CHAPTER - III
METHODOLOGY
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Research methodology involves the systematic procedure by which researcher starts from the initial identification of the problem to its final conclusions. The role of the methodology is to carry on the research work in a scientific and valid manner.

This chapter provides an overview of the method used for the research study selection of subjects, selection of variables, selection of tests, reliability of the instrument, reliability of data, tester competency, orientation to the subjects, collection of data, administration of test, and experimental design and statistical technique employed are discussed here.

Selection of Subjects

To achieve the purpose of the study, sixty male students from Thanjavour District, Tamilnadu were randomly selected as subjects and they were medically fit. The age was ranged from 14-17 years. The selected subjects were divided into two groups namely, Group I consist of thirty literate students who were studying tenth, eleventh and twelfth standard and Group II consist of thirty dropouts
students who were completed sixth standard and below were selected randomly as subjects. A written consent was obtained from the subjects. However, they were free to withdraw their consent in case they felt any discomfort during the period of their participation; there were no dropouts in this study.

Group I and II were subjected to yogic training programmes over the period of twelve weeks and five sessions in a week in addition to their regular schedule.

**Selection of Variables**

The training of Yoga aims to improve all the functions of the body. Such kind of different categories of training concentrate of general fitness, which links in the transport of carrying oxygen from the air to the working muscle.

Yoga improves the functioning of the respiratory, circulatory, digestive and hormonal systems. Regular practice of yoga helps to keep our body fit, controls cholesterol level, reduces weight, normalizes blood pressure and improves heart performance. Yoga can be a powerful enhancement in regular training exercises.
Basic levels of physical fitness can be excellent maintained by indulging in a selected yogic routine. Yogic exercises deal with the vital organs of the body on which health depends.

Training of yoga builds stamina and increases the efficiency of muscles, heart and circulatory system, Yoga was selected as independent variables. Since Yoga exercise training causes changes in the above said variables, the following dependent variables were selected for this study as criterion variables.

**Physical Variables**

1. Arms strength
2. Muscular endurance
3. Agility
4. Explosive power
5. Speed
6. Endurance

**Physiological Variables**

1) Resting Pulse Rate
2) Systolic and Diastolic Blood Pressure
Selection of Tests

The purpose of the study was to investigate the effect of Yogic practice on physical and physiological variables among literates and dropouts (Male). The selected criterion variables for the study were assessed by the following standardized test items: arm strength, muscular endurance, agility, explosive power, speed, endurance was tested by AAHPER Youth Fitness Test. Resting heart rate was estimated by radial pulse method and Systolic and Diastolic blood pressure were measured by sphygmomanometer.

Reliability of Instruments

Instruments such as sphygmomanometer, calibrated measuring tape and stopwatch were used for the study. All the instruments were in good condition and workable. The calibrations were tested and found to be accurate enough to serve the purpose of this study.

Tester Competency and Reliability of the Data

To ensure uniformity and reliability of the testing techniques, the investigator had a number of practice sessions in the testing procedures with the guidance of experts. The test was conducted on the trial subjects by both the investigator and the experts. All the measurements were taken by the investigator with the assistance of
their colleagues. Care was taken that each test item was administered by the same person, so that reliable results could be ensured. After trials and familiar with the test the investigator tested the data on each of the variables and was correlated with the scores obtained by the expert on the same subject.

The tester reliability was established by test retest method. The intra class co-efficient of correlation was obtained from ten subjects on selected physical and physiological variables are given in Table I.

**TABLE I**

**INTRACLASS RELIABILITY COEFFICIENTS OF SELECTED DEPENDENT VARIABLES**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Variables</th>
<th>Co-efficient of Correlation 'R'</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Arms strength</td>
<td>0.86*</td>
</tr>
<tr>
<td>2.</td>
<td>Muscular endurance</td>
<td>0.91*</td>
</tr>
<tr>
<td>3.</td>
<td>Agility</td>
<td>0.89*</td>
</tr>
<tr>
<td>4.</td>
<td>Explosive power</td>
<td>0.93*</td>
</tr>
<tr>
<td>5.</td>
<td>Speed</td>
<td>0.87*</td>
</tr>
<tr>
<td>6.</td>
<td>Endurance</td>
<td>0.91*</td>
</tr>
<tr>
<td>7.</td>
<td>Resting Pulse Rate</td>
<td>0.92*</td>
</tr>
<tr>
<td>8.</td>
<td>Systolic Blood Pressure</td>
<td>0.93*</td>
</tr>
<tr>
<td>9.</td>
<td>Diastolic Blood Pressure</td>
<td>0.94*</td>
</tr>
</tbody>
</table>

* Significant at 0.01 level. Table value of 0.01 level = 0.623
The test retest values were highly reliable above 0.01 level of significance.

**Orientation to the Subjects**

To make the subjects involve themselves in the training program an orientation class was arranged. The researcher has explained the purpose of the study to the subjects and their part in the study. Five sessions were spent to familiarize the subjects with the technique involved to execute the Yoga. The subjects were verbally motivated to attend the training sessions regularly. The subjects of all the groups were sufficiently motivated to perform their maximal level during testing periods.

**Training Program**

The training program scheduled with the duration and load was based on the results of the pilot study. The training program was carried out for a period of twelve weeks. The details of Yogic practice are given below.

**Details of Yoga Training**

The training program was scheduled for one session in the morning between 6.30 AM to 7.30 AM for five sessions in a week and the same was continued for 12 weeks.
15 Minutes – Warming up and Stretching

25 Minutes – Asanas

10 Minutes – Pranayama

10 Minutes – Relaxation

According to the required load asanas and pranayamas were selected from the list of asanas and pranayamas in this chapter. While practicing the asanas and pranayamas the principles were followed. Diagram of each asana was presented in appendix I. The following Asanas and Pranayamas were taken from B. K. S. Iyengar (2001).

**Padmasana**

Sit on the ground. Spread the legs forward and place the right foot on the left thigh and left foot on the right thigh. Some persons like to place first the left foot on the right thigh and then to put the right foot on the left thigh. Either process is right. Let the left hand rest on the left knee and the right hand on the right knee. Let the tips of the thumbs of both the hands touch the tips the index fingers. Keep the hand and the spinal column erect. Keep your
eyes close or open. Those who can place only one leg on the thigh should practice this asana daily with zeal. They will be able to perform this asana easily after some practice. Stay in the final position for one or two minutes in the initial stage. Later increase the time gradually.

**Parvatasana**

Sit in Padmasana. Join the palms of the hands. Stretch the arms vertically up over the head. Some persons perform this asana sitting in the posture of Veerasana. But the Padmasana posture is better than the Veerasana one.

**Pashchimottanasana**

Sit on the floor with the legs stretched straight in front. Bend the trunk forward and hold the feet with the thumbs and the first and the middle fingers. Exhale, and bend the trunk lower so that the head rests on the knees. Draw the abdomen in while bending lower. This will make the bending of the trunk easy.
While bending bring the head between the arms. The aspirants having flexible spine can touch the knees with the head at the first attempt. Fat persons will find some difficulty in practicing this asana. Persons having a weak spine will take a fortnight or a month to accomplish perfection in this asana. Remain in this asana for five seconds. Begin with thirty seconds and gradually increase it to ten minutes.

**Vakrasana**

Sit on the ground with the legs stretched out. Place the left leg near the right knee, stretching out the left hand behind the back, with the palm of the hand flat resting on the ground. Then press the left knee with the right arm and put the palm on the ground. Keep the waist erect and look as far backward as possible. Practice this asana four to six times a day turning to the left side and to the right side alternatively. Gradually, increase the time. The limit is five minutes.

**Shavasana**

Lie flat on the back. Place the hands a little away from the
thighs with the palms up. Keep the eyes and the fists slightly closed. Stretch the legs out. Keep the heels together and the toes apart. Now close the eyes and breathe very slowly. Begin by consciously and gradually relaxing each part and each muscle of the body: feet, calves, knees, thighs, abdomen and hips. Then relax the muscle of the back, chest, arms, fingers, neck, head and face in that order. Inhale and exhale slowly and deeply. Relax the brain during exhalation. Direct your attention to the breathing, to the soul and to God. Retain the meditation for ten to fifteen minutes. In this posture, one finds true relaxation and experiences rest, peace and plenitude. Those who suffer from excessive mental stress or heart-disease must practice only Shavasana regularly.

**Ardha Matsyendrasana**

Place the right heel near the anus (buttock) below the testicles. Do not move the heel from this position. Bend the left knee and put the left ankle on the outer side of the right knee. Let the right armpit rest on the outer side of the left thigh. Now push the knee backwards so that it touches the back part of the armpit.
Then hold the toe of the left foot with the right hand. Twist the spine slowly exerting force on the joint of the left shoulder. Let the spine be twisted to the left side as far as possible. Turn the head to the left side as far as it can go. Bring it to the line of the left shoulder. Take the left hand backwards and try to hold the right thigh with it. Keep the spine erect. Remain in this position for five to fifteen seconds. Repeat the same in reverse by twisting the spine to the right side. This asana makes the spine twist completely.

**Uttanapadasana**

Lie flat on the back. Keep the heels of both the legs together. Inhale deeply and bend the right knee towards the stomach and hold it with both the hands. Raise the head above the ground and bring the chin closer to the knee so that it touches the knee-cap. Exhale and press the muscle of the right abdomen with the right thigh. Keep the stomach pressed till the breath is suspended. This asana is called ‘Dakshina Pavanamuktasana’. If this asana is performed with the left leg, it is called ‘Vama Pavanamuktasana’. Practice this exercise with both the legs together.
This is called ‘Purna Pavanamuktasana’. While holding the legs with both the hands, exhale and control the breathing. Then slowly begin inhaling while stretching the legs out.

**Setubandhasana**

Lie on the back. Bend both the knees. Raise the loins and thighs upward. Keep the back of the head, the neck and the shoulders firmly on the floor. Breathe normally. Remain in this position for six to eight seconds. Then take some rest and repeat the exercise. Practice this exercise four times a day in the beginning. Later, practice it six times a day.

**Ardha Shalabhasana**

Lie on the stomach with the face down on the ground. Stretch both the arms beside the body and clench the fists lightly. The hands can also be placed under the thighs. Inhale and retain the breath till the completion of the asana. Pull the body and raise either of the legs by about 30 cms off
the ground. Raise the leg as high as possible. Stretch the soles of the feet. Hold this position for five to thirty seconds. Then slowly bring the leg down on the ground. Exhale very slowly. Repeat this exercise with the other leg. This asana can be repeated six to seven times.

Purna Shalabhasana

Lie on the stomach with the forehead touching the ground. Stretch the arms beside the body. Keep the thumbs and the index fingers on the ground and clench the fists. Stiffen the body and raise the legs as high as possible. Stretch the soles of the feet. Put the legs, the thighs and the lower part of the abdomen up. Hold this position for five to thirty seconds and the rest the breath. Bring the legs down slowly and then exhale smoothly.

Bhujangasna

Lie on the floor with the face downwards. Relax all the muscles of the body. Place the palms on the ground underneath the shoulders. Slowly raise the head and the trunk like the hood of a serpent. Bend the spine backwards. Stretch the feet backwards so that the toes
touch the ground. This will stretch well the muscles of the back and
the shoulders. There will be
strain on the abdomen. Hold
the breath and hold this
position for six to eight seconds.
Then exhale and bring the head
to its original position. When
you first lie on the ground, keeps the chin touching the chest. Hold
the breath till the head remains in the raised position. Then exhale
slowly. Practice this asana five to six times.

Dhanurasana

Lie prone on the floor on the stomach face downwards. Relax
the muscles; keep the arms
resting along side the body.
Bend the legs at the knees.
Raise the arms and hold the
ankles with the hands. Raise
the chest and the head. Fill the
lungs with air. Straighten and stiffen the hands. Stiffen the legs also.
The body now assumes the posture of a convex arch. If you lift the
legs up, you can raise the chest. Hold the breath. Then exhale slowly.
Attempt to keep the knees together.
In this asana, the abdomen supports the whole body. So practice this asana when the stomach is empty. The body in Dhanurasana pose gets good exercise if it is lightly rocked from left to right and forward and backward. Stay in this position as long as possible. It can be practiced five to six times.

**Makarasana**

Lie on the ground face down, the chest touching the ground and both legs stretched out. Let the upper parts of the feet touch the ground. Keep the heels upwards. Raise the arms and put them in front of the head and hold the middle part of the right upper arm with the left hand. Keep the head downwards and close the eyes. The head will rest on the arms. The parts of the arms from the elbows to shoulders, the abdomen, the thighs and the upper parts of the feet will touch the ground in a straight line. Relax the body while practicing this asana. Breathe deeply and meditate on God.
Vajrasana

Bend the legs at the knees. Place the heels at the sides of the anus in such a way that the thighs rest on the legs and the buttocks rest on the heels. Support the whole body on the knees and ankles. Breathe normally while performing this asana. The knees and the ankles will perhaps ache in the beginning but this ache or pain will disappear by itself. Stretch the arms and place the hands on the knees. Keep the knees close by. Sit erect keeping the trunk, the neck and the head in a straight line. This is a very simple posture and one can hold this posture with ease for a longer time.

Supta Vajrasana

Attain Vajrasna. Then with the support of the elbows lie with the back on the ground. The back should touch the ground. Interlace the arms and put them on the chest. Tilt the head as far back as possible. Hold this position for eight to ten seconds. In the beginning, the
back may not wholly touch the ground. The lower part of the back may remain in a raised position.

**Ushtrasana**

Kneel on the ground as in Vajrasana keeping the distance of about fifteen cms between the knees and between the heels. Breathe deeply. Hold the right ankles firmly with the right hand and the left ankles with the left hand. Raise the arms and take them behind the neck. Breathe in the normal way. Hold this position for six to eight seconds. Repeat these asana two or three times a day.

**Vrshasana**

Bend the right leg at the knee and place the heel under the anus. Place the left knee on the right knee in such a way that the left heel touches the right thigh. Sit erect and place the palm of the right hand on the knee. Then place the palm of the left hand on it. Breathe in the normal way. Direct your sight and attention to the navel.
**Vrukshasana**

Stand on either leg. If difficulty is experienced to balance the body on one leg, take the support of a wall. Bend the other leg at the knee and place its heel at the root of the thigh of the former leg as shown in the figure. Join the palms and raise the arms straight over the head as if you are making an obeisance to the sky. Straighten the elbows. Inhale slowly. Hold this position for about ten seconds. Then repeat the pose, standing on the other leg. This exercise can be practiced four to six times a day.

**Santulananasana**

Stand straight and erect on the ground. Keep the body straight and erect. Keep the arms on the sides. Bend either leg at the knee, keeping the knee facing downwards and the heel upwards. Hold the foot of this leg with the corresponding hand. Raise the other arm close to the ear. Hold this position for eight to ten seconds. Repeat this exercise with the other leg. In the beginning, practice this asana four times a day. Later, it can be practiced six times a day.
Utkatasana

Stand with the legs together. Raise the body on the heels and bring the arms straight over the head and join the palms. Then slowly lower the trunk. This asana does not require much strength to practice it. An aspiranet should only know how to balance the body. One who is slim but has a strong physique can practice this asana with ease and comfort.

Trikonasana

Stand erect keeping a distance of about 75 cms between the feet. Stretch the arms sideways. Then raise them to the level of the shoulders. Let the palms face the ground. Stand erect. Then bend the trunk to the left side and touch the left toes with the left hand. Stretch the right arm upwards and straighten it. Keep the eyes fixed on the right arm. Bring the left hand near the left toe. Keep the left hand in the same position and rotate the right arm from over the waist and bring it to the head level. Look downward. Then touch the right toes
with the right hand. This is the final position of Trikonasana. Rest for five
to ten seconds and repeat this exercise with the right arm downside and
the left arm upside. Hold each position for two seconds. Practice this asana four or five times a day.

**Chakrasana**

Lie flat on the back. Draw the legs in till the heels are close to the hips and the soles touch the ground. The gap between the legs should be of four to six inches. Bend the arms at the elbows and place them on the ground on either side of the hand.

Raise the body from the waist to the hind part of the head and breathe in the normal way. Tilt the head backwards as far as possible. Keep the hands straight. Keep the body steady. Do not shift either the arms or the legs from their positions. Raise the back as far as it allows it to do. Remain in this position for about a minute. Then inhale and lower the body to the ground and bring it to the original position. Then breathe normally.
Pranayama

Nadi Shodan

Sit in any comfortable asana and check which nostril is flowing more freely than the other. Suppose the left is free, close the right nostril with your thumb and start inhaling through the left very slowly. Count 15 numbers during inhalation. Close your nostrils with your thumb and ring finger and hold your breathe inside till you have finished counting so. Open the right nostril and exhale the air slowly in 20 counts.

Surya Bhedana

Sit in the Padmasana or the siddhasana position close the eyes. Close the left nostril with the little finger of the right hand. Inhale deeply throughout the right nostril. Then close the right nostril with the right thumb. Rest the chin in the notch between the collar bone just above the breast bone. Now practice kumbhaka. Gradually, increase the time for kumbhaka. Then close the right nostril with the thumb and exhale slowly through the left nostril. Repeat this exercise in the same.
**Kabalabhati**

Sit in either the paddmasana or the siddhasana, place the hands on the knees. Lower the eyes. Inhale and exhale quickly and forcefully like the bellows of a blacksmith. The exercise should be done with full force so that the body perspires.

**Uddiyana Bandha**

This Bandha can be practiced in either standing posture or sitting posture. In the standing posture, place the hands slightly above the knees. Bend the body slightly forward keep the legs apart. Exhale with full force. Now contract the abdomen and pull it upwards and backwards to the spine with the force of the navel and the diaphragm. The diaphragm will be pulled up and the abdominal wall will be pushed up to the back.

**Administration of Tests**

1. **Arm Strength (Pull Ups)**

**Purpose**

To measure the strength of the arms and shoulders
Equipments

Metal or Wooden Horizontal bar approximately 1.5 inches in diameter is preferred.

Procedure

The bar should be high enough so that the pupil can hang with his arms and legs fully extended and his feet free of the floor. He should use the overhand grasp. After assuming the hanging position, the pupil raises his body by his arms until his chin can be placed over the bar and then lowers his body to a full hang as in the starting position. The exercise is repeated as many times as possible.

The body must not swing during the execution of the movement. The pull must in no way be a snap movement. If the pupil starts swinging, check this by holding your extended arms across the front of the thighs. The knees must not be raised and kicking of the leg is not permitted.

Scoring

Record the number of completed pull-ups to the nearest whole number. (Donald K. Mathews, 1978)
2. **Muscular Endurance (Bent Knee Sit Ups)**

**Purpose**

To measure muscular endurance of the abdominal muscles

**Equipments**

Mat and a stopwatch

**Procedures**

The examinee lies on his back with knees bent at right angles or heels about 18 inches from the hips. Hands should be clasped behind the head. A partner holds the ankles for support. On "Go", the examinee performs repeated sit-up, doing as many as possible in one minute. The elbows should alternately touch the opposite knee in the "up" position. After each up movement, the examinee is to return to the back lying position with shoulders touching the mat. The examinee should be encouraged to breathe regularly during the test.

**Scoring**

The score is the number of correctly performed sit-ups completed in one minute. (Donald K. Mathews, 1978)
3. **Agility (Shuttle Run)**

**Purpose**

To measure the agility of the performer in running and changing direction

**Equipments**

Marking tape, stop watch and two blocks of wood (2"x2"x 4")

**Procedure**

The performer start behind the starting line on the signal "go" and runs to the blocks, pick up one, return to the starting line, and places block behind the line; He then repeats the process with the second block allow some rest between the two trails. Total distance covered in one repetition was 40 yards.

**Scoring**

The score for each performer is the length of time require (to the nearest tenth of second) to complete the course record only the best trial. *(Donald K. Mathews, 1978).*
4. **Explosive Power (Standing Broad Jump)**

**Purpose**

The purpose of the test was to measure the explosive strength.

**Equipments**

Measuring tape, chunnam

**Procedure**

The subject stood behind the take off line with his feet several inches apart before jumping. The subject dips at the knee and swunged the arms backward, then jumped forward by simultaneously extending the knees and swunged the arms forward. Three trials were given.

**Scoring**

The distance between the take off line and the nearest point where any part of the subject's body touched the floor. The best of three trials was recorded. *(Donald K. Mathews, 1978).*
5. Speed (50 mts Run)

Purpose

The purpose of the test was to measure the speed of an individual.

Equipments

Stopwatch, chunnam, Scorecord

Procedure

The subject took a position behind the starting line. The starter used the command, “ready” and “go”. The latter was accompanied by a downward sweep of the arm as a signal to the timer. The subjects ran across the finish line. The standing start method was adopted for this purpose. The stopwatch is started on the command “Go” and stopped when the runner crosses the finish line.

Scoring

The score was the elapsed time to the nearest one tenth of a second between the starting signal and the instant the subject crossed the finished line. The fractions were rounded to the next largest one tenth of a second. One trial was permitted. (Donald K. Mathews, 1978).
6. Endurance (600 yard run-walk)

Purpose

To measure speed endurance

Equipments

A stopwatch, 400 m track

Procedure

Instruct the student to use a standing start. Give the signal ready, Go!, and start the stop watch on the signal Go!. The student begins running and continues running as fast as possible until he crosses the finish line. Although the examinee may walk during the test, it is not encouraged. One trial is taken.

Scoring

The time is recorded in minutes and seconds. A partner should be identified for each runner. The partner either records the time or remembers it and reports it to the scores. (Donald K. Mathews, 1978)
7. **Resting pulse rate**

**Purpose**
To measure the pulse rate of the subjects

**Equipment**
Stop watch, pencil.

**Procedure**
The pulse rate of all the subjects was recorded in sitting position. Before taking pulse rate the subjects were asked to sit in a chair and relax for some minute. To record the pulse rate the fingertips were placed on the radial artery at the wrist in such a manner that pulsation was clear and number of pulsation were counted for 30 seconds. Then multiplied by 2 records for 1 full minute. *(Bloomfield, 1994)*

8. **Systolic and Diastolic Blood Pressure**

**Purpose**
Find out the systolic & diastolic blood pressure.

**Equipments**
Sphygmomanometer and Stethoscope
Procedure

The patient was comfortably seated with the arms slightly flexed and the whole for arm supported on a smooth surface. The artery was chosen as the site of measurement and care was taken to see that clothes did not constrict the arm. A completely deflated cuff was applied snugly and evenly around the arm with the antilapited space and with the rubber bag applied over the inner aspect of the arm. The cuff was of such a type and applied in such a manners that inflation caused neither bulging nor displacement. The stethoscope was placed over the previously palpated artery in the artery in the anteribital space, not in contact with the cuff. There was no opening between the tip of the stethoscope and the skin; this was accomplished with the minimum pressure possible.

To determine the systolic pressure the cuff was rapidly inflated to a pressure about 30mm above the radial pulse level. Then the cuff was deflated at a rate of 2 (or) 3 mm of mercury per second. The level at which the first sound appeared was considered as the systolic pressure and it was noted.
To determine the diastolic pressure deflation of the cuff was continued. The point at which the sound suddenly became dull and muffled was considered as the diastolic pressure. (Bloomfield, 1994).

**Experimental Design and Statistical Procedure**

The subjects chosen for the study were divided into two experimental groups, each group consisting of 30 subjects. Experimental groups were assigned yogic practices. The data was collected for the selected physical and physiological variables first at the beginning (pre-test) and finally at the end of the experimental period of twelve weeks (post-test). The study was aimed at mainly in finding out the effects of training on selected dependent variables.

All the subjects of two groups were tested on selected dependent variables before and after the treatment. The data pertaining to the variables in this study were examined by using dependent t-test to find out significant improvement and analysis of covariance (ANCOVA) for each variable separately in order to determine the differences if any among the adjusted post test means. The level of significance was fixed at 0.05 level of confidence for all the cases.