MATERIALS AND METHODS
CHAPTER – III

MATERIALS AND METHODS

In this chapter the selection of subject, tester reliability, instrument reliability, orientation of subjects, research design, criterion measures, administration of tests, construction of training programme and statistical technique adopted for the analysis of data have been described.

3:1 SELECTION OF SUBJECTS

Among the football players who had participated in the Bharathiar University inter-collegiate men football tournament 1994-95, forty five players had been selected randomly as the subjects for the study. The average age, height and weight of the subjects were mentioned below

<table>
<thead>
<tr>
<th>TABLE -1</th>
<th>MEAN AND STANDARD DEVIATION OF THE SUBJECTS' AGE, HEIGHT AND WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sl.No.</td>
<td>Variable</td>
</tr>
<tr>
<td>1</td>
<td>Age</td>
</tr>
<tr>
<td>2</td>
<td>Height</td>
</tr>
<tr>
<td>3</td>
<td>Weight</td>
</tr>
</tbody>
</table>
All the players had fairly well developed physique as all of them had been participating in football regularly.

3: 2 RELIABILITY OF DATA

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

3: 2.1 TESTER RELIABILITY

To ensure that the investigator was well versed in the technique of conducting the tests, the investigator had a number of practice sessions in the testing procedures. All the measurements were taken by the investigator with the assistance of persons well acquainted with the tests and their procedures. In Morgan flexiflo, the qualified technician administered the tests.

Tester's competency and reliability of tests, were established by test retest process. As very high correlation was obtained, the tester competency in taking measurements and test reliability were accepted.

3:2.2 SUBJECT RELIABILITY

The above test retest coefficient of correlation also established that subject reliability was highly significant.
3:2.3 **INSTRUMENT RELIABILITY**

Leg Dynamometer, skinfold caliper, bicycle ergometer, Morgan flexiflo, stop watches and measuring tape which were used to measure various variables were obtained from standard firms which cater to the needs of various research laboratories in India and abroad. Certificates of accuracy were obtained from appropriate instrument testing agencies and also by recalibrating the scale by using known amounts of variables wherever required.

3:3 **ORIENTATION OF SUBJECTS**

The investigator held a meeting with the subjects prior to the administration of tests. The purpose, the significance of the study and the requirements of the testing procedures were explained to them in detail so that there was no ambiguity in their minds, regarding the efforts required of them. All the subjects agreed voluntarily to co-operate in the testing procedures and training to put in their best efforts in the interest of the scientific investigations and in order to enhance their own performance. The subjects were very enthusiastic and co-operative throughout the project.

3:4 **RESEARCH DESIGN**

The investigation was to find out the effect of
specific pre-season training package compared to traditional method of training on selected physical and cardio-pulmonary variables and skill performance of college football players. For this purpose, the investigator divided the selected 45 subjects randomly into three groups namely

1) Specific pre-season training package group
2) Traditional method of training group and
3) Control group.

The various tests were administered prior to training (Pretest), after fourth week, eighth and twelfth week (final test) of the training schedule.

3: 5 CRITERION MEASURES

By glancing the literature and in consultation with professional experts the following variables which have direct relation to the performance of football players were selected.

3:5:1 PHYSICAL FITNESS VARIABLES

3:5:1.1 SPEED

Speed is the rate of which a person can propel his body or parts of his body through space.

Speed was measured by 50 yards dash to the nearest one tenth of a second.
3:5:1.2 **ENDURANCE**

Endurance is the result of a physiological capacity of the individual to sustain movement over a period of time.

The circulatory-respiratory endurance was measured through 12 minute run test and the total distance covered was taken as score.

3:5:1.3 **AGILITY**

Agility is the physical ability which enables the individual to rapidly change body position and direction in a precise manner.

Agility was measured by zig zag run test to the nearest one tenth of a second.

3:5:1.4 **FLEXIBILITY**

Flexibility is the range of movement in a joint.

The trunk and hip flexibility was measured through sit and reach test to the nearest centimeter.

3:5:1.5 **EXPLOSIVE POWER**

Explosive power is the ability of an individual to bring into maximum muscle contraction at the fastest rate of speed.
Leg explosive power was measured through Sargent vertical jump to the nearest centimeter.

3:5:1.6 **LEG STRENGTH**

Strength is the force that a muscle or a group of muscles can exert against resistance in one maximum effort.

Leg strength was measured through back and leg dynamometer with reading in kilogram.

3:5:1.7 **PERCENT BODY FAT AND LEAN BODY WEIGHT**

The amount of body fat stored in the total body and the weight of the body fat subtracted from the total body weight are the percent body fat and lean body weight.

Skinfold measurements were taken at triceps, subscapular and abdominal to the nearest millimeter with a skin fold caliper. Percent body fat was calculated with body density and lean body weight was calculated by subtracting weight of the body fat from the total body weight.

3:5:2 **CARDIO-PULMONARY VARIABLES**

**3:5:2.1 PHYSICAL WORKING CAPACITY**

Physical working capacity is the maximum level of work of which an individual is capable to supply oxygen to the working muscle.

Physical working capacity was determined with the
subject's work rate at a heart rate of 170 beats per minute on a bicycle ergometer.

3:5: 2.2 $\text{VO}_2\text{ Max.}$

$\text{VO}_2$ max. is referred to the maximal volume of oxygen consumed per minute during exercise.

$\text{VO}_2$ max. was predicted with Fox equation from submaximal heart rate at the end of 5 minutes pedalling in bicycle ergometer.

3:5:2.3 PULMONARY VOLUMES AND CAPACITIES

Morgan flexiflo lung function system was used to measure the pulmonary variables of total lung capacity, tidal volume, forced vital capacity, forced expiratory volume and maximum voluntary ventilation.

3:5:3 SKILL PERFORMANCE
3:5:3.1 DRIBBLING

Zig zag dribbling test was used to measure the dribbling ability and the time was recorded to the nearest one tenth of a second.

3:5:3.2 KICKING

Kicking for distance test was used to measure the kicking ability in both left and right legs. The distance covered was measured in yards.
3:5:3.3 **BALL CONTROL**

The ball controlling ability was measured through Mc.Donald volleying soccer test.

3:5:3.4 **GENERAL PLAYING ABILITY**

The general playing ability was measured through judges rating on a 10 point scale.

3:6. **ADMINISTRATION OF TESTS**

3:6.1 **50 YARDS DASH**

**Purpose:** To measure speed

**Equipment:** A 50 yard course, a starting line, a finishing line, two stop watches.

**Procedure:** After a warm up period the subject took position behind the starting line. The starter used the command 'Are you ready' and 'Go', As he said he swept his arm downward as a sign to the timer. The subject ran across the finish line. One trial was permitted.

**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 finish line.

3:6.2 **12 MINUTES RUN TEST**

**Purpose:** To measure circulatory respiratory endurance.

**Equipment:** 400 metres track, stop watch, flags placed at every 40 meters.
Procedure: The subject ran around the track on signal 'GO'. As the subject crossed the finish line following each lap, lap number was called out. When eleven minutes had elapsed the scholar called out the time left to run. At the end of 12 minutes, the whistle was blown and the distance covered by each runner was noted.

Scoring: The score is the number of laps covered plus the number of flags passed in the last lap and converted to metres.

3:6: 3. Zig Zag Run

Purpose: To measure agility

Equipment: Stop watch, 5 standard posts or chairs, space for Zig Zag course and standards placed on marked spots.

Procedure: On the command 'GO' the subject ran the prescribed course in a figure of eight fashion for three complete circuits. The watch was stopped at the end of the third lap. The subject did not grasp any of the standard.

Scoring: The score was the elapsed time to the nearest tenth of a second between the start 'GO' and the instant of the subject completed his third lap.

3:6.4 Sit and Reach

Purpose: To measure hip and trunk flexibility

Equipment: A 12 by 12 inch box made from 3/4 inch plywood. The scale was marked from 1 cm to 50 cm with the 23 cm line
placed exactly in line with the vertical panel against which the feet were placed.

Procedure: The subject sat on the floor with shoes removed and legs separated enough to place the feet on the vertical panel of the box. The arms were extended forward with the hands placed palms down on the upper surface of the scale. In this position the subject bobbed forward four times and held the position of maximum reach on the fourth count. The knees were kept straight.

Scoring: The score is recorded to the farthest point reached on the measuring scale to the nearest centimeter.

3:6.5 **JUMP AND REACH**

Purpose: To measure leg power.

Equipment: Chalk powder, a paper 6 inches wide and three feet high ruled off in half inch. The paper is fastened to the wall at such a height that 'O' line on the chart is just below the standing reach of the shortest performer.

Procedure: The subject stood with one side of his body parallel with the wall chart. He dipped his forefinger in chalk, reached as high as possible and made a chalk mark on the chart. He then jumped upward as far as possible and made a mark on the wall at the peak of his jump.

Scoring: The score is the number of inches between the two chalk marks. Five jumps were given and the best jump was recorded to the nearest 1/2 inch.
3:6.6. **LEG LIFT**

**Purpose**: To measure leg strength

**Equipment**: Back and leg Dynamometer.

**Procedure**: The subject held the bar with both the hands together in the centre. Both palms towards the body so that it rested at the junction of the thighs and trunk. The belt was placed as low as possible over the hips and gluteal muscles.

The subject stood with feet flat on the base of the dynamometer. The knees were slightly bent and trunk erect. The subject pulled the chain and maximum lift occurred when subject's legs were nearly straight at the end of the lifting effort.

**Scoring**: The reading was recorded in Kgs.

3:6:7 **SKINFOLD TEST**

**Purpose**: To measure the percent body fat and lean body weight.

**Equipment**: Skinfold caliper

**Procedure**: The subject was asked to stand erect. The skinfold measurements were taken of three sites namely triceps, subscapular and abdominal. The skinfold was grasped between the thumb and index finger about one centimeter from the site at which caliper was to be applied.
The caliper was applied above the finger holding the skinfold.

**Scoring** : All measurements were made to the nearest millimeter.

The percent body fat was found out by applying the formula of Brozek (1971): 

\[ \text{Body fat} = \frac{457}{\text{Bd}} - 414.2 \]

Bd is calculated by using Lohman (1981) formula:

\[ \text{Bd} = 1.0982 - (0.000815)(X) + (0.00000084)(X^2) \]

where \( X \) = the sum of triceps, subscapular and abdominal skinfolds.

Lean body weight is calculated by the following equation:

\[ \text{LBW} = \text{TBW} \times (1.00 - \text{Ff}) \]

where\( \text{TBW} \) = Total body weight and \( \text{Ff} \) = Decimal expression of % body fat

**3:6:8 PHYSICAL WORKING CAPACITY**

**Purpose** : To measure the physical working capacity

**Equipment** : Bicycle Ergometer, Stethoscope, Stop watch.

**Test Procedure** : A pilot study was conducted for the subjects to find out the load which will approximately elicit a heart rate around 170.

**Orientation** : The subjects were taught the method of pedalling the bicycle ergometer with 60 revolutions per minute.

A load of 50 watt was fixed and the subject was asked to perform 6 minute bout with a pedalling rate of 60 revolutions per minute. Then the load was increased to
100 watt and 150 watt at the end of each 6 minutes bout. The pulse rates were obtained at the end of each 6 minutes bout. The obtained pulse rates were plotted against work in kilogram meter per minute. A best fit line is drawn through to the pulse rate of 170 beats per minute by extrapolation.

3:6.9 \( \text{VO}_2 \text{ max} \).  
Purpose: To predict \( \text{VO}_2 \text{ max} \).  
Equipment: Bicycle Ergometer  
Procedure: The subject was asked to pedal on the bicycle ergometer at 150 watts with 60 revolution per min. The heart rate was measured at the end of the 5th minute. The \( \text{VO}_2 \) max was predicted referring the Fox Equation table based on the equation.

\[
\text{VO}_2 \text{ max. (Litres per min)} = 6.3 - 0.0193 \times \text{HR sub.}
\]

Scoring: The Fox equation table was referred and the corresponding litres per minute was recorded.

3:6.10 FLEXIFLO LUNG FUNCTION TEST  
Purpose: To measure the following lung volumes and spirometry. Total lung capacity, tidal volume, forced vital capacity, forced expiratory volume, and maximum voluntary ventilation.  
Equipment: P. K. Morgan's Flexiflo R.S-232 C Portable Lung Function System
Procedure:

Training of the subjects: In order to ensure maximal accuracy and benefit certain criteria was adhered.
1. Subjects' cooperation was assured and strict quality control was enforced.
2. Details of the procedure was fully explained prior to the commencement of the test.
3. Coaching and exhortion was given during these maneuvers in order to ensure that the subject inspires and expires as rapidly and as fully as possible.

Administration of Test: Before taking the test the tester performed the following check.
1. Let the Computer and Flexiflo System warm up for about ten minutes.
2. Made sure the data, time, temperature and Barometric pressure were correct.
3. Verified the calibration using a 3 liter Syringe over several flow rates.
4. Checked that the Flexiflo Pnemotachograph head was upright in its stand.
5. Made sure the flow tube and mouthpiece were clean and sterile.

Before undertaking tests, the investigator collected the subjects' records which contained biographical informations and stored. The subject breathed quietly through
the piece. On command the subject inhaled fully as hard and fast as possible, held his breath for one second, exhaled fully as hard and as fast as possible, then took a final small inhalation. The subject performed atleast two tidal breaths for each test.

There was no actual time limit for this test, but the last 50 seconds of the test were used in the calculations.

The subject was connected to the mouthpiece. It was sure that the nose clip was attached to the subject and the subject kept pneumotach head level horizontal. It was ensured that the subject was comfortable and that the mouthpiece was air tight. The subject was directed to breathe quietly through the mouthpiece (a minimum of 2 tidal breathe) and when comfortable to perform the MVV maneuver. The screen displayed the MVV maneuver as it was being performed.

Result of the Test: On consequent command, test result was printed out by printer.

3:6.11 Dribbling For Time
Purpose: To measure dribbling abilty
Equipment: 5 objects, football, stop watch.
Procedure: On the signal 'GO' the subject dribbled the ball in and out of the 5 objects kept 5 yards apart from the starting line and back in the same manner and crossed the
starting line. Three trials were given and the best was selected.

Scoring: Three trials were timed and the best was recorded in tenth of a second.

3:6.12 KICKING FOR DISTANCE — RIGHT LEG

Purpose: To measure kicking ability for distance with a degree of accuracy using the right foot.

Equipment: Football, field markings

Procedure: The player kicked a stationary ball with in lane which is 25 yards wide. The distance the ball travels in the air is measured. Three trials were given.

Scoring: Distance was measured to the first bounce of the ball. The best of three kicks was measured to the nearest yard.

3:6.13 KICKING FOR DISTANCE — LEFT LEG

This test was administered exactly as kicking for distance — right leg except that the left foot was used for kicking.

3:6.14 MC DONALD VOLLEYING SOCCER TEST

Purpose: To measure ball controlling ability

Equipment: Three footballs — a backboard 30 feet wide and 11 1/2 feet high and a restraining line 9 feet from the back board.

Procedure: Three footballs were used, one was kept on the
restraining line, the other two were located 9 feet behind the line in the centre of the area. The subject kicked the ball against the backboard as many times as possible in 30 seconds. Any type of kicks was used. To count, the ball was kicked from the ground with the supporting leg behind the restraining line. If a ball went out of control one of the spare balls was brought to the restraining line and test was continued.

Scoring: The score was the number of legal kicks within thirty seconds. The best of four trials was recorded.

3:6.15 **SUBJECTIVE RATING**

**Purpose:** To measure the general playing ability

**Procedure:** The playing ability of each player was rated on a 10 point scale by three experts in football.

**Scoring:** The average of the three experts' rating was taken as the score.

3.7 **SPECIFIC TRAINING PACKAGE**

A training package which included conditioning exercises, physical activities, drills and tactical maneuvers was designed systematically and scientifically. The package is a comprehensive and thorough one which would improve the specific capabilities of football players.

3:7.1 **PILOT STUDY**

In addition to the literature available a pilot
A study was conducted to collect the following training details by sending a questionnaire to a number of football experts in Tamil Nadu.

(i) The volume of various physical fitness components training.

(ii) The volume of technical and tactical training.

(iii) The means and methods to be followed.

Based on the literature available and the opinion of the experts, the following training details were determined for the specific training package.

<table>
<thead>
<tr>
<th>Periodisation</th>
<th>Double Periodisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of the pre-season</td>
<td>12 weeks</td>
</tr>
<tr>
<td>Number of days per week</td>
<td>6 days</td>
</tr>
<tr>
<td>Number of sessions per day</td>
<td>2 sessions</td>
</tr>
<tr>
<td>Duration of a session</td>
<td>morning - 120 minutes</td>
</tr>
<tr>
<td></td>
<td>evening - 120 minutes</td>
</tr>
</tbody>
</table>

The loading pattern, the volume and intensity of training for physical fitness, technique, and tactics, means and methods to be followed and meso cycle plan were summarised in tables 2 to 6.

3.7.2 **LOAD PROGRESSION**

The principle of progression of load was adopted. The load dynamics was arranged in such a way that the volume increased initially and intensity increased in the end. The load during the micro cycle was high and medium
alternatively and high during the last two days before a complete rest day.

3:7.3 **TRAINING MEANS AND METHODS**

The following means and methods were adopted for the development of various performance factors during the training:

<table>
<thead>
<tr>
<th>Category</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strength</td>
<td>Weight training</td>
</tr>
<tr>
<td>Endurance</td>
<td>Circuit training</td>
</tr>
<tr>
<td></td>
<td>Cross country</td>
</tr>
<tr>
<td></td>
<td>Fartlek training</td>
</tr>
<tr>
<td>Speed</td>
<td>Interval training</td>
</tr>
<tr>
<td>Explosive power</td>
<td>Plyometric training</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Stretching exercises</td>
</tr>
<tr>
<td>Agility</td>
<td>Calisthenics</td>
</tr>
<tr>
<td>Technique</td>
<td>Ball drills</td>
</tr>
<tr>
<td></td>
<td>Skill training</td>
</tr>
<tr>
<td></td>
<td>Lead up games</td>
</tr>
<tr>
<td>Tactics</td>
<td>Functional training</td>
</tr>
<tr>
<td></td>
<td>Set play</td>
</tr>
<tr>
<td></td>
<td>Match play</td>
</tr>
<tr>
<td>Theory</td>
<td>Rules of the game</td>
</tr>
<tr>
<td></td>
<td>Knowledge of tactics.</td>
</tr>
</tbody>
</table>

85
TABLE - 2
LOADING PATTERN IN THE THREE PHASES OF PREPARATORY PERIOD

<table>
<thead>
<tr>
<th>Factors</th>
<th>Preparatory - I 4 weeks</th>
<th>Preparatory - II 4 weeks</th>
<th>Preparatory - III 4 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percentage</td>
<td>Duration</td>
<td>Percentage</td>
</tr>
<tr>
<td>General Physical Training</td>
<td>50%</td>
<td>48h</td>
<td>29%</td>
</tr>
<tr>
<td>Specific Physical Training</td>
<td>12%</td>
<td>11h 30m</td>
<td>20%</td>
</tr>
<tr>
<td>Technical Training</td>
<td>26%</td>
<td>25h</td>
<td>28%</td>
</tr>
<tr>
<td>Tactical Training</td>
<td>10%</td>
<td>9h 30m</td>
<td>20%</td>
</tr>
<tr>
<td>Theoretical Training</td>
<td>2%</td>
<td>2h</td>
<td>3%</td>
</tr>
</tbody>
</table>
FIG. NO. 3
LOADING PATTERN IN PREPARATORY I

GENERAL PHY. TNG.

SPEC. PHY. TNG. 12%

TACTICAL TNG. 10%

THEORE. TNG. 2%

TECHNICAL TNG. 28%
FIG. NO. 4
LOADING PATTERN IN PREPARATORY II

GENERAL PHY. TNG. 29%
SPEC.PHY.TNG. 20%
THEORE. TNG. 3%
TECHNICAL TNG. 28%
TACTICAL TNG. 20%
FIG. NO. 5
LOADING PATTERN IN PREPARATORY III

TECHNICAL TNG.
SPEC.PHY.TNG. 18%
TACTICAL TNG. 35%
THEORE. TNG. 5%
GENERAL PHY. TNG. 29%
13%
TABLE 3

ESTIMATE OF APPROXIMATE VOLUME OF TRAINING OF DIFFERENT ABILITIES OF PHYSICAL FITNESS

<table>
<thead>
<tr>
<th>Abilities</th>
<th>Preparatory I</th>
<th>Preparatory II</th>
<th>Preparatory III</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percentage Duration</td>
<td>Percentage Duration</td>
<td>Percentage Duration</td>
</tr>
<tr>
<td>General</td>
<td>48h</td>
<td>11h 30m</td>
<td>12h 25m</td>
</tr>
<tr>
<td>Specific</td>
<td>27h 25m</td>
<td>19h 10m</td>
<td>17h 15m</td>
</tr>
<tr>
<td>Strength</td>
<td>30% 14h 24m</td>
<td>30% 3h 26m</td>
<td>27% 7h 30m</td>
</tr>
<tr>
<td>Endurance</td>
<td>14h 24m</td>
<td>1h 26m</td>
<td>27% 7h 30m</td>
</tr>
<tr>
<td>Speed</td>
<td>7h 12m</td>
<td>1h 43m</td>
<td>27% 7h 30m</td>
</tr>
<tr>
<td>Flexibility</td>
<td>15h 12m</td>
<td>1h 43m</td>
<td>27% 5h 30m</td>
</tr>
<tr>
<td>Agility</td>
<td>15h 12m</td>
<td>1h 43m</td>
<td>27% 5h 30m</td>
</tr>
<tr>
<td></td>
<td>10% 1h 10m</td>
<td>2h 45m</td>
<td>1h 55m</td>
</tr>
<tr>
<td></td>
<td>1h 48m</td>
<td>1h 10m</td>
<td>1h 55m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2h 45m</td>
<td>1h 12m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1h 45m</td>
<td>1h 45m</td>
</tr>
</tbody>
</table>
FIG. NO. 6
PREPARATORY I
VOLUME OF PHYSICAL FITNESS TRAINING

- Strength: 30%
- Endurance: 30%
- Agility: 10%
- Flexibility: 15%
- Speed: 15%
FIG. NO. 7
PREPARATORY II
VOLUME OF PHYSICAL FITNESS TRAINING

- **Endurance**: 27%
- **Strength**: 27%
- **Flexibility**: 16%
- **Speed**: 20%
- **Agility**: 10%
FIG. NO. 8
PREPARATORY III
VOLUME OF PHYSICAL FITNESS TRAINING

- Strength: 27%
- Flexibility: 16%
- Speed: 20%
- Agility: 10%
- Endurance: 27%
### TABLE 4

**MODEL WEEKLY CYCLE FOR THE DEVELOPMENT OF DIFFERENT ABILITIES**

<table>
<thead>
<tr>
<th>Abilities</th>
<th>Preparatory I (per week)</th>
<th>Preparatory II (per week)</th>
<th>Preparatory III (per week)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>General</td>
<td>Specific</td>
<td>Total</td>
</tr>
<tr>
<td>Strength</td>
<td>3h 36m</td>
<td>52 m</td>
<td>4h 28m</td>
</tr>
<tr>
<td>Endurance</td>
<td>3h 36m</td>
<td>52 m</td>
<td>4h 28m</td>
</tr>
<tr>
<td>Speed</td>
<td>1h 48m</td>
<td>28 m</td>
<td>2h 16m</td>
</tr>
<tr>
<td>Flexibility</td>
<td>1h 48m</td>
<td>28 m</td>
<td>2h 16m</td>
</tr>
<tr>
<td>Agility</td>
<td>1h 12m</td>
<td>17 m</td>
<td>1h 29m</td>
</tr>
<tr>
<td>Technical</td>
<td>6h 15m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tactical</td>
<td>2h 30m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Theoretical</td>
<td>30m</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

94
### TABLE 5

**MODEL WEEKLY CYCLE OF MEANS AND METHODS FOR DEVELOPMENT OF PHYSICAL ABILITIES**

<table>
<thead>
<tr>
<th>Abilities</th>
<th>Means and Methods</th>
<th>Preparatory I (4 weeks)</th>
<th>Preparatory II (4 weeks)</th>
<th>Preparatory III (4 weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Duration</td>
<td>No. of weeks</td>
<td>No. of sessions per week</td>
</tr>
<tr>
<td>Strength</td>
<td>Weight Training</td>
<td>1h 20m</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Plyometric</td>
<td>14m</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Endurance</td>
<td>circuit training</td>
<td>50m</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Cross country</td>
<td>40m</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Fartlek</td>
<td>34m</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Jogging</td>
<td>8m</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Speed</td>
<td>Interval Training</td>
<td>1h</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Stretching Exercise</td>
<td>11m</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Agility</td>
<td>Calisthenics</td>
<td>7m</td>
<td>12</td>
<td>4</td>
</tr>
</tbody>
</table>
### TABLE 6

**MODEL WEEKLY CYCLE OF MEANS AND METHODS FOR DEVELOPMENT OF TECHNIQUE AND TACTICS**

<table>
<thead>
<tr>
<th>Means and Methods</th>
<th>Preparatory I (4 weeks)</th>
<th>Preparatory II (4 weeks)</th>
<th>Preparatory III (4 weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Duration</td>
<td>Sessions</td>
<td>No. of weeks</td>
</tr>
<tr>
<td>Ball Drills</td>
<td>10m</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Skill perfection</td>
<td>20m</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Lead up game</td>
<td>20m</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Shooting practice</td>
<td>10m</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Functional training</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Set play</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Game</td>
<td>42m</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Practice Match</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Theory</td>
<td>5m</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>
3:7.4 LOAD FOR WEIGHT TRAINING

The following weight training exercises which develop the muscles involved in football activities were selected.


The starting load for the training was fixed by repetition maximum method for each individual. The 10 RM load for each individual was fixed by trial and error. The exercise was performed with 10 RM load for 2 sets with 5 minutes rest between the sets.

Load progression was made when the individuals were able to perform 15 repetitions. A new 10 RM load was determined for the increase in load.

3:7.5 LOAD FOR CIRCUIT TRAINING

The extensive interval method was applied in the circuit training for the development of general and specific endurance. Eight stations were fixed from the following activities.

Push up, step up, Vertical jump, Trunk curl, Leg split, Sit ups, Squat thrust, Wall volley, Pendulam heading, shuttle dribble for 10 meters.
The load was determined by conducting maximal score test. The maximum repetition an individual could execute an exercise within 30 seconds was found out. Each exercise was performed at each station for 30 seconds with a break of 30 seconds. 3 circuits were performed with 5 minutes rest between each circuit.

Initially the individuals performed the exercises with half of the maximum repetition in the first session, with maximum repetition in the second session and one and one half of the maximum repetition in the third session. Then a new maximal score test was conducted and the training sessions progressed as in the previous stage and so on.

3:7.6 LOAD FOR INTERVAL TRAINING

A combination of heart rate method and repetition method was adopted to develop speed through interval training. The speed with which an individual could run 30 mts. and 50 mts. for a maximum of 6-8 repetitions and to raise his heart rate to 180-190 beats per minute was fixed as intensity.

The work outs were given for 3 sets with 8 minutes rest between sets. The work relief ratio was fixed as 1:3.
3:7.7 **LOAD FOR CROSS COUNTRY AND FARTLEK TRAINING**

The slow and fast pace method was followed to develop the endurance ability of an individual. While running at slow pace the heart rate of an individual was kept between 140-160 beats per minute and during fast pace the heart rate was kept between 160-180 beats per minute.

3:7.8 **LOAD FOR FLEXIBILITY TRAINING**

Static flexibility was developed through the following stretching exercises. Each stretching exercise was performed and the position held for 10 seconds initially and for 4 times.

Achilles tendon and gastrocnemius stretch, back stretch, hamstring stretch, groin stretch, spine and waistline stretch, quadriceps stretch, hip stretch and abdominal stretch.

Dynamic flexibility was developed through the following active and dynamic exercises. The exercises were performed for 10 repetitions initially for 3 sets. Jumping split, Jumping tuck, Leg swinging, Arm circling, Leg cycling (one leg hop) Jumping Jack, High kick, Trunk twisting.

3:7.9 **LOAD FOR AGILITY AND COORDINATIVE ABILITY TRAINING**

Exercises such as obstacle run, zig zag run,
reaction time exercises were performed to develop the coordinative abilities. The exercise difficulty level was increased with combination of movement, change of rhythm, change of external condition and under pressure of time.

3.7.10 LOAD FOR PLYOMETRIC TRAINING

Exercises such as double leg bound, alternate leg bound, double leg box bound, side hop, squat jump and depth jump were performed to develop the explosive power. The exercises were performed for 10 repetition for 5 sets with 2 minutes rest between the sets.

3.7.11 LOAD FOR TECHNIQUE AND TACTIC TRAINING

A number of drills, lead up games, functional training, set play and match play were used to improve the technical and tactical ability of an individual. The training details were given in the appendix.

3.8 TRADITIONAL METHOD OF TRAINING

The training programme followed traditionally by various teams during the preparation of the team is traditional method of training. This programme did not have any systematic planning in providing exercises and drills. They lack in progression, cyclicity, proper load dynamics and individuality. The following weekly schedule formed the
content of the traditional method of training.

Monday - Warming up,  
Weight Training  
Skill practice, game.

Tuesday - Continuous Running,  
Stretching exercises,  
Ball Drills, Shooting practice,  
Game

Wednesday - Warming up,  
Weight Training,  
Skill practice, Drills, Game.

Thursday - Warming up.  
Fartlek Running  
Agility Exercises  
Technical and tactical drills, game.

Friday - Warming up,  
Stepping exercises,  
lead up games,  
Positional practice, Drills,  
Tactics practice  
Practice match

Saturday - Cross country  
Stretching exercises  
modified games  
skill practice - game.

3.9 STATISTICAL TECHNIQUE

The following statistical techniques were used for the analysis of data in this study.

The purpose of the study was to determine whether the specific pre-season training package programme improves the selected physical fitness and cardio-pulmonary variables and skill performance at the end of the 4th, 8th and 12th weeks of training.
In order to find out whether the obtained differences between the means of the selected variables in the pretest, 2nd test (4th week), 3rd test (8th week) and final test (12th week) are statistically significant, Repeated Measures ANOVA was applied. When the F ratio was found to be significant Newman - Keuls posthoc test was applied to test which of the possible comparison among the means are significant.

Analysis of covariance was applied to determine the significant difference among the three groups namely specific training package group, traditional method of training group and control group in the development of selected variables after 12 weeks of training. When F ratio was found to be significant the Scheffe's posthoc test was applied to test the significance of difference of pairs of adjusted final group means.