CHAPTER III

PROCEDURE

In this chapter, the procedure for selection of subjects, selection of variables criterion measures, experimental design, procedure for administration of tests, administration of training programme and the statistical technique employed for analysis of data have been describe.

SELECTION OF SUBJECTS

Since the purpose of the study was to analyze the changes that may occur in the adult person, as a result of aerobic training, it was considered necessary to choose untrained individuals who were not in any of the game or sports team or in any training or coaching programme. For this purpose thirty sedentary male individuals free from deformities and ailments were selected randomly from Alwar Public School, Alwar.
The requirements of the project were explained to all the subject and all of them agreed voluntarily to undergo the testing and training programmes. A thorough orientation of the rigid requirements of the experimental procedure, as well as the exercise schedule were explained to them so that there was no ambiguity of what effort was required on their part and what hardship they might have to endure.

**SELECTION OF VARIABLES**

The research scholar had gone through both critical as well as allied literature related to the problem. Keeping in the mind, the availability of equipment's acceptability to the subjects and the legitimate time that would be devoted for test in relation to the treatment (experimental variables) requirements and to keep the entire study unitary and integrated, the following cardiac and plasma lipids, Lipoprotein parameters were selected.
CARDIOLOGICAL PARAMETERS

A. CARDIAC MORPHOLOGICAL PARAMETERS

1. Interventricular septum thickness.
2. Interventricular posterior wall thickness.
3. Left ventricular end systolic diameter.
4. Left ventricular end diastolic diameter.

B. CARDIAC FUNCTIONAL PARAMETERS

1. Left ventricular end diastolic volume.
2. Left ventricular end systolic volume.
3. Ejection fraction.
4. Fractional shortening.
5. Stroke volume.
PLASMA LIPIDS AND LIPOPROTEIN PARAMETERS

1. High density lipoprotein - cholesterol.
2. Low density lipoprotein – cholesterol.
4. Total cholesterol.
5. High density lipoprotein cholesterol ratio.
6. Triglycerides.

CRITERION MEASURES

The criterion measures adopted in the study were:

To measure the cardiac morphological parameters, the researcher measured inter-ventricular septum thickness (IVS), inter-ventricular posterior wall thickness (IVPW), left ventricular end systolic (LVES) and end diastolic (LVED)
diameters, through the echocardiograms of the subjects in supine position.

To measures the cardiac functional parameters of the subjects the researcher measured the left ventricular end systolic (LVES) and diastolic (LVED) Volumes, Ejection fraction (EF), fractional shorting (FS), directly through the echograms of the subjects and cardiac output (Competition) measured by multiplying the RHR and SV. Resting heart rate (RHR) of the subjects were measured through the palpation method.

Serum lipids and lipoprotein parameters were measured through the blood sample of the subjects, which were determined by enzymatic method by using the stangen cholesterol kit and hybenga and pileggi's method.
EXPERIMENTAL DESIGN

Random group design was used for the experimental study because it was considered the most appropriate. All the thirty subjects were randomly divided into two experimental that is experimental group A, experimental group B and one control group that is control group C, each consisting of ten subjects. The experimental groups was given aerobic training (jogging/running) of different intensities for a period of six months excluding the period utilized for pre-test and post-test. The control group did not participate in any training programme during the experimental period.

PROCEDURE OF ADMINISTARTION OF TEST

The subjects were asked to lay on supine position on the bed, the transducer, which was at the same time transmitter of the ultrasonic impulse and receiver for the reflected echoes placed on the interior chest wall in the fourth or fifth inter-
costal space parasternally on the left side. The ray of the sound passed through the front chest wall, then the right ventricle. Its lumen could be clearly seen in the pathological expansion. Starting at the right ventricle, the path of the ultrasound ran to the inter-ventricular septum (IVS), then to the cavity of the left ventricle, finally reached the posterior cardiac wall. In the time motion process, the echo-curves which were visible on the screen could be photographed and kept for the record purpose.

**MEASUREMENT OF IVS THICKNESS**

The IVS Thickness was measured directly from the echograms of the septum and it was recorded in millimeter.

**MEASUREMENT OF LVPW THICKNESS**

This was also be measured directly in millimeter from echograms of Left-Ventricular Posterior wall.
MEASUREMENT OF LVM

Left Ventricular Muscle Mass was calculated using a modification of the method described by troy and co-workers (1972)

\[ LVM = [(LVEDD + IVS + LVPW)^3 - (LVEDD)^3] \times 1.05 \]

where LVEDD, IVS, LVPW were Left Ventricular End Diastolic Diameter, Interventricular Septum and Left Ventricular Posterior Wall Thickness respectively. The specific gravity of muscle mass was 1.05 and measured in grams.

MEASUREMENT OF LVED DIAMETER

The Left Ventricular End Diastolic Diameter was measured by calculating the IVS and LVPW Valley distance from M mode echo-cardiogram. It was measured in millimeter.

MEASUREMENT OF LVES DIAMETER

LVES diameter was measured by calculating the IVS and LVPW peak distance from M mode echogram and it was recorded in millimeter.

MEASUREMENT OF LEFT VENTRICULAR END DIASTOLIC VOLUME (LVEDV) & LEFT VENTRICULAR END SYSTOLIC VOLUME (LVESV)

In 2D echo-cardiography the product of measured volume length and area. The area of a circle measured area. According to Teichholtz the left ventricle could be considered as a rotary ellipsoid. This programme of calculating the left ventricular volume was adjusted in the 2D echocardiography machine. LVEDV and LVESV was calculated directly from the echo-cardiogram and it was measured in ml.
MEASUREMENT OF EJECTION FRACTION (EF)

Left ventricular ejection fraction was measured in the following way.

\[
EF = \frac{LVEDV - LVESV}{LVEDV} \times 100
\]

where,

\[
LVEDV = \text{LEFT VENTRICULAR END DIASTOLIC VOLUME}
\]

\[
LVESV = \text{LEFT VENTRICULAR END SYSTOLIC VOLUME}
\]

EF was measured in percentage (%)
MEASUREMENT OF FRACTIONAL SHORTENING (FS)

Fractional shortening was measured in the following way:

\[ FS = \frac{LVEDD - LVESD}{LVEDD} \times 100 \]

where,

LVEDD = Left ventricular end diastolic diameter.
LVESD = Left ventricular end systolic diameter.

FS was measured in percentage (%).

MEASUREMENT OF STROKE VOLUME (SV)

SV was measured by subtracting the left ventricular end systolic volume (LVESV) from left ventricular end diastolic volume (LVEDV).

So,

\[ SV = LVEDV - LVESV. \]

SV was measured in ml.
PLASMA LIPIDS AND LIPOPROTEINS ANALYSIS

Subjects had an over night fast for 12 hours and abstained from exercise for 48 hours prior to the blood collection for plasma lipids and lipoproteins determination. Blood samples was drawn from a vein near the antecubital fossa. From each subject from each subject 10ml of blood samples were taken twice that is before and after the training program. Post test blood samples were drawn 48 hours after the last exercise bout in an attempt to minimize the potential of acute exercise to mark the effect of training on the plasma lipids and lipoproteins. Plasma lipids and lipoproteins variables namely HDL-C, LDL-C, VLDL-C, TG, Total Cholesterol and HDL-C/Total Cholesterol ratio were determined by Hybenga and Pilegg’s method and the Enzymatic method by using the Stangen Cholesterol kit in a well sophisticated and reputed computerised Pathological Laboratory, Alwar (Raj).
ADMINISTRATION OF TRAINING PROGRAMME

The training schedule prepared by the investigator was applied to the experimental groups and training was personally supervised by the investigator with the help of properly trained physical education teachers who strictly followed the instructions of the investigator. The training was carried out trice a week in the morning session on Mondays, Wednesday and Fridays. The details of training method is as follows:

AEROBIC TRAINING

A study was conducted selecting twenty subjects randomly from the experimental groups (EXP. GRP. – 1 And EXP. GRP. –2). Initially the subjects were asked to run at uniform pace and later the running pace was varied. So that the pulse rate was maintained in target zone. On the basis of the pilot study result the duration of the training programme was initiated from 20
minutes with progressive increase of five minutes for EXP. GRP. - A. And three minutes for EXP. GRP. - B. After every three weeks considering that the duration of three weeks was sufficient for adaptation of the body to given work load.

The schedule of aerobic training load is given in Table 1.

### TABLE 1

**SCHEDULE OF AEROBIC TRAINING (JOGGING / RUNNING) PROGRAMME FOR SIX MONTHS**

<table>
<thead>
<tr>
<th>WEEKS</th>
<th>EXP. GRP. – A.</th>
<th>EXP. GRP. – B.</th>
<th>PULSE RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 - 03</td>
<td>20 mins.</td>
<td>20 mins.</td>
<td>120</td>
</tr>
<tr>
<td>04 - 06</td>
<td>25 mins.</td>
<td>23 mins.</td>
<td>120</td>
</tr>
<tr>
<td>07 - 09</td>
<td>30 mins.</td>
<td>26 mins.</td>
<td>130</td>
</tr>
<tr>
<td>10 - 12</td>
<td>35 mins.</td>
<td>29 mins.</td>
<td>130</td>
</tr>
<tr>
<td>13 - 15</td>
<td>40 mins.</td>
<td>32 mins</td>
<td>130</td>
</tr>
<tr>
<td>16 - 18</td>
<td>45 mins.</td>
<td>35 mins.</td>
<td>140</td>
</tr>
<tr>
<td>19 - 21</td>
<td>50 mins.</td>
<td>38 mins.</td>
<td>140</td>
</tr>
<tr>
<td>22 - 24</td>
<td>55 mins.</td>
<td>41 mins.</td>
<td>145</td>
</tr>
<tr>
<td>25 - 27</td>
<td>60 mins.</td>
<td>44 mins.</td>
<td>145</td>
</tr>
</tbody>
</table>
STATISTICAL TECHNIQUE

The following statistical techniques were employed for the analysis of data:

1. To find out the significance of difference between the pre-test mean of the experimental and control group, the 't' test was employed.

2. To compare the significance of mean differences among the experimental and control group on the selected variables, the analysis of covariance was applied. The label of significance was set at .05.
FIGURE 1: SUBJECTS OF THE STUDY
FIGURE 2: CONTROL GROUP
FIGURE 4: EXPERIMENTAL GROUP 2
FIGURE 5: PROCEDURE FOR MEASUREMENT OF ECHOCARDIOGRAM
FIGURE 6: PROCEDURE FOR MEASUREMENT OF BLOOD LIPID PROFILE