CHAPTER III

METHODOLOGY

This research study was carried out with the purpose to find out the efficacy of breathing exercises and pranayama practices on specific physical fitness and performance in discuss throw event 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 twelve weeks.

The Experiment

(a) Sampling

Eighty elite male athletes, age: 18-20 yrs., were selected as sample for the experimental study. For this, a purposive sampling technique was used to locate the elite athletes from different athletic clubs in Nadurbar District of Maharashtra. 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: \( n_3 = 20 \)) & ctrl gr (Gr IV: \( n_4 = 20 \)). The consent from the subjects was taken in writing and assurance was obtained that they will undergo all testing program.

Inclusion and Exclusion Criteria

- Male students aged 18 to 20 years were included.
The subjects who agreed to sincerely attend the training programme were allowed to participate in training protocol.

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**

There were dropouts due to various reasons. One subject from group-II, three subjects from Group-III and two subjects from Group-IV were irregular in the experiment. Thus, total six subjects were dropped out from the experiment.

(b) Allotment of training interventions and Phases of Experiment

Group I received specially designed **breathing exercises** training, Group II received **Pranayama practices**, Gr. III received **Breathing exercises plus pranayama training** whereas Gr. IV participants does not received any special training. Further, practice of discus throw was also administered to all the subjects of the four groups. The experiment was carried out in three parts as follows:

- Stage – I: Baseline assessment.
- Stage – II: Specially designed Training, &
- Stage – III: Post Assessment.

Pre – Test (phase – I)

The participants of all the groups including control group were assessed for the status of selected morphological, physical fitness, psychological, physiological variables and performance in discus throw event to record pre-test data.

Treatment stimuli (phase – II)
After assessment for the status of all the selected parameters the subjects were allowed to participate in respective exercise training intervention whereas, 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 45 minutes daily in the morning excluding general holidays and Sunday for one and half month.

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

- Group I – Breathing exercise
- Group II – Pranayama practice
- Group III- Breathing exercise + Pranayama
- Group IV- Control

One yoga teacher and one expert in breathing 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, the subjects from intervention groups and wait list control group were again administered the selected morphological, physical fitness, psychological, physiological variables and performance in discus throw event 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 used</th>
<th>Criterion measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Morphological Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td>Stadiometer</td>
<td>Nearest to 0.05 cm.</td>
</tr>
<tr>
<td>Weight</td>
<td>Weighing machine</td>
<td>Nearest to 0.1 gm</td>
</tr>
<tr>
<td>Body mass index</td>
<td>Height in M²/Weight</td>
<td>Index</td>
</tr>
<tr>
<td>Girths of arm, chest, thigh and calf</td>
<td>Gaullick tape</td>
<td>Nearest to 0.05 cm.</td>
</tr>
<tr>
<td><strong>Physical fitness Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoulder strength</td>
<td>Throwing a 200 gm ball for a distance</td>
<td>Nearest to 0.05 Cm</td>
</tr>
<tr>
<td>Explosive power of leg muscles</td>
<td>Standing broad jump</td>
<td>Nearest to 0.05 Cm</td>
</tr>
<tr>
<td>Strength of abdominal muscles</td>
<td>Sit ups</td>
<td>Nearest to 1 No.</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Sit &amp; reach</td>
<td>Nearest to 0.05 cm.</td>
</tr>
<tr>
<td>Breath holding time</td>
<td>Stop watch</td>
<td>Nearest to 0.005 sec.</td>
</tr>
<tr>
<td>Balance</td>
<td>Balance rail</td>
<td>Nearest to 0.005 sec.</td>
</tr>
<tr>
<td><strong>Psychological variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sports anxiety</td>
<td>Questionnaire</td>
<td>Points</td>
</tr>
<tr>
<td>Mental Health</td>
<td>Questionnaire</td>
<td>Points</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------</td>
<td>--------</td>
</tr>
<tr>
<td><strong>Physiological variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resting PR</td>
<td>Digital blood pressure monitor</td>
<td>Beats /min</td>
</tr>
<tr>
<td>Resting BP</td>
<td>Sphygmomanometer</td>
<td>mm.Hg.</td>
</tr>
<tr>
<td>Resting RR</td>
<td>Stopwatch</td>
<td>Nearest to 0.005 sec.</td>
</tr>
<tr>
<td><strong>Discus throw</strong></td>
<td>Discus for men of senior category</td>
<td>Meter (M).</td>
</tr>
</tbody>
</table>

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

### 3.2.2 Designing Independent Variable

Breathing exercises and pranayama practices and their combination were included as an independent variable in this study.

#### 3.2.2.1 Designing Breathing Exercise Training Schedule

Independent variable, representing breathing exercise for the experimental Group I, was constituted with certain breathing exercises. They have been included in the training schedule on the basis of the following:

- Breathing exercise in proper way has many health benefits. Breathing in controlled manner can be a best tool to reduce stress and helps to relax, improves tone of skin, sound sleep. Further, it can help in reducing weight. However, most of people found to be breathing incorrectly and are not aware of it. Hence, are deprived of being receive benefits of proper breathing. In fact, we can get all the benefits if we do correct breathing. Once we re-learn how to
breathe correctly we can use the breath when it is most needed during stress. Many of us are aware that we normally take shallow, minimal breaths, just barely enough to survive.

- It has been observed that people tend to use only twenty percent of their lung capacity. Various studies have been conducted to test how much of our brain cells are used. Further, it has been assessed that how lungs are functioning to its fullest extent. It is important to note that human being are using very limited portion in all these areas inspite the organs have more potential. The toxic element such as carbon dioxide is eliminitaed through respiratory system which comes to around 70 percent. When we allow our body to accumulate toxins we are going to develop disease or disorder.

**Inclusion of Deep Breathing**

Certain deep breathing techniques have been included in this study, since they have the following benefits:

1. Deep breathing improves blood circulation to various organs and that to with more oxygen. This activity aids in elimination to toxins from the respiratory system.

2. Improvement in digestion and absorption of nutrients to the fullest extent is observed after practice of deep breathing. Due to proper breathing circulation improves and more oxygen is received by stomach that in turn improves efficiency of digestive system.

3. Nervous system receives more oxygen due to deep breathing. The brain, nerves, spinal cord as well as peripheral nerves work efficiently due to proper oxygenation. This brings in homeostasis and improvement in overall health. The communication between various parts of the body is also improved.

4. The endocrine glands such as pineal and pituitary can be rejuvenated due to more oxygenation. Further, it has bee found that brain requires three times more
oxygen that the rest of body which can be achieved through use of proper breathing techniques.

5. The facial wrinkles are also reduced and skin is rejuvenated by breathing techniques.

6. Due to deep breathing techniques the organs in the abdominal cavity receives massage. The vital organs present in abdominal cavity i.e. liver, stomach, intestines & pancreas work efficiently. The blood circulation is also improved because upper movement of diaphragm massages heart.

7. The lungs become powerful and healthy due to utilization of proper deep breathing techniques.

3.2.2.2 Designing Pranayama Training Schedule

1. Since pranayama refers to slow and steady breathing, it minimizes the work load on heart. The result is a more proficient, stronger heart that operates better and lasts longer. Also maintenance of blood pressure at optimum level and healthy heart.

2. Pranayamas found to reduce the work load on heart in two ways. Firstly, the techniques involved in pranayama practices improves efficiency of lungs, which indicates that the blood moving from heart to lungs receives more oxygen. Therefore, heart need not have to work hard to provide oxygen to the tissures. Secondly, pranayama change the pressure difference in lungs that leads to increase in circulation thereby providing rest to the heart.

3. Weight can be controlled by pranayama practices. As pranayama leads to provide more oxygen which is utilized for burning of excess fat more efficiently. Further, if someone is underweight, the oxygen is provided to the starving tissues and glands. In other words, pranayamic breathing in yoga tends to produce the ideal weight.
4. Pranayama relaxes the mind and body and causes a reflex stimulation of the parasympathetic nervous system, which results in a reduction in the heart rate and relaxation of the muscles. These two factors cause a relaxation of the mind and body, since they are very interdependent. In addition, oxygenation of the brain tends to normalize brain function, reducing excessive anxiety levels.

Overall, it has been found that the pranayama causes an increase in the elasticity of the lungs and rib cage. This in turn creates an increased breathing capacity throughout the day, not just during the actual practice period.

### 3.2.2.3 Composition of Breathing Exercise Training Interventions

Following breathing exercise training intervention was imparted to the experimental group I for the duration of 45 mins for a total period of eight weeks (Table 3.1).

**Table 3.1**

<table>
<thead>
<tr>
<th>Breathing Exercises</th>
<th>1st – 2nd Week</th>
<th>3rd – 4th Week</th>
<th>5th -6th Week</th>
<th>7th – 8th Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Blowing a burning candle</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>• Bubbling of water 1-1-1</td>
<td>Contd.</td>
<td>Contd.</td>
<td>Contd.</td>
<td></td>
</tr>
<tr>
<td>• Ballooning 1</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>• Inhaling through pipe (mouth) 1-1-1</td>
<td>Contd.</td>
<td>Contd.</td>
<td>Contd.</td>
<td></td>
</tr>
<tr>
<td>• Blowing through mouth 1-1-1</td>
<td>Contd.</td>
<td>Contd.</td>
<td>Contd.</td>
<td></td>
</tr>
<tr>
<td>• Inhaling through mouth 1-1-1</td>
<td>Contd.</td>
<td>Contd.</td>
<td>Contd.</td>
<td></td>
</tr>
<tr>
<td>• Exhaling through nostril 1-1-1</td>
<td>Contd.</td>
<td>Contd.</td>
<td>Contd.</td>
<td></td>
</tr>
<tr>
<td>• Hold the breath after inhaling 1-1-1</td>
<td>Contd.</td>
<td>Contd.</td>
<td>Contd.</td>
<td></td>
</tr>
<tr>
<td>• Hold the breath after</td>
<td>Contd.</td>
<td>Contd.</td>
<td>Contd.</td>
<td></td>
</tr>
</tbody>
</table>
exhaling 1-1-1

N.B.-Duration of exercises increased in every week.

3.2.2.4 Composition of Pranayama Training Interventions

Blue print of schedule of pranayama training intervention has been presented below (Table 3.2):

<table>
<thead>
<tr>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Breathing (10) Anuloma-Viloma (2-10) Kapalbhati (5-10) Bhashrika (5) 1 Om Recitation (5-10) Sit silently (breathing awareness for 5 mins.)</td>
<td>Ujjayi Anuloma-Viloma (10) Kapalabhati (10-30) Bhashrika (5-25) 2 Om recitation (10) Sit silently (breathing awareness for 5 mins.)</td>
<td>Ujjayi Bhashrika (25-40) 2 Om recitation (3) Sit silently (breathing awareness for 5 mins.)</td>
<td>Ujjayi Bhashrika (40) 2 Om recitation (3) Sit silently (breathing awareness for 5 mins.)</td>
</tr>
</tbody>
</table>

It is important to note that yoga training comprises of eight practices (yama, niyama, asana, pranayama, pratyahara, dharana, dhyana and Samadhi), which are complimentary to each other. It is very difficult to assess the effect of one particular type of yoga practice. Likewise, in general, asanas are practiced prior to the practice of pranayama, because they are complimentary to each other. However, as this project has specially designed to record the effect of pranayama, some of the basic asanas were introduced. They are –

1st – 2nd Week
Shavasana, Crocodile (4), Ardhahalasana, Niralambasana, Naukasana, Sarpasana, and Paschimottanasana, Vrikshasana, Deep Breathing (10), Anuloma-Viloma (2-10), Kapalbhati (5-10), Bhasrika (5) 1 Om Recitation (5-10), Sit silently (breathing awareness for 5 mins.)

3rd – 4th Week
Shavasana, Pawanmuktasana, Naukasana, Viparitakarani, Matsyasana, Ujjayi, Anuloma-Viloma (10), Kapalabhati (10-30), Bhasrika (5-25) 2 Om recitation (10), Sit silently (breathing awareness for 5 mins.).

5th -6th Week
Shavasana, Sarvangasana, Matsyasana, Yogmudra, Ujjayi, Bhasrika (25-40) 2 Om recitation (3), Sit silently (breathing awareness for 5 mins.).

7th – 8th Week
Shavasana, Sarvangasana, Matsyasana, Yogmudra, Ujjayi, Bhasrika (40) 2 Om recitation (3) Sit silently (breathing awareness for 5 mins.).

3.2.2.5 Composition of Breathing exercises plus Pranayama Training Interventions

Blue print of schedule of pranayama training intervention has been presented below (Table 3.2):

<table>
<thead>
<tr>
<th>Breathing Exercises plus Pranayama</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhaling through pipe (mouth) 1-1-1</td>
<td>Contd.</td>
<td>Contd.</td>
<td>Contd.</td>
<td></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:

**A) MORPHOLOGICAL VARIABLES**

1. Height

To assess standing body height of participants from all groups.

*Equipment:*

Measuring tape attached perpendicularly to the flat surface scale etc.

*Procedure:*

Each subject one by one, stands on the flat surface adjacent to the perpendicular wall where the measuring tape has been fixed. Students stand without shoes or chappals in front of the wall (fixed with tape) heels, buttocks, upperback and back of the head making firm contact. The scale was placed on the subjects head that forms right angle to the wall as well as to the measuring tape. Keeping the scales in its position, the subject is instructed to move away and the scores of height it was recorded.

*Scoring:*

The height was measured in centimeters.

2. Weight
**Purpose:**

To measure the total body weight of students.

**Procedure:**

Each subject one by one, stands on the flat surface of the weighing scales which was kept on a hard surface. Subjects were not allowed shoes or chappals while standing on the machine. They were instructed to wear minimum clothes and then stand erect by keeping equal weight on both legs and by looking in front. They were restricted to move body while standing on the machine. Keeping the machine in its position the investigator took the reading from the pointer associated with a scale indicating body weight.

**Score:**

The score was recorded in Kg neared to 0.5 Kg.

3. **Body mass index**

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.

4. **Girths**

a. **Arm**

- aim: To assess perimeter of arm, that assess adipose tissue and musculature. Girth assessment in combination with skin fold measurements are able to produce a clearer picture of distribution of fat and muscle.
• equipment required: Tape used for anthropometric measurement and pen suitable for marking skin.

• description / procedure: Generally, arm circumference was assessed from the right part of body. The participant was asked to raise arm in horizontal position with elbow at around 45 degrees. The subject asked to contract biceps muscle maximally, and the largest circumference is measured. While recording it was ensured that the tape was not too tight or loose.

b. Chest

• To assess girth of chest.

• equipment required: anthropometric measurement tape and suitable marker.

• procedure: The circumference of chest is at the level of sternum, the tape was passed under the arms of participant. When the tape was in position, the participants were asked to relax the arms by the side of body, and the measurement was taken after expiration.

• advantages: low cost is required for this procedure.

c. Thigh

• aim: To assess perimeter of the thigh, as a measure of underlying adipose tissue and musculature.

• Instrument needed: anthropometric measurement tape and marker.

• procedure: Marking is done before actual measurement. Measurement is done on right side of the body. The subject was asked to standstill with about one feet distance between the legs.

d. Calf
• **Aim:** To assess perimeter of calf, as a measure of the underlying adipose tissue and musculature.

• **Instrument needed:** anthropometric measurement tape and marker.

• **procedure:** Marking is done before actual measurement. Measurement is done on right side of the body. The subject was asked to stand still with approximately one feet distance between legs.

**B) PHYSICAL FITNESS VARIABLES**

1. **Shoulder Strength**

*Purpose*

To measure the power of arms.

*Equipment*

Shot put circle, Medicine ball, Measuring tape etc.

*Instruction*

Students sit erect in the centre of the circle with adequate distance in legs. He holds the ball (medicine ball) in front of the chest with elbows stretched out and parallel to the floor. Student then throws (like chest pass) the ball in forward direction as far as possible. Care should be taken that the student doesn’t get up or touch the lines while throwing the ball.

*Scoring*

Farthest distant taken to the nearest cm from the first bounce to the outer edge of the circle. The tape should be held upto the centre of the circle.

2. **Explosive power of leg muscles**

*Rationale*
To assess power of leg muscles.

**Instrument & Facilities**

Measuring tape & outdoor jumping pit.

**Procedure**

The participant was asked to stand behind the starting line. Before jumping the participant was asked to dip into knee and swing the arm, backward then allowed taking jump forward by simultaneously extending the knees and swinging arms forward. Three practices were given before actual measurement.

**Instructions**

You may take off from both feet simultaneously jump forward as fast as possible and land on both feet. You can jump further by crouching before the jump and swinging your arms.

**Scoring**

The score is the distance between take off line and nearest point when body of student touches measured in feet an inches best of 3 trials is recorded.

**3. Strength of abdominal muscles**

**Purpose:**

The objective of this test is to complete as many partial curl-ups as possible at a rhythmic pace.

**Equipment:**

Stopwatch, Mat, Evolution Sheet, Pencil.

**Procedure:**
• The subject was asked to lie on his back with knees flexed and feet on the floor with approximately twelve to eighteen inch distance between heels.

• Then the subjects were asked to do the finger lock with arms placed under the head.
• The feet of the testee were held by his partner so that the feet will not be lifted during actual sit up.

• With tightening of abdominal muscles, subject was asked to curl to sitting position.

• One sit up completes when the subject touches his head to knees.

• To complete one sit up the participant was asked to return to his down position with back resting on surface of floor/mat.

The counting of sit up was started when the tester gives a signal to the subject and stopped after completion of one minute. The numbers was recorded for correct sit ups.

Scoring:

The performance in sit up was recorded in number after completion of one minute.

4. Flexibility

Purpose:

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

Equipment:

The instrument is nothing but box with measuring tape mounted on the box.
**Procedure:**

- The participant was asked to remove his shoes before starting the test.
- The examinee was asked to sit in front of the instrument i.e. flexibility body with feet touching the end of board.
- The subjects were asked to keep legs extended and the distance between the feet was kept approximately 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 farthest 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.

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. **Balance**
Objective:

The objective of the test *Standing Stork Test- Blind* is to record the balance time in static position.

Materials:

Stopwatch.

Procedure:

- At the beginning of actual test the subjects were instructed to warm up for ten minutes.
- The subject stands comfortably with hands on the hips.
- The subject is asked to lift the right leg and place the sole of the right foot against the side of the left kneecap and close both eyes.
- Next the on the command “GO”, start the stopwatch and the subject is instructed to raise the heel of the left foot to stand on the toes.
- The subject has to hold this position as long as possible.
- When the subject touches left heel to the ground or the right foot moves away from the left knee the time is recorded.

C) PSYCHOLOGICAL VARIABLES

1. Sports anxiety

The researcher has gone through many literature related to the availability of Indian adapted psychological tests on sports anxiety, motivation and aspiration, which have been selected in this study. However, the researcher has administered all these tests as developed and standardized by Bera (1993). The reliability coefficients of these
tests (sports anxiety, motivation and aspiration) were 0.73, 0.76 and 0.74 respectively, whereas the validity coefficients were 0.70, 0.78 and 0.75 respectively.

2. Mental health

**Instrument:**
Mental health inventory (Jagdish & Srivastava 2005)

The mental health is defined as person’s ability to make positive self-evaluation, to perceive the reality, to integrate the personality, autonomy group oriented attitudes and environmental mastery. This questionnaire has 72 items which are distributed in six dimensions which are as follows:

1. **Positive Self-Evaluation (PSE):** It involves self acceptance, self confidence, feeling of worth whileness, self identity, and realization of one’s potentialities etc.
2. **Perception of Reality (PR):** PR is related to perception free from need of distortion, broad outlook on the world, and absence of excessive fantasy.
3. **Integration of Personality (IP):** This indicates balance of psychic forces in an individual & includes ability to understand & to share other’s emotions, interest in various activities, and the ability to concentrate at work.
4. **Autonomy (AUTNY):** This includes stable set of standards for a person’s action, self dependence rather than dependence on other person.
5. **Group Oriented Attitudes (GOA):** This is associated with ability to get along with other people, work with them and their ability to find recreation.
6. **Environmental Mastery (EM):** This includes efficiency in facing various situations and meeting their requirements, person’s ability to work and play, capacity for adjustment, and ability to take responsibilities.

**Reliability of the Inventory:**

The reliability of the inventory was determined by split half method using odd-even procedure. The reliability coefficients of different dimensions of mental health and overall are presented below:
<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Reliability Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Positive self evaluation</td>
<td>0.75</td>
</tr>
<tr>
<td>2. Perception of reality</td>
<td>0.71</td>
</tr>
<tr>
<td>3. Integration of personality</td>
<td>0.72</td>
</tr>
<tr>
<td>4. Autonomy</td>
<td>0.72</td>
</tr>
<tr>
<td>5. Group oriented attitudes</td>
<td>0.74</td>
</tr>
<tr>
<td>6. Environmental competence</td>
<td>0.71</td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td><strong>0.73</strong></td>
</tr>
</tbody>
</table>

**D) PHYSIOLOGICAL VARIABLES**

1. **Pulse Rate**

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

2. **Blood pressure**

   *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.

### 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 Breathing Exercises

**A) Blowing a burning candle**

*Facilities and equipment:*
Measuring tape, candle, match box and gymnasium.

**Procedure**

A burning candle is kept at a distance of 50 cm from the subject. This activity is done in gymnasium. Subject is asked to blow off the candle from the measured distance. After the candle was blown off the subjects were given rest of 30 seconds. This exercise was practiced thrice.

**Instruction:**

Subject was not allowed to come forward while blowing the candle. Subject was asked to remain in a parallel position so that the candle is blown from the closest position. Leaning forward was discouraged.

**B) Bubbling of Water**

**Facilities and equipment**

- Straw, glass, water, stopwatch.

**Procedure:**

A glass was filled with tap water. Student was instructed to blow continuously with the help of straw immersed in the glass full of water. Water was bubbled till 1 minute without stopping. Rest of 30 seconds was granted between three set of exercise.

**Instruction:**

Subjects were strictly instructed to bubble water continuously for 1 min without withdrawing straw from the glass. Water used for this experiment was hygienic.

**C) Ballooning**

**Facilities and equipment**

- Balloon, carton.
**Procedure:**

A balloon was placed in a carton of 5 litre size. At one end of the carton a nozzle was made. Balloon was blown from the nozzle. Balloon was blown till the carton is fully covered. One set of this exercise was performed.

**Instruction:**

While blowing the balloon nozzle has to be closed regularly so that air does not escape through nozzle.

**D) Inhaling through pipe**

**Facilities and equipment**

Pipe, water and vessel.

**Procedure**

A pipe measured 1 meter is kept in a vessel full of water. From the open end the water is forcefully suck till the pipe is fully filled upto the measured mark, 45 seconds rest is taken between two sets. Three sets of exercise performed.

**Instruction**

Pipe must be perpendicular to the ground.

**E) Exhaling through nostril**

**Facilities and equipment**

Table tennis ball, block of 1 meter x 2" (boundary)

**Procedure:**
Area of length and width 1 meter x 2" is required. Table tennis ball is placed at the starting point. Table tennis ball is blown through nostril. Ball is drawn towards the mark of 1 meter end point. Three sets of this exercise are performed.

**Instruction:**

Floor should be of uniform level. Table tennis ball of ‘triple crown’ was used.

**F) Blowing through mouth**

**Facilities and equipment**

Table tennis ball, block of 1 meter x 2"

**Procedure:**

Table tennis ball is blown through mouth till it reaches 1 meter mark. Three sets of exercise are performed.

**G) Hold the breath after inhaling**

**Facilities and equipment**

Bucket full of water, stopwatch

**Procedure:**

Take bucket full of water. A student deep exhale followed by deep inhaling then holds the breath in bucket full of water for 45 seconds. 30 second rest is granted in between two sets. Three sets are performed.

**Instruction:**

Research scholar has to give command of holding the breath and discontinue after 45 seconds.

**H) Hold the breath after exhaling**

**Facilities and equipment**
Bucket, water, stopwatch

**Procedure:**

Take bucket full of water. Student exhales then holds the breath inside the bucket full of water for 10 seconds. However, for a second trial 30 second rest is given.

### 3.5 Description of Pranayama

#### 1) Kapalabhati

Kapalabhati is classed as one of the six cleansing processes in yoga. Kapala, in Sanskrit, means ‘forehead’ and bhati means ‘to shine’ hence the name, it removes impurities from the passage of the nostrils and the sinuses by the forceful of the air. This is done in sitting position. Form a foot-lock by placing 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 abdominal strake at the navel region. Let the abdomen relax and simultaneously inhale. In the beginning practice 10=20 rounds of kapalabhati. The number of strake and the speed may be increased as one gets used to the practice.

**Stages for Practice**

**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 and forcibly given an inward stroke at the navel region.
- Relax the abdomen completely and inhale.
- Repeat the forceful exhalation and inhalations a number of times comfortably.
- Lower the chest.
• 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 to the starting position.

**Important Points to Remember**

**Do’s**

• Sit erect while doing Kapalbhati.
• Soon after exhalation relax the abdomen fully and inhale, son after inhalation, do forceful exhalation.

**Don’ts**

• Avoid all contortions on the face.
• Avoid the chest movement.
• Avoid doing Kapalbhati with loaded stomach

**Expected Learning Outcomes**

• Keeps the respiratory passage clean.
• Helps to promote blood circulation in the whole body.
• Helps to increase the efficiency of the respiratory system.

**Physical Benefits**

• Kapalbhati cleanses the nasal passages, lungs and entire respiratory system.
• It strengthens and increases the capacity of the lungs and the inter costal muscles.
• Bronchial congestion is removed as is spasm of the bronchial tubes; consequently, asthma is relieved and cured over a period of time.
As the lungs are cleansed, excess carbon dioxide is eliminated. This permits the red blood cells to suck in more oxygen, increasing the richness of the blood.

This blood is purified and towed. The body gets an increased supply of oxygen to all cells.

The abdominal contractions of Kapalbhati massage the liver, spleen pancreas, stomach and heart, thus invigorating them. Abdominal muscles are strengthened, digestion is improved.

**Mental / Psychic Benefits**

- Kapalbhati refreshes and invigorates the mind.
- It brings an increase in alertness as a result of the increase of oxygen to the brain.
- It creates a feeling of exhilaration.
- Kapalbhati activates panic energy.

**2) Anuloma-Viloma**

It is classed as a type of pranayama. In pranayama controlled breathing is insisted upon, when the breath is unsteady, the mind is unsteady, but when the breath is still, the mind is also still. In Sanskrit, anuloma means towards and loma or viloma means ‘reverse’. It is also called toma-viloma, one inhales through the left nostril, holds the breath and exhales it through the right nostril and again inhaling through the right nostril and holding the breath, exhales through the left nostril. This completes one round of the Anuloma-Viloma.

Maintain a time ratio of 1:3 between the inhalation and the exhalation i.e. if inhalation is for five seconds then exhalation should be for 10 seconds. While doing this
practice keep a control over the abdomen. One may start with five rounds and slowly go on increasing the rounds up to ten or even more.

**Stages for Practice**

**Starting Position** – Sitting in Padmasana or in other comfortable posture.

- Keep the body erect and place the hands on the respective knees.
- Raise the right hand and place the right thumb on the right nostril and close it inhale slowly through the left nostril.
- Close the left nostril by using only the ring and the little fingers and exhale slowly through the right nostril in a ratio of 1;2 between the inhalation and the exhalation.
- Again inhale through the right nostril.
- Now exhale through the left nostril.
- Repeat the stages 2 to 5 at least five times.
- Place the right hand on the right knee.
- Stop the practice and release the posture.

**Important Points to Remember**

**Do’s**

- Slowly inhale the air with out bulging the abdomen.
- Exhale the air by pressing the abdomen in.
- Keep ratio of 5;10 between the inhalation and the exhalation.

**Don’ts**

- Avoid producing any sound from the nose.
- Avoid pressing head on the nostrils.
- Avoid retaining breath in the beginning.
**Physical Benefits**

- Anuloma Viloma cleanses and strengthens the lungs and entire respiratory system.
- It harmonizes the entire system.
- During retention there is the highest rate of gaseous exchange in the lungs. Because of the increase in the pressure, more Oxygen goes from the lungs into the blood and more Co2 pass from the blood in to the lungs for elimination during exhalation.
- As exhalation is twice the time of inhalation, state air and waste products are drained from the lungs.
- The anabolic and catabolic processes of the body are brought into equilibrium.

**Mental Benefits**

- Anuloma Viloma helps to calm the mind making it lucid and steady.
- Practice of Anuloma Viloma purifies the nadis. It should be mastered and practiced on a regular basis before going on to more advanced pranayamas.
- Prana, the vital energy, is stored and controlled.
- It makes the body light and the eyes shine.
- The psychic system is balanced.

3) **Bhastrika Pranayama (The Bellows Pranayama)**

**Contra-indications** : Persons having any serious trouble in the lungs abdomen and throat should avoid this pranayama.
**First Variety**

**Technique**

**Starting Position**: Sit in Padmasana. Catch the knees firmly with the respective palms i.e. apply Drona Mudra Apply Moola Bandha

**Action**: The technique of Bhastrika can be roughly divided into two parts.

**First Part**: Retaining the Moola Bandha, expand the chest and fix it as in Kapalabhati. In the state of expanded chest and contracted lower abdomen, give a stroke at the middle portion of the abdomen i.e. The portion of the abdomen in between the ribs (epigastric region) and breathe out quickly and, immediately actively protrude the epigastric region to the original position and at the same time breathe-in quickly. In the same way perform quick cycles of breathing-in and breathing-out, one after mother, without stopping in between. This breathing will be active and with a frictional sound. Breathing will be shallow and rhythmic. Perform these cycles with increasing speed. Perform these breathing-in and breathing-out cycles till you feel short of breath and can not maintain the speed, finally do Rechaka fully and then complete the Pooraka slowly. From here, the second part of Bhastrika commences.

**Second Part**: After finishing the complete Rechaka, do the Pooraka through the right nostril somewhat slowly i.e. in about 8-10 seconds. At that time, keep the nasal passage free. After completing the Pooraka, start the Kumbhaka. Then by applying the Jalandhara Bandha, close the air-passage in the throat: Draw in the navel region (i.e.Uddiyana Peetha) and keep it in the same contracted position. Maintain an easy Kumbhaka as per capacity. After this, start the Rechaka. First release the jalandhara Bandha and take the head up. Close the right nostril with the right thumb and perform the Rechaka slowly through the left nostril. Prolong the Rechaka as much as you can with case and comfort.

**Eyes**: Keep the eyes closed throughout.
Attention: In the first part, let the attention be on the movements of the abdomen while in the second part of Pooraka, Kumbhaka and Rechaka, let the attention be on the lower abdomen.

Practice: In the first part, give 20 quick strokes, complete the easy Kumbhaka of the second part. Perform 3 Rounds in this manner.

While performing Bhastrrika along with Kapalabhati and Ujjayi pranayama, three Rounds of Bhastrrika are enough. However, if only Bhastrrika Pranayama is to be done, perform 18 to 36 Rounds according to the above.

Probable Mistakes and their Correction:

- Do not lean backward during the Pooraka and lean forward during the Rechaka. Keep the body erect.

- Do not move the torso during the performance of the first part of the pranayama.

- Avoid unnecessary contractions or movements of the facial muscles or the lower portion of the nose during the bellow-like breathing in the first part of the Pranayama.

- Do not exceed your capacity during Kumbhaka so that you are not starved for air and the subsequent operations are not upset.

- Do not bring the shoulders forward or bend them while applying Jalandhara Bandha during Kumbhaka.

Notes

- Practice the Bhastrika Pranayama after mastering the techniques of Kapalbhati and Anuloma-Viloma.
• If there is a desire and capacity, one can perform Easy Shoonya Kumbhaka also. Performing this is optional.

• It is all right to do the Rechaka through both the nostrils.

• There are many methods of performing Bhastraika Pranayama, short descriptions of some of these are given below for the information of eager sadhakas.

• In all these, the Rechaka (Breathing out ) and the Pooraka (Breathing in) in the first part are speedy, shallow and performed only by strokes given to the middle and upper abdomen.

• In some traditions during the stroke in the first part, sound is produced by closing the throat partially.

**Second Variety**

Partially close the throat while giving strokes in the first part. Produce sound during Rechaka and Pooraka. In the second part, do the Pooraka through the right nostril and the Rechaka through the left nostril. The remaining part of the technique is as given above.

**Third Variety**

In the first part, do the Pooraka and the Rachaka through the right nostril while giving odd numbered strokes i.e. 1,3,5,7 and so on. Keep the nasal passage free and during even numbered strokes i.e. 2,4,6,8 etc. do the Rechaka and Pooraka through the left nostril.

In the second part, leave the nasal passage free. During the odd numbered Rounds i.e. 1,3,5,7 etc. do the Pooraka through the right nostril, followed by Kumbhaka and finally do the Rechaka through the left nostril. For the even numbered Rounds i.e. 2,4,6,8 etc. do the Pooraka by the left nostril, followed by the Kumbhaka and finally do the Rechaka through the right nostril.
**Fourth Variety**

In the first part, quickly do the pooraka through the right nostril and the Rechaka through the left nostril with strokes till one feels short of breath and cannot maintain the speed.

Then in the second part, do the Pooraka through the right nostril, followed by the Abhyantara Kumbhaka and then finally do the Rechaka through the left nostril. Thus complete on Round. Follow this procedure for odd numbered Rounds i.e. 1,3,5,7 etc.

In the same way for the even-numbered Rounds i.e. 2,4,6,8 etc. perform Bhastrika as follows:

In the first part quickly do the Pooraka with the left nostril and the Rechaka through the right nostril with strokes at the abdomen till on feels short of breath and cannot maintain the speed.

In the second part do Pooraka through the left nostril. Then maintain Kumbhaka as per text i.e. with Tribandhas and finally do the Rechaka through the right nostril.

**Notes**

- Perform Bhastrika, keeping in mind the notes given under Kapalbhati and Ujjayi.

- Different methods of performing Bhastrika are prevalent in different traditions. One can practice any method which suits him/her.

- Perform Kumbhaka in Bhastrika within one’s capacity and which gives a happy feeling.

- The Pooraka and the Rechaka in the first part of Bhastrika are not slow as in other Pranayamas but fast and quick because they are the result of strokes. In the same way one should not forget that the Pooraka also in the second part is more speedy and reactionary compared to the Pooraka in other Pranayamas.
- some traditions (e.g., Gheranda Samhita) suggest 20 strokes in the first part of Bhashrika.

**Benefits**

- The benefit of Bhashrika Pranayama gives all the benefits of other pranayamas and Kapalbhati, with some differences.

- Both abdominal breathing and chest breathing are taken care of.

- Asthma, breathing problems, gasping for breath, inefficient breathing etc. are mitigated to a great extent.

- The Practice of Ujjayi, Kapalbhati, Anuloma-Viloma and Bhashrika are complementary to each other.

- Bhashrika Pranayama can be practiced in any season. Its practice keeps a balance between the Tridoshas i.e. Vata (air Principle) Pitta (bile) and Kapha (phlegm) in the body.

- Digestion function is activated and made more functional.

- Promotes spiritual progress.

- Emotional life gets balanced to some extent.

- Helps the mind to become peaceful and single-pointed i.e. concentration capacity is increased.

4) **Bhramari Pranayama**

The solemn sound of the ocean, the sounds made by the glow-worms on a dark night, the jingling of the ghungaroos, the serene sounds of church bells coming from a long distance at dawn, the whistle blown in a dense forest, the soft bubbling sound of a stream in an isolated place, the cracking sound generated in a bamboo jungle when the wind blows, the enchanting sounds of cymbals and mridanga coming from far away at night, the grinding sound coming out from the manual grind-stone on a quiet morning.
(With traditional songs), in the village, the tinkling sound produced by the bells around the necks of the bullocks while they tread slowly, the melodious sound coming out of a stringed instrument like a tambora at the crack of dawn with a pleasing devotional song, the high-pitch singing of the cuckoos from a mango grove at midday etc. are wonderful, magical sounds which bring a rare, unique and ecstatic pleasure human mind and ears. Many minute sweet and melodious vibration and resonance in the sounds have a soothing effect on the nerves and the mind. Many a times, such happiness could be like the pleasure one gets during Savikalpa Samadhi complete merging of the mind in the subject). Because of these capabilities of sound, it is called “ Nada Brahma ” Nada Brahma can bring about Gana Samadhi to both the singer and the listener. That is why supreme importance is given to sound in spiritual science.In Shambhavi Mudra, Shanmukh Mudra Ujjayi Pranayama, Bhramari Pranayama etc. use is made of these very sound vibrations for increasing the serenity of the mind and preparing it for merger with the subject. This is called “ Laya Yoga ” In Hatha Yoga, this is called “Nadanusandhana” It is practiced to arrest the fickleness and modulations of the mind. In this practice it is said that the sadhaka gets progress by practicing the initial stage, the ‘Ghata’ stage, the order. It is said that in these stages many sounds (Produced without friction) are also experienced by the sadhaka. From this one can gauge what a high place is given to vibrations and sound in Hatha Yoga.

While practicing Pooraka and Rechaka in Bhramari Pranayama , low but reverberating and pleasant humming sounds are produced similar to those made by the male bee and the female bee respectively. It is said that, with this vibrational sound, the body, mind and the chitta (cognitive affective and conative functions of man) become pleasant and the entire personality is filled with ecstasy. It is not surprising, therefore, that this Pranayama has proved to be the master key to the release of tensions in this modern tensionful world.

**Contra-indications** ; if there is a swelling or pain in the throat/nose or if the nose is choked, or if there is an extra growth of a bone or muscle in the nose, this Pranayama should be avoided.
Leading and Preparatory Practices: Practice Bhramari Rechaka and Bhramari Pooraka separately for a few days. Only after getting a good practice of both separately, one can combine these leading practices and produce a humming sound both in the Pooraka and in the Rechaka.

However, the ideal proportions of time between Pooraka and Rechaka should be practiced only after getting a good command over Pooraka and Rechaka.

Technique

Starting Position: Sit in any of the sitting postures. Apply Moola Bandha.

Action

Pooraka: Bring the soft palate and the throat near to each other and start performing Pooraka. A humming sound resembling Um as in “numb” is produced. In the beginning this sound is irregular, harsh and rough. However with practice, this sound becomes clear, vibratory sweet and humming. The sound would then be like that coming out of a stringed instrument i.e. sweet and attractive and humming, like that made by the male bee. Complete the Pooraka in the predetermined time such that Rechaka : Pooraka ratio is 2:1

Kumbhaka: The time taken for the Rechaka is twice that taken by the Pooraka. Therefore, the same air which is inside the lungs has to be released over a longer period at a slower rate and lesser volume. Therefore, the quality of the vibrational sound production in Rechaka is different. The pitch loudness, volume (of sound) and vibrations as also the timbre are less and, therefore this sound is mind-winning, more delicate, subtle and ringing, resembling the humming sound of a female bee.

Release the Jalandhara Bandha. Bring the inner part of the throat to the soft palate. Contract the chest slowly. Produce a mixed sound resembling in Omkara with the (nasal sound). Imitate the sound like that of a female bee. Let this sound reverberate and continue till the completion of the Rechaka. After completing the
Rechaka as above, continue the chain of Pooraka-Kumbhaka-Rechaka a number of times as per your desire.

**Gaze and Attention** : Keep the eyes closed and let the attention be on the exhilarating humming sound that is produced in Pooraka and Rechaka.

**Practice** : Health culturists may perform 10 to 30 Rounds one after another in a day, beginning with 5 Rounds and adding 5 Rounds each week.

After completing the desired number of Rounds, release the Moola Bandha and relax.

**Probable Mistakes and their Correction** : Leaning backward or forward during the Pooraka and Rechaka respectively should be avoided.

**Notes**

- In the beginning practice only Rechaka. The practice of simple Pooraka (i.e. without sound) and Rechaka with sound, increases one’s confidence, and the actor of producing sound during the Rechaka is made easy.

- In the beginning, while bringing out the sound during the Pooraka there is irritation of the throat and coughing is produced. At such times, stop the practice.

- First practice the art of producing the sound like that of a bee. In the beginning produce this sound only during the Rechaka. Afterwards, produce the sound during the Pooraka only. Practice sound production in Rechaka and in Pooraka Separately. Then practice only Pooraka and Rechaka, both with sound. Later, after these are mastered, practice Pooraka, Kumbhaka and Rechaka in the required rations.

- The joy of performing Bhramari at midnight when there is all-round peace everywhere is indescribable.
• In Gheranda Samhita it is said that if Bhramari Pooraka, Kumbhaka and Rechaka are practiced at midnight in a calm and quiet place, plugging the ears with fingers, a variety of sounds are experienced and the mind merges in them.

**Benefits**

• The ringing and melodious vibrating and sweet sound in Bhramari elevates and enchants the body and mind. Hence, Bhramari is called “Mood-elevating Pranayama.

• Mental stresses and strains are removed and, as a result, the whole body is relaxed. This is a golden key for sound sleep.

• All the systems of the body become activated.

• Mind becomes single pointed. Minor functional defects of the mind are kept at bay.

• This Pranayama is the best way to get rest, peace of mind and mental stability.

5) **Ujjayi Pranayama**

There is a tendency among common people to avoid even some beneficial things if there are strict and numerous difficulties and restrictions. The common people, while playing cards, prefer rummy to bridge, and prefer carom to the intellectual game of chess. This is the nature of man from times immemorial and it will continue for ever. This is the same reason why many persons, fearing Yamas and Niyamas in Yoga, keep themselves away from them. In Hatha Yoga there is a very beneficial Pranayama practice which even such persons would like and its name is “Ujjayi Pranayama”

This Pranayama, when compared to the other types of Pranayamas, has less restrictions and more benefits. The first advantage of this is i.e. Ujjayi Pranayama can be practiced while walking, sitting or standing.
Such a concession is given for this Pranayama. Secondly, it is said that in this Pranayama, Kumbhaka can be maintained according to one’s capacity. This means that it is not a must to keep the traditional restrictions of ratio between Kumbhaka and Pooraka / Rechaka while practicing this Pranayama. Because of these concessions, common sadhakas feel relieved. Even with these concessions, the benefits accruing from this Pranayama are not less. The particular benefits derived from this Pranayama are such as to attract no only the spiritual sadhakas but also the commoners.

This Pranayama can be practiced while walking even without the application of any Bandhas. Due to these advantages, even persons leading fast life-styles in big cities like Mumbai (Bombay), Chennai (Madrass), New York, London, Paris etc. can practice this Pranayama, if they so wish. One can take advantage of this Pranayama practice while going to the station, while waiting for the bus at the bus at the bus stop or even while traveling in the bus or train. Such a practice, however, is not ideal. From the point of view of the maxim something is better than nothing, it has some importance. Therefore, due its extra ordinary characteristics, this Pranayama is a boon to the common urban Yoga sadhakas leading busy city life-styles.

The word “Ujjayi” is derived by prefixing the word “Jai” with “Ud”. “Ud” means with force or speed and “Jai” denotes success. From this “Ujjayi” would mean “Sound Proclaiming Victory”

While practicing Ujjayi, a sweet, melodious whistling sound is produced from the throat. It is possible that this Pranayama was given the name Ujjayi taking the sound as denoting the proclamation of victory (Jaijaikar). If one sees from another point of view “Ud” means ‘Great’ and “Jai” means success. The one who practices it gets great success- this meaning can also be taken of the word “Ujjayi”.

**Contra-indications:** Persons having throat infections, acute disorders particularly of the lungs or blockage of then nose should avoid this Pranayama.

**Caution**
The sound comes through the throat. It should not be nasal. If the heaviness in the head, giddiness etc. occur, it is better to stop the practice of the Pranayama.

Faulty or excessive Pooraka can have ill-effects on the lungs.

**Technique**

**Starting Position** : Sit in Padmasana (If this is not possible, sit in Sukhasana or Swastikasana). Let the palms be in Padma Mudra. Let the gaze be on the tip of the nose (Nasagra Drishti) or normal aply Moola Bandha.

**Actions** : Pooraka, Abhyantara Kumbhaka and Rechaka are the three important phases of Ujjayi Pranayama. (Note: if Bahya Kumbhaka is done it is the fourth phase of the Pranayama. It is all right if common people omit this part.)

The actions in each phase are independently described below.

(First determine the length, speed and time required for Rechaka and adjust the time for Pooraka accordingly). Breathe out completely and be ready for Pooraka.

**Pooraka** : Pooraka means controlled and complete breathing-in. While doing Pooraka, air is taken in through both the nostrils.

Constrict the throat (i.e. partially close the glottis) leaving some small space for the air to enter. First raise the shoulders. Afterwards, contract the muscles between the ribs so that the chest will be expanded and the ribs will be raised. At the same time contract the diaphragm such that the dome-like muscles will comes down and the lower part of the chest will expand more. As the void enlarges more and more, the outside air will go on entering. While doing so, due to the partial constriction of the throat, the air will enter with friction and a whistling-like but sweet and self-experienced clear sound will emerge. Keep your mind on this sound. Ensure that this sound is of the same volume, uniform but minute and clear, from the beginning to the end. If the expansion of the chest is done slowly and mythically, the Pooraka also becomes mythmic. Keep your attention on the whistling sound produced during the Pooraka.
Abhyantara Kumbhaka

**Caution**

- This is the most beneficial and at the same time, most effective part in the Pranayama. Caution should be exercised during this phase.

- The forceful application of Kumbhaka can possibly damage the air sacs in the lungs.

First constrict the throat fully and tie the tongue up the palate i.e. apply Jivha Bandha (See note below) Let the chin touch the chest. Fix the chin firmly in the depression in the upper part of the chest i.e. apply Jalandhara Bandha. Let the gaze be between eyebrows (Bhrumadhya Drishti) and keep your attention on this area. At the same time, take the navel region (i.e. Uddiyama Peetha) inward i.e. apply Uddiyana Bandha. This is the Uddiyana Bandha in the Abhyantara Kumbhaka.

Maintain the Tribandha (i.e. Moola Bandha, Jalandhara Bandha and Uddiyana Bandha) comfortably. With case and according to your capacity.

Afterwards, first release the Jalandhara Bandha. Straighten the face release the Bhrumadhya Drishti and closing the right nostril, start the Rechaka through the left nostril.

**Rechaka**

Caution: If the Rechaka is prolonged or intermittent or if control on it suddenly lost, this can possibly strain the heart.

Rechaka should be for double the time taken for the Pooraka, continuous and slow. Before starting the Rechaka, constrict the throat partially so that the out-going air produces a rhythmic, whistling-like frictional sound. For performing the Rechaka, slowly relax the contraction of the muscles of the chest, one after the other. Relax the abdomen and lower portion of the chest so that the diaphragm and muscles between
the lower ribs are slowly relaxed. Afterwards, relax the upper portion of the chest. Finally, bring the shoulders down. Then, contract the abdominal muscles to the maximum to complete the Rechaka.

After completing the Rechaka, wait for a moment and start the second Round of Pooraka, Kumbhaka and Rechaka. Maintain the Moola Bandha from the beginning to the end.

**Practice**: For health culturists, practice of 20 to 60 Rounds, one after another in a day are enough, beginning with 5 Round and adding 5 Rounds each week, each Round consisting of Pooraka, Pooma Kumbhaka and Rechaka. However, spiritual aspirants should practice Rounds of Pooraka, Pooma Kumbhaka Rechaka and Shoonya Kumbhaka as per need. At the end of the practice release Moola Bandha and relax.

**General Notes**

**Pooraka**

- In Pooraka, the control of the breathing-in process is done by the movements of the chest. The expansion of the chest must be mythmic, continuous and complete. First raise the shoulders. Next, expand the upper chest. Finally expand the lower ribs and upper portion of the abdomen.

- Do not bend the spine backwards.

- The chest will expand on all sides i.e. up and down, left and right sides, and back and front sides. However, one should not exceed one’s capacity limit during the expansion of the chest.

- After completing the Pooraka, if the time taken for it is less, do not indulge in filling the time by awkward jerky actions to increase the duration of the Pooraka for the required period.
• Pooraka should be done continuously and rhythmically. There should not be any intermittent break. If the Pooraka is interrupted now and then, the continuity of the sound produced is lost.

• The control over Pooraka should be with minimum effort up to the end.

• As Pooraka is active, it is easier to control.

• The Sound produced must be guttural and not nasal.
• If one feels heaviness in the head and vertigo-like sensations, the Pranayama practice should be stopped.

• Wrong and excessive Pooraka may damage the lungs.

**Kumbhaka**

Perform Kumbhaka according to capacity. The pressures created in the chest, abdomen and lungs should be pleasurable. If the pleasure in Kumbhaka is lost, do not try to prolong the Kumbhaka by force.

**Rechaka**

• Is rhythmic and takes double the time taken for the Pooraka. Therefore, first determine the length speed and time required for the Rechaka and adjust the Pooraka accordingly.

• The Rechaka, being reactionary and passive, is difficult to control. While performing it one should be more cautious.

• Stop for a moment after the Rechaka before starting the next Pooraka.

**Benefits**

• Ujjayi Pranayama is like an obstacle race. Just as life in normal times becomes happier when we have developed the habit of facing difficulties, the same thing happens after practicing Ujjayi. Due to the partial constriction of the throat, the
lobes of the lungs are required to be expanded to the maximum extent for completing the Pooraka, and the chest and abdomen are required to be contracted to the maximum extent for completing the Rechaka. For these actions, the unutilized capacity of the lungs has to be brought into action. If this is done regularly, then in normal life the breathing becomes easy and light, and the lungs capacity increases just as in the saying “One who dances well can walk easily.” Ease can be seen in the walking of a regular dancer.

- As the efficiency of the entire respiratory system increases, the provision of blood to the brain and the oxygen to the blood becomes abundant. However, this happens because of the discipline and regulation in breathing due to the practice of Ujjayi and not while practicing the Pranayama.

- The capacity of the brain to tolerate Co2 tension increases (This happens in all Pranayamas). In this state, the conscious control on the brain goes on increasing to the maximum extent.

- All the organs situated in the abdominal cavity get pleasantly massaged. Digestion, excretion and blood circulation processes are activated and normalized.

- The heart gets rest. It also gets pleasantly massaged. The working capacity of the heart also increases.

- Due to the abundant supply of blood, the functioning of the nerves is maximized.

- Because of Nadanusandhana, mental tensions are reduced, the nervous system is smoothened and the mind becomes calm and stable. The body becomes refreshed.

- The benefits of Bandhas and Mudras are also obtained.

3.6 Procedure of the Study
3.6.1 Procedure of Preparatory stage to conduct experiment

This study was conducted at Nadurbar (Maharashtra), the researcher consulted the Heads of colleges and identified eighty (n=80) athletes, age: 18-20 yrs., from the selected colleges situated in Nadurbar District.

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 college 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 college record.

3.6.2 Procedure of Pre-test

The baseline assessment was done with consent in writing from all the participants. Each participant was designated with a particular number and a card was prepared with number and name so that it would be easy for researcher to find out that the subject belongs to which group.

All the participants were given instructions to undergo testing program wherein separate testers were given responsibility to conduct the tests. For this purpose each variable was assessed by professionally qualified person to record baseline and post test.

The variables involved in this experiment were explained to the participants and demonstration of each variable was given to all the participants.

Standard procedures were followed for testing the entire variables selected for. Then the group division was made into four groups viz., Group- I (Breathing exercise training), Group- II (Pranayama practises), Group -III (Breathing exercise + Pranayama) and Group- IV (Control) where each group represents 20 subjects.
3.6.3 Procedure of Daily Administration of Training Interventions

Training programmes on breathing exercise and pranayama practices were scheduled separately. Regular attendance of subjects for participation in training intervention was taken and it was observed that eighty percent of participants attended the training protocol. In fact, some of the students were dropped out because of irregular attendance. Nevertheless, the participants were given demonstration of all new movements and its beneficial effects were also explained to them. Further, they were motivated to attend all classes being conducted during experimental period.

3.6.4 Procedure of Post-Test

Same like baseline assessment post test was conducted on all the participants. Same testers were given responsibility for conducting the tests. All the subjects were given instruction to arrive at each of the testing stations which were made for collecting data on the selected variables. Same procedures, as followed in baseline assessment, were performed for tests administration among all the subjects belonging to experimental and control groups.

3.7 Statistical Procedure

Descriptive statistics was applied prior to employing inferential statistics. As there were four equated groups (viz., breathing exercise, pranayama, breathing exercise plus pranayama and control) participated in different training interventions for a particular duration of time, where the nature of the variables were different (i.e., morphological, fitness, physiological, psychological and discus throw performance), the data were analyzed by employing “ANCOVA” followed by post hoc analysis.