CHAPTER-III

METHODOLOGY

The procedure adopted in this research study is related to the selection of subject’s selection of variables, selection of tests and experimental designed before the administration of the test researcher given orientation of the test.

Selection of subjects

For the purpose of gathering the date 120 female adolescents were selected in the age group of 12 to 16 years studying in kendriya vidyalaya of vijayapur district Karnataka state, the selected subjects were divided into three groups such as pranayama group. Kriyas group and control group.

Selection of variables

The researcher reviewed the available scientific literature and discussed with experts pertaining to cognitive and physiological variables from various journals, books. The investigator considered the criteria, of feasibility, availability of the instrument and the relevance of variables to the present study. The following variables were selected for pranayama and kriyas trainig

Independent variables

Pranayama

- Anuloma viloma
- Sheetali
- Shetkari

Kriyas

- Jalneeti
- Trataka
- kapalbhati
Dependent variables

Cognitive variables

- Long term Memory
- intelligence

Physiological variables

- Resting pulse rate
- Maximum oxygen consumption (Vo2 max)

Pranayama and kriyas training schedule

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Pranayama and Kriyas Training</th>
<th>Time allotted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>Pranayama</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Warm up</td>
<td>07 minutes</td>
</tr>
<tr>
<td></td>
<td>Anuloma Viloma Pranayama</td>
<td>15 minutes</td>
</tr>
<tr>
<td></td>
<td>Sheetali Pranayama</td>
<td>15 minutes</td>
</tr>
<tr>
<td></td>
<td>Sheetakati Pranayama</td>
<td>15 minutes</td>
</tr>
<tr>
<td></td>
<td>Relaxation</td>
<td>08 minutes</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>60 minutes</strong></td>
</tr>
<tr>
<td>2)</td>
<td>Kriyas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Warm up</td>
<td>07 minutes</td>
</tr>
<tr>
<td></td>
<td>Jal neeti</td>
<td>15 minutes</td>
</tr>
<tr>
<td></td>
<td>Kapalbhati</td>
<td>15 minutes</td>
</tr>
<tr>
<td></td>
<td>Tratka</td>
<td>15 minutes</td>
</tr>
<tr>
<td></td>
<td>Relaxation</td>
<td>08 minutes</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>60 minutes</strong></td>
</tr>
</tbody>
</table>
To give systematic training for Pranayama and Kriyas Experimental group for trained individuals were selected to look after the training schedule regularly as per the planned training programme

**Experimental design**

The selected subjects (N=120) were divided into three equal groups as pranayama group I, Kriyas group II, and control group III. Group I underwent pranayama training group II underwent Kriyas training for sixteen weeks. Group III control group did not undergo any kind of training.

**Selection of tests**

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Variables</th>
<th>Test items and tools</th>
<th>Criterion Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Long term memory</td>
<td>Questionnaire developed by Dr. B.B. Asthana</td>
<td>By using Card related to Questionnaire and the subject’s responses within two minutes recorded.</td>
</tr>
<tr>
<td>2</td>
<td>intelligence</td>
<td>Questionnaire developed Dr. P.N. Mehrotra</td>
<td>Cognitive development of the subject as per Questionnaire</td>
</tr>
<tr>
<td>3</td>
<td>Resting pulse rate</td>
<td>Radial Pulse rate</td>
<td>Place index and middle fingers together on the opposite wrist, about ½ inches on the inside of the joint, in line with the index finger. Once pulse is located count the number of beats felt within a one minute period and recorded.</td>
</tr>
<tr>
<td>4</td>
<td>Vo$_2$ max</td>
<td>Cooper test 12 minutes Run and walk 400 meter running track, marker, cones and stop watch.</td>
<td>Distance covered by subject against time taken.</td>
</tr>
</tbody>
</table>
The test items were selected for the study after thorough review of related literatureas well as consultation with experts, physical education professionals, and also with research supervisor. The criterion variables are presented in the table.

**Orientation of subjects**

The investigator conducted a orientation with the subjects prior to the administration of test. The purpose, the significance of the study and the requirements of the testing procedure were explained to them in detail so that there was no ambiguity in their minds. All the subjects agreed to extend their fullest co-operation during test administration. The subjects were enthusiastic and co-operative throughout the study.

**Pilot study**

The Researcher wanted to know the Effect of Pranayama and Kriyas on cognitive and physiological variables of adolescent development. For the purpose of pilot study the researcher selected 30 subjects for the study. Pre-test was administered and recorded. Then the Researcher was given one month training on Pranayama and Kriyas. The post-test was administrated soon after the one month training. The Researcher compared the pre-test and post-test Results. The post- test Results indicated significant development in Cognitive and physiological variables.

**Collection of data**

The data were gathered by conducting pre and post test by using questionnaire, for Long term memory and intelligence, to measure resting pulse rate (radial pulse rate) were taken and maximum oxygen consumption (Vo2max), 12 minute run and walk test was conducted.
Administration of the Tests

Long term memory

The purpose of the third stage, long-term memory (LTM), is to serve as a store- house for information that must be kept for long periods of time. Once information is transferred from STM, it is organized and integrated with other information in LTM. It remains there until the need to retrieve it. Then it is sent back to STM for the use. The test used here is devised by Dr.B.B.Asthana.

Purpose

The aim of the experiment is to find out the effect of rehearsal of paired- associates on the long term memory of the subject when tested after two minutes of interpolated task.

Equipment required

- Data sheet
- Stop watch
- Memory Cards
- Paper, pencil

Procedure Instructions

After seating the subject comfortably the following instruction were given to Testees

“I will perform an experiment to test your memory. Kindly be attentive. I will explain you what to do. I will show you some pairs of words one by one after giving you a ready signal. Just after showing you the pairs, I will say a number say, 1, 2, 3, or 4. Your task is to speak aloud the pairs presented to you either once, twice, thrice or four times, depending on the number spoken by me.

Immediately after this I will again speak a number to you. You note it down on the page supplied to you and start writing reverse number, starting from the number given to you with a difference of three, e.g., if you are given 97, then write...
down, 97, 94, 91, and so on. You have to continue this task till you are asked to stop. As soon as I say ‘stop’ you have to speak out pair originally presented to you. The same procedure will be repeated 16 times. The success of the experimented depends on your cooperation, so kindly be attentive towards the task.

After assuring that the subject has followed and fully understood the task, the proper experiment was started. Each pair was presented for 2 Secs., with the help of memory drum (or showing cards for 2 Secs., with help of stop watch). ‘E’ presented the pair of words after giving ready signal. Immediately after presenting the stimulus pair, ‘E’ speaks the number 1, 2, 3, or 4; according to the sequence given in the data sheet. ‘S’ repeats the pair according to the number given to him. Now ‘E’ speaks another number and ‘S’ start writing backward according to instruction. ‘E’ starts stop watch simultaneously and the task continues for 2 minutes ‘E’ now asks the subjects to stop. Subject on hearing ‘Stop’, reproduce the pair of words presented to him which noted down by ‘E’ on the data sheet. The same procedure was followed for all the 16 pairs of words.

**Scoring**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Stimulus words</th>
<th>Time to be Repeated</th>
<th>Number string</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>QUEEN-PONY</td>
<td>1</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>FRUIT-SOLDIER</td>
<td>2</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>BUS-COW</td>
<td>4</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>SHIRT-JEEP</td>
<td>3</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>RAT-CAP</td>
<td>2</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>SWORD-TREE</td>
<td>4</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>DOG-CAR</td>
<td>3</td>
<td>98</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>FROCK-HEN</td>
<td>1</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>BALLOON-FLOWER</td>
<td>4</td>
<td>84</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>GEM-FAN</td>
<td>3</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>LION-SHIP</td>
<td>1</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>BAT-COAT</td>
<td>2</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>PEN-CAT</td>
<td>3</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>DEER-BOAT</td>
<td>1</td>
<td>89</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>BADGE-SHEEP</td>
<td>2</td>
<td>98</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>HAT-FOX</td>
<td>4</td>
<td>65</td>
<td></td>
</tr>
</tbody>
</table>
Statistical Analysis

The responses should be tabulated according to table 3. Then find out the correct percent recall the four retention intervals and compare them.

Table

<table>
<thead>
<tr>
<th>No. Of Repetitions</th>
<th>Number of Correct responses</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Plate- I. Subject responding, the response to the long term- memory cards (questionnaire).
Intelligence test

The Mixed type group test of Intelligence is a test of human intelligence developed by Dr. P.N. Mehrotra of the natural psychological corporation. The feature of this test to be conducted is its ability to apply knowledge to manipulate one’s environment or the ability to learn or understand and also the skilled use of reason.

Purpose - The purpose of the test is to monitor the cognitive development of the subject

Equipment required - Mixed type group test of Intelligence questionnaire.

Procedures - The presence of intelligence is primarily a group test which can also be used for individual testing as well. The instructions for each part of the test that is verbal and non-verbal, are printed on the test form. The answers to these questions are to be given by the subjects on answer sheet supplied to them. To minimise the work of writing on the part of a testee, the answers have been framed in such a manner that the testee has to give an answer to a question in digit form. The whole test consists of a work of only 20 minutes, i.e., 10 minutes each for verbal and non-verbal.

When the pupils are properly seated in appropriate position, the tester should start with preliminary talk to them regarding the test. Thereafter, the test-booklets along with answer sheets of verbal test should be distributed among pupils with the assistance of helpers who may be the senior students of the school. Later the tester should request the pupils that they should fill in the required columns given on the above side of the answer-sheets. When the pupils say that they have filled in the required columns, the tester should read out the instruction given on the test and should write the examples on the blackboard.

Then the pupils should solve those problems, given in the beginning of the test under the head ‘examples’. After solving the problems, the tester should enquire from the pupils if there is any difficulty in filling the answers in the appropriate columns of the answer-sheets given to them? When the tester himself is satisfied, he should announce, “Do not start the work until you are asked.”
When these preliminaries are completed, order should be given to the pupils to start the work. The time must be noted. After ten minutes, testee is asked to stop his responses on verbal test. The same procedure may also be adopted for non-verbal test. No extra time should be given to any of the pupil.

**Scoring** - An easy method of scoring in the present test has been followed. In each test, only one correct answer is to be selected by pupil for one question from the different alternatives given under each question. In scoring, credit of one point should be given for each correct answer and zero for each incorrect answer. No marks should be deducted for wrong answers. For scoring, keys have been prepared for verbal and non-verbal test separately. After setting the scoring key on the answer-sheet, the wrong and left out questions should be crossed. The number of correct questions should be counted in each test, i.e., verbal and non-verbal, which becomes the raw score of a pupil. This raw score can be interpreted in any manner according to different types of norms given.

**Statistical basis of intelligence classification**

<table>
<thead>
<tr>
<th>Classification of intelligence</th>
<th>Limits in terms of PE</th>
<th>T-score Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very superior</td>
<td>+3PE and above</td>
<td>70 and above</td>
</tr>
<tr>
<td>Superior</td>
<td>+2PE to +3PE</td>
<td>63-70</td>
</tr>
<tr>
<td>Bright average</td>
<td>+1PE to +2PE</td>
<td>57-63</td>
</tr>
<tr>
<td>Average</td>
<td>-1PE to +1PE</td>
<td>43-57</td>
</tr>
<tr>
<td>Dull Average</td>
<td>-PE to -2PE</td>
<td>37-43</td>
</tr>
<tr>
<td>Inferior</td>
<td>-2PE to -3PE</td>
<td>30-37</td>
</tr>
<tr>
<td>Very inferior</td>
<td>-3PE and below</td>
<td>30 and below</td>
</tr>
</tbody>
</table>
Plate-II. Subject responding, the response to the Intelligence questionnaire.
**Resting Pulse Rate (radial pulse)**

“The number of frequencies of the heart beat in one minute when an individual is in a resting condition”

**Purpose**

The purpose of measuring resting pulse rate it indicates circulatory status of the heart or the blood flow rate.

**Materials required**

To measure the resting pulse rate a stopwatch is required.

**Procedure**

Flex the elbow of the subject and keep the lower part of the arm across the chest and support the wrist of the subject by grasping better aspect with the help of thumb place it the index and middle figure on inner aspect of the subjects wrist over radial artery by applying light but firm pressure until pulse is palpated. Once the palpate pulse is identified count the pulse rate by using stop watch. Count the number of beats for 30 seconds and multiply by 2 total numbers of beats in one minute as recorded and it is the performance of the individual.
Plate-III. Subject responding, the response to the resting pulse rate.
**Vo\textsubscript{2}max (Maximum Oxygen consumption)**

**Cooper 12-minute Run Test**

The Cooper 12 minute run is a popular maximal running test of aerobic fitness, in which participants try and cover as much distance as they can in 12 minutes.

**Purpose:** to test aerobic fitness (the ability of the body to use oxygen to power it while running)

**Equipment required:** flat oval or running track, marker cones, recording sheets, stop watch.

**Procedure**

Place markers at set intervals around the track to aid in measuring the completed distance. Participants run for 12 minutes, and the total distance covered is recorded. Walking is allowed, though the participants must be encouraged to push themselves as hard as they can to maximize the distance covered.

**Scoring**

*There are Cooper test norm tables for general guidelines for interpreting the results of this test for adults. There are also several equations that can be used to estimate*

\[
\text{VO2max (in ml/kg/min) from the distance score (a formula for either kms or miles):}
\]

\[
\text{VO2max} = (35.97 \times \text{miles}) - 11.29
\]

**Cooper test table for girls:**

<table>
<thead>
<tr>
<th>Condition</th>
<th>12 years</th>
<th>13 years</th>
<th>14 years</th>
<th>15 years</th>
<th>16 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bad</td>
<td>&lt;1650</td>
<td>&lt;1675</td>
<td>&lt;1700</td>
<td>&lt;1725</td>
<td>&lt;1750</td>
</tr>
<tr>
<td>Reasonable</td>
<td>1675-1775</td>
<td>1700-1800</td>
<td>1725-1825</td>
<td>1750-1850</td>
<td>1775-1900</td>
</tr>
<tr>
<td>Average</td>
<td>1800-1900</td>
<td>1825-1950</td>
<td>1850-1975</td>
<td>1875-2000</td>
<td>1925-2025</td>
</tr>
<tr>
<td>Good</td>
<td>1925-2125</td>
<td>1975-2150</td>
<td>2000-2175</td>
<td>2025-2200</td>
<td>2050-2225</td>
</tr>
<tr>
<td>Excellent</td>
<td>&gt;2150</td>
<td>&gt;2175</td>
<td>&gt;2200</td>
<td>&gt;2225</td>
<td>&gt;2250</td>
</tr>
</tbody>
</table>
Plate-IV. Subject responding, the response to the Cooper 12-minute Run Test
Pranayama

Anulom vilome pranayama

Anulom vilome pranayama is an alternate nostril breathing inhale air through right nostrils and exhale through left and inhales air through left nostrils and exhales through right

Procedure

• The following instructions were given to the subjects during training programme. Ask the subjects to close their eyes and relax in the sitting position for 2 minutes tell the subjects were settling down.
• Ask the subjects to close right nostril with right thumb and inhale through the left nostril up to the lungs maximum capacity.
• The subjects should hold the breath.
• Ask the subject close the left nostrils with middle and ring figure and exhale through the right nostril rhythmically. This will be continued up to one set of anulom vilome pranayama.
Plate-V. Subject performing, the Anulom vilome pranayama.
Sheetali Pranayama

According to Pradeepika and Gheranda Samhita; “Sheetali Pranayama cools the body”.

Procedure

- Ask the subject to open the mouth and stretch tongue outside the lips and fold the tongue like a pipe from both the sides.
- Ask the subjects gently inhale, not forcibly, through the folded tongue with the hissing sound and ask them to feel the coolness at the back of the throat.
- Then ask the subject to take the tongue inside the mouth and ask them close the lips firmly.
- Ask them to hold the breath as possible with closed eyes.
Plate-VI. Subject performing, the Sheetali pranayama.
Sheetkari

“The practice of sheetkari pranayama has cooling effect on the body”

Procedure

- Ask the subject sit erect in padmasana.
- Then ask the subject in gahanna mudra position by placing their hands on corresponding knees and assume the position.
- While during jnanamudra part of the lips and teeth keeping together.
- Ask the subject to hold lip of tongue against the lower teeth than ask them to inhale through their mouth with a hissing sound.
- This process will continue until the lungs are filled. Now ask them close their mouth and exhale through both the nostrils.
Plate-VII. Subject performing the Sheetkari pranayama.
Kriyas

Jala Neti

“Jalneeti means nasal clessing with water”

Procedures

1. Ask the subject to widen the legs the shoulder’s level
2. Knees should be slightly flexed and shoulders should be hunched
3. Head should be slightly tilted to the right side and water is made to how into the left nostril
4. Ask the subject to let water flow up the nostril and it should reach just above the bridge of the nose and should flow into the middle canting and flow out through the other nostril
5. The same should be repeated with the other nostril.
Plate-VIII. Subject performing the Jala Neti kriya.
Kapalabhati

Kapalbhati is a breathing technique for purifying the frontal region of the brain.

Procedure

- Ask the subject to place their left leg on the thigh and right leg over their left leg, then ask them to close their eyes.
- Now ask the subjects to exhale through their nostrils forcefully while doing so, and ask them to pass their abdomen forcefully.
- Ask the subjects to make their inhalation very slowly.
- Ask them to continue this process for about 15 times.
Plate-IX. Subject performing the Kapalabhati kriya.
Trataka

“The trataka practice in tense gazing at one point or object which develop the power of the concentration”

Procedure

- Ask the subjects to sit in meditation pose infront of a candle. Place the candle about one arm length away from the subject wick of candle at the same height as the chest. The iron should be still not moving in a draft.
- Ask the subject to close their eyes and mentally repeat the meditation mantras.
- Now ask the subjects open their eyes and look at the flame without blinking. The flame has three zones of the colors at the bottom of the week is reddish color in the middle bright and white color and at the teep. Slightly smoky color.
- Ask the subject to concentrate on the upper part of the flame were it is brightest.
- Then ask the subjects close their eyes again the image of the flame appose within concentrate on that image without creating any tension do not try to perceive are hold on to the image otherwise it will fade and display.
- Ask the subject repeat the practice for three times.
Plate-X. Subject performing the Trataka kriya.
Statistical Technique

As per the objectives of the research study following statistical tool were applied the following mean SD and ANOVA were applied to find out the differences among Pranayama group I. kriyas group II and control group III.