CHAPTER III
METHODOLOGY

In this chapter, the selection of subjects, experimental design, selection of variables, selection of tests, instruments reliability, reliability of the data, pilot study, orientation of the subjects, training programme, test administration, collection of the data and statistical procedure have been explained.

Selection of Subjects

The purpose of the study is to find out the effects of yogic training aerobic training and detraining on health related physical fitness of college male students. Forty five healthy, untrained students were selected from Dr.R.K.Shannmugam College of Arts & Science, Indili, Kallakurichi T.K, Villupuram Dt, Tamil Nadu, during the academic year 2009 – 2010 for this study. The subject’s age ranged from 18 to 21 years.

Experimental Design

The selected subjects were divided into three groups with fifteen subjects in each group selected randomly, with two experimental groups and one control group. Experimental Group I underwent the yogic training in selected asanas and pranayama. Experimental Group II underwent the selected aerobic dance with music’s programme. The training periods of experimental groups were twelve weeks, five days per week with duration of 45 minutes. Control group did not undergo any training programme rather than their routine work.

Selection of Variables

On the basis of the available literature, personal experience, discussion done with research supervisor and consulting with sports experts, the following health related physical fitness variables were selected.
Health Related Physical Fitness

a. Muscular Strength
b. Muscular Endurance
c. Cardio-respiratory Endurance
d. Flexibility
e. Body composition

Selection of Tests

The test items were selected for this study after thorough review of literature as well as consultation with experts, physical education professionals, research supervisor and sports experts which were appropriate and ideal for the variables. The criterion variables are presented in the table 3.1.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Criterion Variables</th>
<th>Test Items</th>
<th>Unit of Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Muscular Strength</td>
<td>Grip dynamometer</td>
<td>kilograms</td>
</tr>
<tr>
<td>2</td>
<td>Muscular Endurance</td>
<td>Sit ups (Bent knees)</td>
<td>Counts</td>
</tr>
<tr>
<td>3</td>
<td>Cardio Respiratory Endurance</td>
<td>12-Min run / walk</td>
<td>Meters</td>
</tr>
<tr>
<td>4</td>
<td>Flexibility</td>
<td>Sit and reach box</td>
<td>Centimeters</td>
</tr>
<tr>
<td>5</td>
<td>Body composition</td>
<td>Skin fold caliper</td>
<td>Millimeters</td>
</tr>
</tbody>
</table>

Instruments Reliability

Hand grip dynamometer, sit and reach box, skin fold caliper, stop watch and other equipments used for this study. All these instruments were available in the department of physical education and sports sciences, Pondicherry University, Puducherry. They were new and good with working condition. Their calibration were tested and found to be accurate enough to serve the purpose of the study.
Reliability of the Data

The reliability of the data was established through test and retest method. Ten subjects were randomly selected from the Dr. R.K. Shanmugam College of Arts & Science, Indili, Kallakurichi T.K, Villupuram Dt, Tamil Nadu and they were tested twice by the same testers under similar conditions on each criterion variable. The intra class correlation was used to find out the reliability of the data with test - retest scores on each criterion variables separately and they are presented in table 3.2

<table>
<thead>
<tr>
<th>Tests</th>
<th>r value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right hand grip strength</td>
<td>0.91*</td>
</tr>
<tr>
<td>Left hand grip strength</td>
<td>0.94*</td>
</tr>
<tr>
<td>Bent knee sit-ups</td>
<td>0.89*</td>
</tr>
<tr>
<td>Twelve minutes run and walk</td>
<td>0.91*</td>
</tr>
<tr>
<td>Sit and reach</td>
<td>0.93*</td>
</tr>
<tr>
<td>Skin fold caliper</td>
<td>0.90*</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence.
(The table value required for significant at .05 level of confidence is 0.632)

Pilot Study

A Pilot study was conducted before finalizing the training program to ensure that the intensity and duration of yogic training and aerobic training. Ten students were randomly selected for pilot study from each group. They were asked to practice their respective training. The average performances of the ten students from each group were calculated and that was fixed as an initial load for the experimental groups.

Orientation of the Subjects

The researcher explained about the purpose of the study to the subjects and their part during the training programme. The investigator had also explained the testing procedures on selected criterion variables and gave instructions to the subjects about the procedures to be adopted while measuring. Three sessions were spent to familiarize the subjects with the techniques involved in executing the yogic training
and aerobic training, which helped them to perform exercises properly and avoid injuries. The subjects were verbally motivated to attend the training session regularly.

**Training Programme**

During the training period the yogic group and the aerobic group underwent weekly five classes for twelve weeks of training on their respective program. The yogic group was given training on selected asanas and pranayama. The aerobic group was given training on aerobic dance with music’s programme for 30 minutes with an intensity that elicited heart rates of 140-160 beats per minute. The progressive load method was used for twelve weeks on the respective groups. The training schedule is enclosed in appendices.

**Tests Administration**

**Hand Grip Dynamometer Test**

**Purpose**

To measure the muscular strength of right and left hand grip and strength forearms.

**Equipments**

Hand grip dynamometer (Model IMI – 1417) and score sheet.

**Procedure**

The subject first dried the hand with chalk. The Hand grip dynamometer (Model IMI – 1417) was adjusted and placed comfortably in the hand. The second joint (articulation) of the fingers had fitted snugly under the handle. The person assumed a standing position (using an upper cut portion) in a way so that the instrument was not being touched by the body or and other object. The person gave an all out effort, statically contacting the muscles of hand, wrist and forearm for at least two to three seconds. The same process was repeated with the other hand.

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Scoring

The person was given three trail, and best of taken as the score. The score was recorded to the nearest half kilogram.

**Bent Knee Sit-Ups Test**

**Purpose**

To measures the muscular endurance of the abdominal muscles.

**Equipments**

Mats, stop watch and score sheet.

**Procedure**

The subjects were asked to take a supine lying position on the mat, knees bent to an angle less than 90 degrees, and hands clasped behind neck. The angles were held firmly on the ground by another subject. The performer lifted his trunk, touched his knees with forehead and then lowered his trunk touching the mat with his elbows. This exercise was done continuously without pause for one minute. Numbers of correctly executed sit ups were recorded as his performance.

**Scoring**

The maximum number of repetitions performed in sixty seconds is the score. The repetition was not counted when finger tips did not maintained contact behind the head, when the knees were not touched.

**Twelve Minutes Run-Walk Test**

**Purpose**

To measures Cardio Respiratory Endurance.

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86 B. Haffman, Reema, Ibid, pp. 54-55.
Equipments

Football field, stopwatch, whistle, score sheet, pencil and clapper, etc...

Procedure

For this test a foot ball field was prepared with marking at every ten meters for 200m as in the above picture. The groups of fifteen subjects were doing this test. The subjects were asked to stand on the starting position and were given instructions to cover as much distance as possible by running, jogging or walking, if running throughout the twelve minutes period was not possible. They were instructed to continue till the final whistle was blown and to stop before. With the starting whistle they started and at the end of twelve minutes the whistle was blown. The number of minutes left was announced to the subjects every minute, and the subjects jogged with moving forward the final whistle. When the signal to stop was given, they immediately stopped their running.

Scoring

The subject was concerned covered the distance was recorded. The score in meter was determined by multiplying the number of complete laps (200 meters) completed, plus the number of segments of five meters of an incomplete lap plus the number of meters stopped off between a particular segments.

Sit and Reach Test\textsuperscript{88}

Purpose

To measures the flexibility of the back and leg (hamstring) muscles.

Equipments

A sit and reach box, centimeter scale, score sheet and pencil.

Procedure

The subject was asked to assume a sitting position on the floor with fully extended legs. A sit and reach box kept closer to the feet in such a way that, the bottom of the feet were forwardly fixed at the box. The subject was asked the arms are extended forward with one hand on top of the other and finger pads on top of fingernails. The subject reaches directly forward, palms down, along the measuring scale three times, holding the position of maximum reach the last time for one full second.

Scoring

Three trials will be given to each subject. Each attempt is held for one second and the measurement is taken to the nearest centimeter.

Skin Fold Caliper Test

Purpose

To measures the level of body fat.

Equipments

Harpenden skins fold caliper, score sheet and pencil.

Procedure

An estimation of body fat by skin fold thickness measurement, were taken in three different anatomical sites around the body. The right side is usually only measured (for consistency). The tester pinches the skin at the appropriate site to raise a double layer of skin and the underlying adipose tissue, but not the muscle. The calipers are then applied 1 cm below and at right angles to the pinch, and a reading in millimeters taken two seconds later. The mean of two measurements should be taken.

If the two measurements differ greatly, a third should then be done, then the median value taken. There are many common sites at which the skin fold pinch can be taken.

To Predict Body Density from the Sum of Skin fold fat, Generalized Regression equation was used. The sites are followed

**Triceps Measures**

This measurement was taken at a site halfway between hip of the armorial process and tip of elbow. The measurement is taken with the arms hanging freely. The skin fold measure was taken on the backside of the right arm parallel to the long axis of the arm.

**Sub Scapular Measures**

The skin fold is lifted at the tip of right sub scapular on the diagonal plane about 45 degree from Horizontal plane. The caliper was placed about one centimeter in a laterally downward angle.

**Abdominal Measures**

The Subject stands on his feet. The skin fold was cited vertically taken at a lateral distance of approximately 2cm from the umbilicus.

**Calculating Percent Body Fat from Body Density**

**STEP 1**

**Lohman Equation-Calculation of Body Density**

\[
BD = [1.0973-(\text{sum SF} \times 0.000815)] + [(\text{sum SF})^2 \times 0.00000084]
\]

(Sum of SF = Triceps SF + Sub scapular SF + Abdominal SF)

**STEP 2**

**Brozek Equations-Calculation of % Body Fat from Body Density**

\[
\%\ BF = \frac{457}{BD} - 414.2
\]
Collection of the Data

The data were collected on health related physical fitness variables namely muscular strength, muscular endurance, cardio respiratory endurance, flexibility and body composition for all the three groups before the experimental period (pre test), after six weeks of training (mid test) and after twelve weeks of the training period (post test) respectively. After training period data collection the detraining period data were collected on all the variables once in ten days for three times. During this period the subjects were not allowed to participate in any training programme.

Statistical procedures

In order to test the effect of training, the collected data from all the three groups before, during and after experimentation on health related physical fitness variables were statistically analyzed by using two-way (3x3) factorial analysis of variance with last factor repeated measures.

The data collected from the three groups at post experimentation and detraining (three cessation) on health related physical fitness variables were statistically analyzed by using two way (3x4) factorial ANOVA with last factor repeated measures.

Whenever, two-way factorial ANOVA with last factor repeated the obtained ‘F’ ratio interaction values are found to be significant, the simple effect test is used. When the obtained ‘F’ ratio value in the simple effect is found significant, the Scheffe’s test is applied as post hoc test to determine which of the paired mean had significant differences. In all the cases the level of confidence is fixed at 0.05 to test the significance.