Chapter III

METHODOLOGY

This chapter clearly show the method adopted for collection of data, training and statistics used for calculation are presented.

Selection of Subjects

To accomplish the purpose of the study, ninety (90) female subjects were selected with age ranging between 21 to 35 years. These female working subjects were selected from Swami Vivekanand Subharti University, Meerut, Uttar Pradesh and novice with pranayama. These subjects were classified into three groups based on their age as Group 1: 21 to 25 years, Group 2: 26 to 30 years and Group 3: 31 to 35 years each constitutes thirty (30) subjects. The selected subjects all gave willingness to participate in this study. After getting their consent, 90 healthy female subjects were medically examined and found they were free from diseases.
A written consent was obtained prior to initial data collection, which is given in Appendix A. This clearly explains the nature of the study, the training program for the training group and variables in which they will be tested. They were also informed that they were free to opt out of the study at any time if they felt any discomfort or any difficulty in continuing the training program.

**Selection of Variables**

The investigator referred to various literatures and consulted with professors to identify ideal variables. In addition to this by using the investigator’s personal knowledge and professional experience the following most appropriate dependent variables were selected for the present investigation and are presented in Table 2.
### Table 2

**Variables**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Variable</th>
<th>Unit of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pulse rate</td>
<td>No of beats per minute</td>
</tr>
<tr>
<td>2</td>
<td>Systolic blood pressure</td>
<td>mmHg</td>
</tr>
<tr>
<td>3</td>
<td>Diastolic blood pressure</td>
<td>mmHg</td>
</tr>
<tr>
<td>4</td>
<td>Vital capacity</td>
<td>ml</td>
</tr>
<tr>
<td>5</td>
<td>Resting respiratory rate</td>
<td>No of breaths per minute</td>
</tr>
<tr>
<td>6</td>
<td>Breath holding time</td>
<td>Seconds (sec)</td>
</tr>
<tr>
<td>7</td>
<td>Cardiovascular efficiency</td>
<td>%</td>
</tr>
</tbody>
</table>
Independent variable

The independent variable selected in the present study was Anuloma Viloma pranayama which was administered daily for three months.

Selection of Test

In the current exploration standardized tests and procedures were used to assess the selected physiological variables are presented in table 3.

**Table 3**

**Test used for criterion variables**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Variables</th>
<th>Methods/test/equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pulse rate</td>
<td>Omron pulse monitor</td>
</tr>
<tr>
<td>2</td>
<td>Systolic blood pressure</td>
<td>Sphygmomanometer</td>
</tr>
<tr>
<td>3</td>
<td>Diastolic blood pressure</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Vital capacity</td>
<td>Wet spirometer</td>
</tr>
<tr>
<td>5</td>
<td>Resting respiratory rate</td>
<td>Manual</td>
</tr>
<tr>
<td>6</td>
<td>Breath holding time</td>
<td>Manual</td>
</tr>
<tr>
<td>7</td>
<td>Cardiovascular efficiency</td>
<td>Modified Harvard Step Test</td>
</tr>
</tbody>
</table>
**Calibration of Instruments**

In this investigation standard equipments bought from reputed companies were used. These instruments were calibrated for its accuracy.

**Physiological variables**

The standard equipments like omron pulse monitor, sphygmomanometer, wet spirometer and peak flow meter were available in the Department of Physical Education, Swami Vivekanand Subharti University, Meerut, Uttar Pradesh was used to measure physiological variables. Hence their calibrations were accepted as accurate enough, for the present research work.

**Reliability of Tests**

The testers competency for test administration was evolved with the reliability of tests. To establish the reliability of tests, test and retest method was followed. For this purpose, 20 female subjects were selected from Swami Vivekanand Subharti University, Meerut, Uttar Pradesh. All the criterion variables selected in the present investigation were tested twice for same subjects under similar condition. The Pearson product moment
correlation was computed separately for each variable and the coefficient of correlation thus computed is given in table 4.

**Table 4**

**Reliability coefficients for test and retest on criterion variables**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Variables</th>
<th>Coefficient of correlation</th>
<th>Level of significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pulse rate</td>
<td>0.68</td>
<td>0.05</td>
</tr>
<tr>
<td>2</td>
<td>Systolic blood pressure</td>
<td>0.71</td>
<td>0.05</td>
</tr>
<tr>
<td>3</td>
<td>Diastolic blood pressure</td>
<td>0.66</td>
<td>0.05</td>
</tr>
<tr>
<td>4</td>
<td>Vital capacity</td>
<td>0.76</td>
<td>0.05</td>
</tr>
<tr>
<td>5</td>
<td>Resting respiratory rate</td>
<td>0.80</td>
<td>0.05</td>
</tr>
<tr>
<td>6</td>
<td>Breath holding time</td>
<td>0.88</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Table value required for 16 df at 0.05 level of significance is 0.468
The entire criterion variables were significant at 0.05 level and this reveals that all the test items are reliable. Hence, these tests were used in this study.

**Orientation of Testers**

Since, the investigator alone could not organize the administration of tests, colleagues from the Department of Physical Education, Swami Vivekanand Subharti University, Meerut, Uttar Pradesh were recruited to serve as testing personals.

The purpose of the study, testing procedures and method of scoring were briefly explained and demonstrated to the testers. The investigator had overall supervision on the subjects and the testers. All the testers performed their duty to the utmost gratification.
**Orientation of Subjects**

Prior to exploration, the investigator informed the rationale of the study and concise preface time of day effect impact on the criterion variables selected for the tests to the subjects. The way of doing each test was demonstrated and explained to subjects by the researcher. Subjects were verbally motivated to exhibit their maximum performance in the test. All the subjects cooperated to their best during the course of experimentation.

**Experimentation**

The collection of physiological variables were collected from female subjects at three different age group before and after pranayama training for three months and its impact on physiological variables of female subjects at different age group are represented in Figure 1.
Figure 1

Study design with pre test and post test with test procedure and intervention phase

- **Months of Training**
  - Anuloma Viloma pranayama

<table>
<thead>
<tr>
<th>Pre Test</th>
<th>Test</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female (21 to 25 years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female (26 to 30 years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female (31 to 35 years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Test**
  - Pulse rate, SBP, DBP, Vital capacity
  - Resting respiratory rate, Maximum breath holding time
  - Cardiovascular efficiency
Training Protocol

Anuloma Viloma pranayama practice was administered daily in the morning between 06:00am to 07:00am for three months.

Procedure of Anulom Vilom pranayam:

The subject was seated in a comfortable sitting posture with back straight. Inhalation is through one nostril, and then breath is retained followed by exhalation through the other nostril in a ratio of 2:8:4, with eyes closed and concentrating on breathing. One round of Anulom Vilom pranayam consists of six steps:-

1. Inhale through the left nostril, closing the right with the thumb, to the count of four.

2. Hold the breath, closing both nostrils, to the count of sixteen.

3. Exhale through the right nostril, closing the left with the ring and little fingers, to the count of eight.

4. Inhale through the right nostril, keeping the left nostril closed with the ring and little fingers, to the count of four.
5. Hold the breath, closing both nostrils, to the count of sixteen.

6. Exhale through the left nostril, keeping the right closed with the thumb, to the count of eight.

This is one complete round of Anulom Vilom pranayam. After every 10 minutes one takes rest pause for 20-30 seconds. This procedure was practiced for 20 minutes daily.

**Administration of Tests**

**Pulse rate**

This test intends to measure the number of heart beats per minute recorded during resting condition for which stopwatch and stethoscope was used. The subjects were asked to remain in sitting position and the radial pulse was palpated for one minute and the score was recorded as number of beats per minute.

**Blood pressure**

The systolic and diastolic blood pressure was measured using stethoscope and sphygmomanometer. The subjects remain sitting adjacent to a table and instructed to place their left upper arm on the table in a extended position. The left
upper arm was encircled by an inflatable rubber bag which was connected to a rubber pump and manometer. The examiner after fitting it he starts pumping air as result the bag get inflated and mercury level raises to 200mmHg which was sufficient to stop blood movement in the artery. Then he places the stethoscope at the lower end of the cuff and lower the pressure as a result at a point the pulse could be felt. At this point the pressure shown on the dial was considered as systolic blood pressure. As the pressure was reduced continuously at a point the sound disappears was taken as diastolic blood pressure.

**Vital capacity**

It is the amount of air that can be expired after a full inspiration which was measured using wet spirometer. The subjects were instructed to stand erect and place the rubber hose in their mouth prior to which nose clip was sealed to prevent air movement through nose. Then the subject were asked to inhale deeply and keep the hose in the mouth exhale the air through the hose as result the drum in the spirometer rises gradually and the score was recorded as displacement of drum height.
**Resting respiratory rate**

The respiration rate in subjects is measured in the relaxed straight sitting position. The tester places his hand on the subjects upper chest and then look at the chest movement. When the chest rises then begin counting to one minute. Once the counting is finished then record how many times the chest has raised as respiratory rate.

**Breath holding time**

The subject stands erect and inhale deeply after which they hold breath for a length of time as possible. The thumb and centre finger were used to hold the nostril and also the cooperation of the subjects by not letting the air opening the mouth apparently was considered while recording the breath holding time. The time of holding breath till the moment the subject let the air out was clocked by using stopwatch to the nearest $1/10^{th}$ of second as breath holding time.

**Cardiovascular efficiency**

The modified Harvard step test was used to measure cardiovascular efficiency. To organise this test 50.8 cm high platform, stopwatch and metronome was required. The subjects were instructed to perform 30 steps in a minute for five minute
or until exhaustion. The subjects sit immediately after completion of step test. The subject’s heart beat was measured at three time points after finishing test at 1 to 1.5 minutes, 2 to 2.5 minute and 3 to 3.5 minute. The subject heart rate was measured through radial pulse at their wrist. The subject’s cardiovascular efficiency was measured through following equation:

\[
\text{Cardiovascular efficiency} = \frac{100 \times \text{test duration in seconds}}{2 \times \text{sum of heart beats in the recovery periods}}
\]

**Experimental Design**

For the present study pretest – posttest randomized group design (Thomas, Nelson & Silverman 2005) which consists of a groups with respect to different age on physiological variables. Equal numbers (thirty) of subjects were assigned through random sampling. The data collected were statistically analysed to examine the changes in female with respect to different age group.
**Statistical Technique**

Analysis of Covariance (ANCOVA) was administered in the present study. When $F$ is significant Scheffe S post hoc test was applied. The changes within the each group were assessed through paired $t$ test. The level of confidence was fixed at 0.05 to test the significance. The data was analysed in computer system by using statistical package for social science (SPSS) version 16.