able to execute the split all the way, but until then, only go as deep into the pose, as your body comfortably allows you to.

9) Veerasana

Steps:

• Sit in sukhasana
• Place the right heel under the perineum.

• Bend the left leg in such a way that the left foot slides towards the outer edge of the left buttock.

• Keep the spine erect, the arms stretched and the hands, in adhi mudra, resting on the knees.

10) Kapotasana

• Keep yourself upright and kneel keeping your legs slightly apart. Keep your shoulders and head bent backwards.

• Bring your hands behind you and press at the back of your pelvis with a slight force.

• Inhale deeply and bow your head, tucking your chin into your sternum. Lean your shoulders back. While doing this, try and keep your hips in place.

• Keep your shoulder blades firm and lift your chest as high as you can. Now gradually release your head and let it tilt back.

• Bring both your hands in front of you in the Anjali mudra.

• Now slowly place your hands on the floor and bring your forehead to the floor as well.

• Take a deep breath and raise your hands, arching them backwards. Move your hips forward so that you can counterbalance this move.

• Allow your upper thighs to be perpendicular to the floor and drop back. Touch your ankles with your hands and if you can, grab your heels.
• Rest the back of your head on the soles of your feet.

• Open the front of your groin as much as possible and lift your pelvis. Now lengthen your upper spine and lower your forearms. Draw in your elbows towards each other.

• Extend your neck and place your forehead on the floor.

• Inhale deeply. Now softly exhale and press both your forearms and your shin to the floor. Hold the pose for about 30 seconds and keep breathing normally.

• Exhale and expand your chest. Now release your grip on your heels and slowly come back to the kneeling position.

11) Shavasana

Introduction:

In this asana the body remains completely relaxed on the floor. In Sanskrit “Sava” means “a dead body” and “Asana” indicates “a stable and comfortable posture.” This is a traditional asana mentioned in the Hathapradipka (I –32) and the Gheranda Samita (II-19).

Stages; Preparation:

• The starting position is resting on the back (supine decubits) with the legs together. The hands remain by the side of body with the palms resting on the floor.

• Slowly, separate the legs up to 30 or 40 cm. And stop there. Relax the feet so that the toes remain pointing outwards.

• Open the arms very slowly up to 30 cm. from the body and stop there. Relax the hands so that the palms are facing upwards.
• Then relax the head and the whole body. Close and relax the eyes. To concentrate, feel the heart, the touch of the air on the nostrils and the breathing movements.

• Keep a natural deep breath throughout the practice and go further relaxing.

• Maintain the posture for some time and come back to the initial position slowly by reversing the steps.

**Salient points to remember:**

*Do’s:*

• Try to do all the movements very mindfully avoiding mechanical actions.

• In the final posture keep the feet open and the spine in a straight line.

• Maintain a natural breath throughout the practice.

• Keep the eyes closed if it is comfortable for you.

• Concentrate your mind to avoid dreaming and to maintain attention on the posture.

• Keep the head in line to prevent tension on the neck.

• Once you have adopted the complete asana try to move as less as possible.

*Don’ts:*

• Do not tilt the head while relaxing it.

• Do not jerk the body while opening the legs up or while opening the arms.
• Do not tense the elbows during the practice, keep them open and relaxed.

• Do not move the body after assuming a comfortable and stable position.

12) Tadasana

Technique:

• Keep feet apart at shoulder width.

• Raise the arms up to shoulder level, palm facing each other.

• Raise the arms upward, fingers pointing towards the sky, biceps touching the ear, elbows straight.

• Stretch the hands up towards the sky and raise the heels up from the floor, balance the body on the toes. Keep toes stretched.

Benefits

• Strengthens the leg muscle and ankle joint.

• Develops a sense of balance.

• Develops concentration

• Helpful in relieving pressure in between spinal bones.

• Children in the adolescent period should perform tadasana immediately after shirshasana. If they don't do so, it can affect their height.

• Helpful in increasing height.
Limitation

- Those who have weak ankle joints should be careful while performing this posture.

PRANAYAMA

1) Anulom-Vilom

- Sit in padmasana, raise the right hand and close the middle and index finger into the palm of the hand. Little, ring finger and thumb will be open.

- Place the right hand thumb on the right nostril and close the nostril and close the nostril. Little and ring finger in between the forehead. Inhale through left nostril for 4 seconds.

- Place the little and ring fingers on left nostril and close the left nostril. Hold the breath for 16 seconds.

- Release the right hand thumb and place it on the forehead. Exhale through the right nostril for 8 seconds. The whole process moves in reverse order to complete one round.

2) Ujjayi

This is one of the eight classical kumbhaka pranayama mentioned in the Hatha yoga pradipika. It is practiced on its own as a pranayama and it is used also as a technique during the practice of asanas.

As a pranayama, it has been transmitted by the great exponents of Hatha yoga in two main forms: Gheranda recommends its practice with bahya kumbhaka (empty lung retention) and Kuvalayananda recommends it with abhyantara kumbhaka (full lung retention). Nevertheless, in the early stages, it is recommended to practice ujjayi without any kumbhaka.
The technique consists in keeping the glottis partially closed thereby allowing the movement of air to produce a gently and continuous sound. This partial resistance breathing revitalizes the respiratory tract by increasing the intra thoracic depression during inhalation and by increasing the intra pulmonary pressure during exhalation. This has positive effect on the venous circulation and on the lung elasticity. Moreover, through this deep respiratory activity, the blood is fully oxygenated, the nerves are soothed and the mind is calmed.

**Ujjayi without Kumbhaka**

Sit in padmasana, siddhasana or vajrasana. The trunk is leaning slightly forward, the spine erect and the arms are stretched out allowing the hands to rest on the knees with fingers in chin mudra. Inhalation is performed slowly and deeply through both nostrils. The abdominal belt is controlled, the glottis is partially closed and the breathing is mainly thoracic. The air produces a regular sound. At the end of the inhalation, close the glottis completely for a short retention of two seconds.

During exhalation, keep the abdominal belt under tighter control, open the glottis slightly so as to allow the air to flow out with the same continuous sound. Then, contract the thoracic muscles and lower the clavicles in order to force all the air out of the lungs. Keep the spine fully erect. Exhalation should be twice as long as inhalation.

Practice one round of three breaths, relax and repeat another two rounds. With practice, it is possible to achieve seven rounds.

**Ujjayi with Abhyantara Kumbhaka (full lung retention)**

Sit in padmasana or siddhasana. Start with a complete exhalation, keeping the spine fully erect. During the inhalation, which follows, the breath is slowly and deeply drawn in through the nostrils. The glottis is partially closed, the facial and nasal muscles are kept relaxed. When the chest is fully
expanded and the lungs are full, practice jaalandhara banda and close the nostrils with the fingers of the right hand.

This full lung retention is accompanied by mula bandha and is kept for a ration of 4 to 1 compared with the inhalation phase. The upper limit of this ration is reached when a slight vibration is felt in the navel area.

Exhalation is practiced through the left nostril only, with the glottis partially closed and it should last twice as long as the inhalation. The abdominal muscles contract, the chest deflates while the spine is kept fully erect and the lungs are completely emptied.

Remain with a short empty lung retention of two seconds and inhale again. The third inhalation should not be hasty otherwise it is a sign that the retention period was exaggerated and should be reduced.

The full cycle of ujjayi has a ration of 1-4-2 and should last approximately thirty two seconds. There rounds of nine breaths each can be practiced and followed by shavasana.

**Ujjayi with Bahya Kumbhaka (empty lung retention)**

Sit in padamasana or siddhasana. Inhale through both nostrils. Then pull up the internal air from the lungs and throat into the mouth. Retain the air in the mouth with lips tightly closed. Exhale this air very slowly through the mouth. At the end of the exhalation, perform jalandhara bandha and mula bandha and perform kumbhaka for as long as is comfortable.

Practice one cycle on nine breaths. Rest and repeat two more rounds.

During ujjayi pranayama, the concentration of the mind is on the passage of air through the nostril and on the sound produced by the air at the level of the glottis. This pranayama strengthens the throat, tones the nervous system, improves digestion and develops a better harmony between the
breath and the respiratory organs and between the mind and the nervous system.

Antara kumbhaka is advised in the case of low blood pressure and a tendency to laziness and depression. Bahya kumbhaka is advised in case of high blood pressure, nervous tension. In a sequence, ujjayi follows kapalbhati and precedes bhastrika.

3) Bhramari

*Technique:*

- Inhalation: through both nostrils producing a sound resembling the hum of a male bee.

- Retention: hold the breath inside and apply jalandhara banda and moola bandha.

- Exhalation: through both nostrils producing a sound resembling the female bee.

*Benefits:*

- Relives stress and insomnia. Develops concentration, reduces blood pressure.

*Limitations:*

- Should not be performed by those who have heart diseases. Those who have ear infections should not perform this breathing.

4) Bhastrika

This is one of the eight major pranayamas described in the Hatha yoga pradipika. It is a technique of forced rhythmic breathing in which the exhalation sets the pace and both exhalation and inhalation are vigorous. Its foundation is the three staged yogic breath with control of the abdominal belt.
Mastery of this pranayama is gradually obtained by gaining a complete control of the abdominal belt, by enhancing the exhalation and by accelerating its rhythm while contracting the abdominal belt. After some practice, the exhalations will become more vigorous than the inhalations. But, in the perfected and advanced practice, at higher speeds of breathing, inhalation and exhalation become perfectly harmonious and the abdominal and intercostals muscles coordinate properly with a smooth movement of the diaphragm. The varieties encountered in the practice of bhastrika pranayama are related to the use of nostrils or one nostril, presence or absence of partial closure of the glottis and use or absence of bandhas.

**Technique:**

**Variation I**

- Sit in padmasana or vajrasana. Keep the spine erect and the ribcage slightly raised. Keep the palms of the hands on the sides of the lower ribs and the fingers turned downwards.

- Inhale deeply and then exhale, allowing the lungs to contract naturally. Repeat this breathing ten times.

- Inhale deeply again and, then, contract the abdominal muscles, causing a forced expulsion of air.

- Repeat this breathing ten times.

- When both forceful inhalation and exhalation have been learned, combine the two movements.

- Inhale and concentrate on the downward movement of the diaphragm.

- Exhale and concentrate on the contraction of the abdominal and intercostals muscles. Perform one cycle of twenty breaths.
• At the end of this cycle, inhale very deeply and without haste and allow the chest to expand fully. Do not force the air in rapidly and do not increase the friction by closing the glottis.

• When this inhalation is completed, retain the air in the lungs with the practice of aprakasha mudra, mayra mudra, jalandhara bandha and keep the nostrils closed with the fingers in Vishnu mudra.

• The retention period lasts about thirty seconds in the early stages of the practice and it can go up to two minutes at an advanced stage.

• Slowly exhale after releasing the nostrils, opening the glottis and releasing the jalandhara bandha. The exhalation is through and deep and the chest and abdomen contract.

• This completes one bhastrika pranayama, which is followed by a few normal breaths before starting the next round.

• The number of air expulsions, which can go up to one hundred and eight, and the time of retention will depend on the practitioners lung capacity and on the regularity and intensity of their practice. In any case, there should be a gradual development of the technique over a period of eight weeks.

Variation II

• This is the same as for variation I but with a partial closure of the glottis.

• After a round of air expulsions, inhale slowly and deeply through the right nostril. Retain the air for as long as comfortable and slowly exhale through the left nostril.

• Repeat three rounds of breathing in this fashion.
Variation III

- Sit in in vajrasana. Close the right nostril with the right hand in visnu mudra and inhale through the left nostril.

- Close the left nostril and make a series of air expulsions through the right nostril.

- Keep the left nostril closed and inhale through the right nostril deeply. Retain the breath for a comfortable period and, then, slowly exhale through the left nostril whilst closing the right one.

- Repeat the same process with the other nostril and perform three cycles of bhastrika for each nostril with the alternate nostril breathing technique. After this, do gentle breathing and relax.

- This variation of bhastrika is more powerful than the first one and should be practiced only when the first variation has been completely mastered.

- At the beginning, the hand movements, the alternate nostril breathing and the bhastrika rhythm will have to be harmonized. This requires skill, time and patience whereas great caution will have to be applied in the practice, which has to be progressive and should not exceed fifty breaths per minute.

KAPALABHATI

It is classified as one of the six processes in Yoga. “Kapala” in Sanskrit means forehead and “bhati” means to shine hence the name. It removes impurities from the passages of the nostrils and the sinuses by the forceful current of the air. This is done in sitting position by a foot lock, placing of the right foot on the left thigh and left foot on the right thigh. Place the hands on the knees. Sit erect. Exhale suddenly and forcibly giving an inward stroke at
the naval region. Let the abdomen relax and simultaneously inhale. In the beginning practice 10 – 20 rounds of Kapalabhati. The number of strokes and the speed may be increased as one gets used to the practice.

**Stages:**

**Starting position:**

Sitting with the legs extended together. Place the right foot on the left thigh. Similarly place the left foot on the right thigh. Place the hands on the respective knees.

- Raise the chest a little and sit erect.
- Exhale suddenly giving an inward stroke at the naval region.
- Relax the abdomen completely and inhale.
- Repeat the forceful exhalation and inhalation a number of times comfortably.
- Lower the chest and release the hands from the knees.
- Remove the left foot from the right thigh and extend it.
- Remove the right foot from the left thigh and come back to starting position.

**Salient points to remember:**

**Do’s:**

- Practice this after a firm practice of Padmasana.
- Keep the spinal column vertical.
- Concentrate on the rhythm of the inhalation and exhalation.
• Try to do all the movements very smoothly and firmly.

• Maintain a normal breath if required after the practice.

Don’ts:

• Do not sit loosely.

• Do not jerk the shoulder.

• Do not hold the breath.

• Do not distort the nose and face during practice.

• Do not lean forward or backward.

3.4.2 PLYOMETRIC EXERCISES

The following exercises recommended by Chu were selected for plyometric training. The selection of exercises was made on the basis of commonly applicable to both experimental groups Sprint and long jump.

• Standing long jump and sprint

• Single foot side to side ankle hop

• Alternate bounding with single arm action

• Multiple box-to-box jumps with single leg landing

• Combination bounding with vertical-jump

• Depth jump to prescribed height.

1) Standing long jump and sprint

Equipment:

A mark 10 meters from the end of jump and gross surface for smooth and safety landing.
**Starting position:**

Stand in a semi squat with feet shoulder-width apart. Action: Using a big arm swing, jump forward as far as possible. Upon landing sprint forward approximately 10 meters. Try to keep from collapsing on the landing, land fully on both feet, then explode into a sprint.

**Repetitions and sets:**

Performed 5 repetitions of 4 sets with 2 minutes rest between each set. Intensity rating: performed with high intensity.

2) **Single-foot side-to-side Ankle hop**

**Equipment:**

Two cones 30 cms height placed 90 cms apart.

**Starting position:**

Stand on one foot between the cones.

**Action:**

Hopping from one foot to the other land on the right foot next to the right cone, then the left foot next to the left cone, continue hoping back and forth.

**Repetitions and sets:**

Performed 10 repetitions of 4 sets with 2 minutes rest between sets. Intensity rating: Performed with medium intensity.

3) **Alternate bounding with single arm action:**

**Equipment:**

None

**Starting Position:**
Log into the start of the drill to increase forward momentum. As you jog, start the drill with the right foot forward and the left foot back.

**Action:**

This exercise is as good as running action. Start with the left foot and take the leg forward with the knee curved and the thigh parallel to the ground. At the same time reach forward with the right arm. Hold this extended stride for a brief time, then land on the left foot. The right leg then drives through to the front bent position, the left arm reaches forward and the left leg extends back. Make each stride long and try to cover as much distance as possible.

**Repetitions and sets:**

Performed 12 repetitions of 4 sets with 2 minutes rest between each set.

**Intensity rating:**

Performed with high intensity.

4) **Multiple Box - to- Box jumps with single leg landing**

**Equipment:**

A row of 3 boxes 30 cms height.

**Starting position:**

Stand on one foot at the end of the row of boxes.

**Action:**

Jump on to the first box, landing on the take-off foot, then jump to the floor: landing on the same foot. Continue in this fashion down the row of boxes. Repeat the exercise using the other leg.
Repetitions and sets:

3 repetitions on each leg 4 sets with 2 minutes rest between each set.

Intensity rating:

Performed with medium intensity.

5) Combination of bounding with vertical jump

Equipment:

None

Starting action:

Stand on one feet.

Action:

Do a combination bounding sequence left - left - right, then follow immediately with a strong vertical jump. On the third bound, bring the non-bounding foot up to meet the bounding foot. So that the jump is off both feet. So that the jump is off both feet. Use a double arm swing to assist in lifting you vertically. As soon as you land from the vertical jump, complete another bounding sequence.

Repetitions and sets:

Performed with the high intensity.

6) Depth jump to prescribed height

Equipment:

A box 30 cms high placed in front of an elevated wall marked with colour chalk.
Start:

Stand on the box, toes close to the edge and facing the wall.

Action:

Step off the box and land on both feet. Immediately jump up, reaching with one hand towards the marks on the wall and then do repeated jumps, alternating hands and trying to reach the marked object on the wall each time. Time on the ground should be very short with each jump being as high as the one before. Perform 3 wall jump after each depth jump.

Repetitions and sets:

Performed 3 repetitions of 4 sets with 2 minutes rest between each set.

Intensity rating:

Performed with medium intensity.

3.5 Procedure of the Study

3.5.1 Procedure of Preparatory stage to conduct experiment

This study was conducted at Mumbai (Maharashtra), the researcher consulted the Heads of schools and identified eighty (n=80) athletes, age: 14-18 yrs., from the selected schools/colleges situated in Mumbai.

The names of the athletes were enlisted and the purpose of this research project was discussed with athletes in the presence of the Principal and sports coach. The principal/coach has given consent about their student’s participation as subjects in this project. The project was conducted after school hours so that the daily class routine was not disturbed. The age group of the subjects was recorded from the date of birth as enlisted in the schools’ record.
3.5.2 Procedure of Pre-test

The investigator conducted the pre test on the subjects with consent in writing form from the athletes. Each subject was given individual code number i.e. Case number and record card was prepared by the investigator so that they can be identified easily.

All the subjects were strictly instructed to arrive at each station made for testing the variables to collect data on the selected variables. Four professionally qualified and trained assistants controlled each station for pre-test data collection.

Demonstration of the test was given and question asked by the subjects were explained and doubts, if any, were clarified.

Standard procedures were followed for testing the entire variables selected for. Then the group division was made into four groups viz., Group- I (Yoga training), Group- II (Plyometric exercise), Group -III (Plyometric exercise + Yoga) and Group- IV (Control) where each group represents 20 subjects.

3.5.3 Procedure of Daily Administration of Training Interventions

Training programmes on Yoga and Plyometric exercise were scheduled separately. Although attendance of the subjects was taken regularly, the percentage of attendance of majority of the participants after completion of training was found more than 80%. In fact, some of the students were dropped out because of irregular attendance. However, in a regular class the students were demonstrated and explained while new movements / treatment are introduced. Any question asked by the students has been clarified. They were also motivated properly.
3.5.4 Procedure of Post-Test

Post-test was conducted like pre-test, where all the subjects were strictly instructed to arrive at each of the testing stations which were made for collecting data on the selected variables. Same procedures, as followed in pre-test, were performed for tests administration among all the subjects belonging to experimental and control groups.

3.6 Statistical Procedure

Descriptive statistics was applied prior to employing inferential statistics. As there were four equated groups (viz., yoga, plyometric, yoga plus plyometric and control) participated in different training interventions for a particular duration of time, where the nature of the variables were different (i.e., fitness and sprint performance), the data were analyzed by employing “ANCOVA” (analysis of covariance) followed by Scheffe’s post hoc test.