CHAPTER III

METHODOLOGY

This chapter deals with the selection of subjects, selection of variables, orientation of the subjects, reliability of the instruments, competency of the tester, reliability of the data, test administration, experimental design and the statistical procedure used.

3.1 SELECTION OF SUBJECTS

To facilitate the study hundred and fifty middle aged men from Perithalamanna, Malappuram district in Kerala State were randomly selected as subjects and their age ranged between 40 and 50 years. They were assigned into five groups of which the first group served as yogic practice group, the second group as walking group, the third as jogging group, the fourth as combined physical activity group and the fifth group served as the control group.

The requirements of the experimental procedures, testing as well as exercise schedules were explained to them so as to avoid any ambiguity of the effort required on their part and prior to the administration of the study, the investigator got the individual consent from each subject.
3.2 SELECTION OF VARIABLES

The research scholar reviewed the various scientific literatures pertaining to the yogic practices, walking and jogging on selected cardio respiratory and psychological variables from books, journals, periodicals, magazines, research papers and internet. Taking into consideration the feasibility, availability of instruments and the relevance of the variables of the present study, the following variables were selected.

3.2.1 Dependent Variables

3.2.1.1 Cardio respiratory Variables

1. Resting Pulse Rate

2. VO₂ Max

3.2.1.2 Psychological Variables

1. Anxiety

2. Aggression

3. Self Confidence

3.2.2 Independent Variables
1. Twenty four weeks of yogic practices

2. Twenty four weeks of walking exercises

3. Twenty four weeks of jogging exercises

4. Twenty four weeks of combined yogic practices and walking and jogging exercises

3.3 EXPERIMENTAL DESIGN

The study was formulated as a true random group design, consisting of pretest and post test. The subjects (n=150) were randomly assigned to five equal groups of thirty middle aged men each. The groups were assigned as Experimental Groups I, II, III, IV and the control group respectively. Pre tests were conducted for all the subjects on selected cardio respiratory and psychological variables such as resting pulse rate, VO₂ max, anxiety, aggression and self confidence. The experimental groups participated in their respective yogic practices, walking and jogging and combined yogic practices for a period of twenty four weeks.

The post tests were conducted on the above said dependent variables after a period of twenty four weeks treatment. The training programme was scheduled from 6.30 to 7.30 a.m. for five days per week.

3.4 PILOT STUDY
A pilot study was conducted to assess the initial capacity of the subjects in order to fix the exercise load. For this purpose ten men, who were not the subjects for this study were selected and training in yogic practices, walking and jogging and combined exercises were given.

Based on the response of the subjects in the pilot study, during the training, the training schedules for group I, group II, group III and group IV were constructed. However the individual differences were not considered. This enabled the investigator to adopt suitable training schedule for this study, for the yogic practices group, walking and jogging group and combined group.

3.5 CRITERION MEASURES

By referring the literature, and in consultation with professional experts, the following variables were selected as the criterion measures in this study.

1. Resting pulse rate was measured for a period of one minute and was recorded in beats per minute.

2. \( \text{VO}_2 \text{ Max} \) was measured through the following formula suggested by Cooper.

\[
\text{VO}_2 \text{ max} = \frac{d_{12} - 505}{45}
\]

Where \( d_{12} \) is the distance (in meters) covered by the subject in 12 minutes run / walk test.
3. Anxiety was measured through standard questionnaire developed by Spielberger.

4. Aggression was measured through standard questionnaire developed by Buss and Perry (1992).

5. Self confidence was measured by Hardy and Nelson Self Confidence questionnaire.

3.6 RELIABILITY OF DATA

The reliability of data was ensured by establishing the instrument reliability, tester’s competency and subject reliability.

3.6.1 Instrument Reliability

Swiss made stop watches (walkman) calibrated to one hundredth of a second were used in this study for recording the timings and this stop watch times were compared with other watches in different situations and were considered reliable. A standard measuring steel tape (freeman) and digital heart rate measuring machine (EW 243, Japan) were used to measure the tests. All the instruments used were the best in standard and therefore their calibrations were accepted accurate enough for the purpose of the study.

3.6.2 Tester’s Competency

Reliability was established by the test-retest processes. Nine men from all the three groups were tested on selected variables. The repeated measurement of
individuals on the same test is done to determine reliability. It is a univariate not a bivariate situation; it makes sense then to use a univariate statistics like the interaclass correlation coefficient (Baumgartner and Jackson, 1975).

The intra class correlation coefficient obtained for test-retest data are presented in Table I.
Table I

Intra Class Correlation Coefficient of Test – Retest Scores

<table>
<thead>
<tr>
<th>S.No</th>
<th>Variables</th>
<th>Coefficient of Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Resting Pulse Rate</td>
<td>0.97*</td>
</tr>
<tr>
<td>2</td>
<td>VO₂ Max</td>
<td>0.98*</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level

As for the psychological variables of anxiety, aggression and self confidence, the authors of the questionnaire have determined reliability and the same was adopted for this study and was considered reliable.

3.6.3 Subject Reliability

The intra class correlation value of the above test and retest also indicated subject reliability as the same subjects were used under similar conditions by the same tester. The co-efficient of reliability were significant at 0.05 level, for the above test under investigation.

3.7 COLLECTION OF DATA
The purpose of the study was to estimate the effects of yogic practices, walking, jogging and combined effects of yogic practices and walking and jogging on selected cardio respiratory and psychological variables among middle aged men. For this purpose, the scholar followed the following procedure.

The subjects of the study were selected at random and were divided into five homogeneous groups. Among the five groups, the control group was kept without undergoing any special activity. The experimental groups have undergone the experimental treatments.

The experimental groups were well acquainted with their allotted techniques and the experimental treatment given to them were done for a period of twenty four weeks under the personal supervision of the researcher.

3.8 TRAINING PROGRAMME

The following training programme was adopted for walking, jogging, yogic practices and combined groups.

3.8.1.1 BRISK WALKING TRAINING

Experimental group subjects for brisk walking were required to undergo brisk walk continuously without any rest. They underwent this training from Monday to Friday, excluding Saturdays and Sundays. The experimental period was for 24 weeks. Proper warm up and warm down timings were given to the subjects during the
experimental period. The subjects were asked to perform the brisk walking 10 minutes with light intensity, followed by 10 minutes moderate intensity and finally 10 minutes high intensity at each session.

3.8.1.2 JOGGING TRAINING

Experimental group subjects after warm up were required to undergo jogging continuously without any rest. Subjects underwent training five days per week for a period of 24 weeks. Proper warm up and warm down timings were given to the subjects during the experimental period.

The subjects performed walking and jogging training as detailed.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm up</td>
<td>5 minutes</td>
</tr>
<tr>
<td>Walking</td>
<td>10 minutes</td>
</tr>
<tr>
<td>Jogging</td>
<td>10 minutes</td>
</tr>
<tr>
<td>Walking</td>
<td>10 minutes</td>
</tr>
<tr>
<td>Jogging</td>
<td>10 minutes</td>
</tr>
<tr>
<td>Warm down</td>
<td>5 minutes</td>
</tr>
<tr>
<td>Total</td>
<td>50 minutes</td>
</tr>
</tbody>
</table>

3.8.2 TRAINING YOGIC PRACTICES

3.8.2.1 Vajrasana
Vajrasana is the prayer pose. This is good for meditation and pranayama. The subjects were asked to sit with legs stretched, heels together, palms pressing on the ground by the side of the buttocks, to keep the body at right angles to the legs with an erect spine. They slowly bend the right leg and keep the heel under the buttock. Then they bring the left leg under the left buttock with spine erect and the head, shoulders and buttocks in a vertical line. The have to rest the palms on the thighs. Sit for a few seconds and release in reverse order. It is important to keep the spine, the neck and the head, upright in one straight line in this asana. The subjects have to keep the sight fixed at the level of the height without having any pressure on the hands.

3.8.2.2 Dhanurasana

Subjects were asked to be on their stomach, fold the legs backward and hold the angles with respective hands. They were asked to push the heels away from the buttocks and raise the knee. They had to raise their chin and chest up to look up without bending the elbows, to bring the knees together and raise their feet higher to
the maximum possible limit by pushing the heels away and maintain for few seconds breathing normally..

3.8.2.3 Bhujangasana

The subjects were directed to lie down in prone position and touch the ground with forehead. The palms are to be rested on the ground with fingers pointed towards head and raise the head slowly. The chest and abdomen are raised up to the chest. The pose is maintained for a few seconds and return to the original position gradually, first touching the forehead.
3.8.2.4 Ardha Chakrasana

The subjects were asked to support the buttock at the waist by the palms, inhale and bend backwards from the lumbar region, drop the head backwards, stretching the muscles of the neck. They have to retain the position for a minute with normal breathing and return to vertical position.
3.8.2.5 Ardha Pawan Muktasana

The subjects were asked to raise the right leg keeping it straight to above 45 degrees from the ground and the left leg firmly on the ground. The right leg is to be placed perpendicular to the ground. They were asked to bend the right leg and press the knees over the chest by holding the legs by interlocked fingers of the hand. The movement is continued by keeping the knee straight and bringing the leg perpendicular to the ground. The left leg is to be rotated in an elliptical fashion 5 times in the clockwise direction and 5 times in anticlockwise direction. With normal breathing they have to slowly come back to the starting position.

3.8.2.6 Sarvangasana

The subjects were asked to lie down flat on the back, palms down beside the thighs. They have to raise the legs with bent knees and slowly roll the back up to the shoulders until the chin touches the chest. The hands are to be used as a support, resting on the elbows and straighten the legs vertically. The body should be at a right angle to the head, neck, shoulders and elbows. The back should be straight, the chin pressing the chest. To return to the lying position, the knees are to be brought down to the forehead, placing the hands on the floor, and lowering the body and legs slowly to the floor. The breath has to be held in while raising and lowering the body.
3.8.2.7 Matsyasana

The subjects were asked to sit in padmasana and carefully bend backward, supporting the body with the arms and elbows, until the crown of the head touches the floor and remove the hands on the head. They have to catch hold the big toes by hooking index around them. To return to the starting position the palms are to be placed on the floor.
3.8.2.8 Halasana

The subject were asked to inhale and raise the legs together slowly and gracefully without bending the knees till it forms about 90° to the ground, keeping the arms down placing next to the buttock. The have to exhale and bring down the legs till the toes touch beyond the head. They were asked to keep the knees together with legs and thigh in straight line, breathe normally and remain in this position for a few seconds. Then slowly they have to raise the legs and bring them to the original position lying on the ground.

3.8.2.9 Vakrasana

Subjects were asked to bend the right leg at the knee and place the foot beside the left knee of the extended leg (left leg). They have to straighten and twist the waist towards the right side and exhale. Then they have to bring the left hand around the right knee and catch the right big toe, taking the right hand back and keeping the palm on the ground in such a way that the trunk is kept erect with a proper twist. Breathe normally and hold the position for a few seconds. Lateral twist gives flexibility to the spine and
toes up the spinal nerves. It helps to cure constipation, dyspepsia, stimulates the pancreas and is useful for diabetes and to improve the lung capacity.

3.8.2.10 Ardha Matsyasana

The subjects were asked to lie flat in shavasana with the arms resting on the floor by the sides. The back is arched, pressed against the floor with the lower arms and bringing the top of the head to rest on the floor. The weight of the body rests on the outstretched legs, buttocks and top of the head. Both palms are placed on the thighs. To release the posture the hands are brought back down to the floor, relaxing the arch and return to shavasana.

3.9 TRAINING PROCEDURE

The training programmes, namely, selected yogic practices exercises were given to subjects for five days a week for twenty four weeks in the morning sessions.
Proper warming up and very basic things required for the training was provided to the subjects. The investigator sought the help of two assistants who were well versed with this training programme for the smooth functioning of the treatment and for controlling the subjects during the course of training.

The yogic exercise schedule is presented in Table II
Table II

YOGASANA SCHEDULE FOR TWENTY FOUR WEEKS

<table>
<thead>
<tr>
<th>S.No</th>
<th>Yogasana</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Loosening the limbs</td>
<td>15 minutes</td>
</tr>
<tr>
<td>2</td>
<td>Vajrasana</td>
<td>3 minutes</td>
</tr>
<tr>
<td>3</td>
<td>Dhanurasana</td>
<td>3 minutes</td>
</tr>
<tr>
<td>4</td>
<td>Bhujangasana</td>
<td>3 minutes</td>
</tr>
<tr>
<td>5</td>
<td>Pachimotrasana</td>
<td>3 minutes</td>
</tr>
<tr>
<td>6</td>
<td>Ardha Chakrasana</td>
<td>3 minutes</td>
</tr>
<tr>
<td>7</td>
<td>Ardha Pawan Muktasana</td>
<td>3 minutes</td>
</tr>
<tr>
<td>8</td>
<td>Sarvangasana</td>
<td>3 minutes</td>
</tr>
<tr>
<td>9</td>
<td>Matsyasana</td>
<td>3 minutes</td>
</tr>
<tr>
<td>10</td>
<td>Sasangasana</td>
<td>3 minutes</td>
</tr>
<tr>
<td>11</td>
<td>Halasana</td>
<td>3 minutes</td>
</tr>
<tr>
<td>12</td>
<td>Vrksasana</td>
<td>3 minutes</td>
</tr>
<tr>
<td>13</td>
<td>Ardha Matsyendrana</td>
<td>3 minutes</td>
</tr>
<tr>
<td>14</td>
<td>Savasana – Relaxation</td>
<td>3 minutes</td>
</tr>
</tbody>
</table>
3.10 COMBINED TRAINING PROCEDURE

The combined training programmes, were given to the subjects on both yogic practices and walking and jogging exercises following the same procedure explained above on five days for twenty four weeks. Proper warming up and very basic things required for the training were provided to the subjects. The investigator sought the help of two assistants who were well versed with these training programme for the smooth functioning of the treatment and for controlling the subjects during the course of training.

Table III

SHOWING COMBINATION OF WALKING AND JOGGING AND YOGIC EXERCISES IN A WEEK

<table>
<thead>
<tr>
<th>S.No</th>
<th>Days</th>
<th>Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monday</td>
<td>Walking</td>
</tr>
<tr>
<td>2</td>
<td>Tuesday</td>
<td>Yogic Practices</td>
</tr>
<tr>
<td>3</td>
<td>Wednesday</td>
<td>Jogging</td>
</tr>
<tr>
<td>4</td>
<td>Thursday</td>
<td>Yogic Practices</td>
</tr>
<tr>
<td>5</td>
<td>Friday</td>
<td>Walking</td>
</tr>
</tbody>
</table>

The diagram shown in Figure I show the methodology adopted for this study.
Flow Chart Showing the Methodology adopted in the Study

**SUBJECTS**
**MIDDLE AGED MEN**
**N = 150**

**GROUP I**
(n=30)  
**GROUP II**
(n=30)  
**GROUP III**
(n=30)  
**GROUP IV**
(n=30)  
**GROUP V**
(n=30)

**PRE TESTS ON**

- **Psychological Variables**
  1. Anxiety
  2. Aggression
  3. Self Concept

- **Cardio respiratory variables**
  1. Resting Pulse rate
  2. VO₂ Max

**POST TESTS ON**

- **Psychological Variables**
  1. Anxiety
  2. Aggression

- **Cardio respiratory Variables**
  1. Resting Pulse rate
  2. VO₂ Max

**STATISTICAL ANALYSIS**
(Analysis of Co-variance ANCOVA)
and Scheffé’s Post Test

**RESULTS, DISCUSSION & CONCLUSIONS**
3.9 TEST ADMINISTRATION PSYCHOLOGICAL VARIABLES

3.9.1 Anxiety

Anxiety was measured through the anxiety questionnaire developed by Spielberger. It was designed to measure the degree of anxiety experience prior to the competition.

Spielbergers Trait Anxiety questionnaire was given to all the subjects. Twenty items were adopted from Spielbergers Trait Anxiety questionnaire for this investigation. The complete questionnaire scores are as follows:

<table>
<thead>
<tr>
<th>S.No</th>
<th>Response</th>
<th>Score of Positive statements</th>
<th>Score of Negative statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not at all</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Some what</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Moderately so</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Very much</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Negative Statements</td>
<td>3,4,6,7,9,12,13,14,17,18</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Positive Statements</td>
<td>1,2,5,8,10,11,15,16,19,20</td>
<td></td>
</tr>
</tbody>
</table>

3.9.2 Aggression
Aggression of the subjects under the study were measured through Aggression Scale test developed by Guru Pyari Mathur and Raj Kumari Bhatnagar (2004).

**Description of the Questionnaire**

The aggression scale questionnaire consists of fifty five statements. The subjects answered the statements in the graded manner, namely, strongly agree, agree, undecided, disagree and strongly disagree. The level changes from extremely uncharacteristic to extremely characteristics. The respondents were made to mark ‘✓’ against the box provided for this purpose. This represents the appropriate characteristics suited to their attitude.

3.6.2.1 Scoring
This inventory was scored with the help of the scoring key given below. The range of score was from 275 to 55. The higher the score the more aggressive the player is.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Response</th>
<th>Score of Positive statements</th>
<th>Negative Statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly Agree</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Undecided</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Disagree</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Strongly Disagree</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

3.9.3 Self Confidence

Standard Hardy and Nelson (1992) questionnaire for self confidence was used to scale the self confidence level of middle aged men. The test consists of four questions with six levels of responses. The levels of changes from strongly disagree to strongly agree. The respondents were made to encircle the appropriate number which suited their attitude.

Scoring
This scoring range of the questionnaire was 4 to 24. The higher score indicates the high level of self confidence.

3.10 MEASUREMENTS OF PHYSIOLOGICAL VARIABLES

3.10.1 Resting Pulse Rate

Objective

To measure the resting pulse rate of each subject per minute

Equipment

Digital Heart Rate Measuring Machine, manufactured by National Company, Japan.

Administration

The pulse rates of all the subjects were recorded in a sitting position, in the evening between 4 and 5 p.m. Before taking the pulse rate the subjects were asked to relax for about 30 minutes.

Then the subjects were instructed to sit in a back supported chair and maintain in a slight incline position and placed his left hand on the table. Next the researcher collected pulse rate by using Digital Heart Rate measuring machine which was placed in the chest level on a table. In this way the researcher measured the heart rate of the subject.

Scoring
The pulse was recorded in minutes.

3.10.2 VO2 Max

Cooper’s 12 Minutes Run or Walk Test

Purpose

To measure the VO\textsubscript{2} max (cardio respiratory endurance)

Equipment

Whistle, stopwatch, 400 meters track.

Description

Subjects assembled behind the starting line at the starting signal, and they ran or walked as fast as possible within the 12 minutes time limit. At the signal ‘to stop’ the performers should remain where they finished long enough for test administrators to record the distance covered. Ample time was given for stretching, warm-up as well as cool down.

Scoring

The distance was recorded in meters covered in 12 minutes

The VO\textsubscript{2} max in ml/min/kg was calculated based on the formulae suggested by Cooper (1960) was:
\[ \text{VO}_2 \text{ max} = \frac{d_{12} - 505}{45} \]

Where, \( d_{12} \) is the distance (in meters) covered in 12 minutes.

### 3.13 STATISTICAL TECHNIQUE

The data obtained was analysed by using analysis of variance (ANOVA) and analysis of covariance (ANCOVA). The analysis of variance was used to assess the significant difference between the pre-test and post-test, for each of the variables on the yogic practices, walking and jogging and combined physical activity separately.

Analysis of covariance was computed for any number of experimental groups, the final means were adjusted for differences in the means for significance. The analysis of variance was first computed to find out the difference between the initial means. The obtained ‘F’ ratio compared with critical ‘F’ value for significance, will provide confidence that the critical samples came from the same population and are devoid of sampling bias.

When the ‘F’ ratio was found to be significant, Scheffe’s post hoc test was used to find out the paired mean significant difference.

Scheffe post hoc test has the greatest power and is the most conservation with respect to Type 1 error: this method loads to the smallest number of significance differences. The difference between two means would be significant, if it exceed Scheffe F. In order to be significant, ‘F’ must equal \((k - 1) (F_{.05} \text{ or } F_{.01})\). Thus, the
necessary ‘F’ ratios for the difference between paired adjusted mean (k-1) would be computed and compared for significance.