CHAPTER – III

METHODOLOGY

In this chapter the procedures adopted for the selection of subjects, selection of variables, pilot study, criterion measures, orientation of subjects, reliability of data, instrument reliability, tester’s reliability, subject reliability, administration of tests, training programme, collection of data, experimental design and statistical techniques for the analysis of the data have been explained.

3.1. SELECTION OF SUBJECTS

The purpose of the study was to find out the effects of varied intensities of plyometric training on motor fitness components and soccer techniques of junior players.

To fulfill the purpose of the study one hundred and twenty junior soccer players were randomly selected from Government Boys Higher Secondary School Manjeri, Hidayathul Muslimin Yatheemkhana Higher Secondary School Manjeri, M S P Higher Secondary School Malappuram and Govt. Higher Secondary School Pookottur of Malappuram District in Kerala State. The selected subjects were divided into four equal groups consisting of thirty each. No attempt was made to equate the groups. Experimental group I \( (n = 30) \) underwent low intensity plyometric training (LIPT), experimental group II \( (n = 30) \) underwent medium intensity plyometric training (MIPT), experimental group III \( (n = 30) \) underwent high intensity plyome-
tric training (HIPT) for a period of 12 weeks. Group IV (n = 30) acted as the control group (CG). The subjects in the control group were not engaged in any training programme other than their regular work. The subjects were free to withdraw their consent in case any discomfort during the period of their participation but there was no dropout during the study.

3.2. SELECTION OF VARIABLES

The research scholar reviewed the available literature pertaining to the varied intensities of plyometric training from books, journals, periodicals, magazines and research papers. Taking into consideration the feasibility criteria, availability of instrument and the relevance of the variables of the present study the following variables were selected.

3.2.1. DEPENDENT VARIABLES

There is a positive relationship between speed, agility, flexibility, leg strength and soccer techniques (dribbling, passing, kicking and shooting). The cardio respiratory endurance is also a very essential component not only for soccer players but also for all kinds of sportsmen involving in running and jumping.

The speed increases linearly with increasing agility (Baily, 2000). The leg strength is very much essential for the better kicking performance and it has positive association with soccer performance (Kreamer, 1985). Hence the motor fit-
ness variables of speed, agility, flexibility, leg strength and cardio respiratory en-
durance were selected as dependent variables for this study.

Kicking in soccer is related to the strength and power of the kicking foot, dribbling the ball and tackling are very much associated with speed and agility of the player. Good flexibility is also important in preventing injury because of the stresses involuntarily placed on the joints during tackling and blocking (Moran et al. 1994). The performance in the game of soccer is totally determined by both motor fitness and fundamental skills in the game like dribbling, passing, shooting, trapping and kicking. These skills have positive relationship with speed, agility, flexibility, leg strength and cardio respiratory endurance. Hence the skills like dribbling, passing, kicking, trapping and shooting were selected as dependent variables. Totally the present study consists of ten dependent variables.

3.2.2. INDEPENDENT VARIABLES

There are numerous references supporting that any form of systematic training would be an effective programme to improve the performance. Regular plyometric training increases power by improving the capacity of the muscles and tendons to capture elastic energy and by enhancing the efficiency of communication between the brain and the muscles.
Plyometric training exercises foster speed and agility and it can improve balance and co-ordination. Plyometrics is positively associated with the athletic performance (Coetzee, 2007).

Low impact plyometric training programme has positive relation with lower-body power in adolescent athletes (Rubley et al. 2011).

Short term plyometric training programme is essential to improve soccer performance of prepubescent boys (Diallo et al. 2001). Six weeks of depth jump, (DJ) counter movement jump (CMJ) and plyometrics are worthwhile activities for improving power and agility of youth soccer players. Hence, the plyometric training was selected as independent variable for this study.

3.3. PILOT STUDY

A pilot study was conducted to assess the initial capacity of the subjects in order to fix the load and to make sure that the duration of exercise included in the programme was within the limits of the subjects to ensure the satisfactory effect. For this, fifteen subjects were selected at random and divided into three groups of five each, in which group I underwent low intensity plyometric training (LIPT), group II underwent medium intensity plyometric training (MIPT) and group III underwent high intensity plyometric training (HIPT) for a period of 4 weeks under the supervision of the investigator. After the period of 4 weeks the subjects were post tested. Based on the response of the subjects in the pilot study the train-
ing load for the experimental groups to the main study was fixed for a period of 12 weeks. After completion of the pilot study the present study was conducted on 120 subjects.

3.4. CRITERION MEASURES

By glancing to the literature and in consultation with the professional experts, the following variables were selected as the criterion measures for this study to test the hypothesis.

Table – 3.1

<table>
<thead>
<tr>
<th>Sl.no</th>
<th>Criterion variables</th>
<th>Test items</th>
<th>Unit of measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MOTOR FITNESS COMPONENTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Speed</td>
<td>50 mts dash</td>
<td>Seconds</td>
</tr>
<tr>
<td>2.</td>
<td>Agility</td>
<td>4×10 mts shuttle run</td>
<td>Seconds</td>
</tr>
<tr>
<td>3.</td>
<td>Flexibility</td>
<td>Sit and reach test</td>
<td>Centimeters</td>
</tr>
<tr>
<td>4.</td>
<td>Leg strength</td>
<td>Leg dynamometer</td>
<td>Kilograms</td>
</tr>
<tr>
<td>5.</td>
<td>Cardio respiratory</td>
<td>Cooper’s 12 minutes run and walk</td>
<td>Meters</td>
</tr>
<tr>
<td></td>
<td>endurance</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SOCCER TECHNIQUES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Dribbling</td>
<td>Sir Bobby Charlton Soccer School of Australia Test</td>
<td>seconds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for Dribbling</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Passing</td>
<td>Sir Bobby Charlton Soccer School of Australia Test</td>
<td>points</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for Passing</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Kicking</td>
<td>Sir Bobby Charlton Soccer School of Australia Test</td>
<td>points</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for Kicking</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Trapping</td>
<td>Sir Bobby Charlton Soccer School of Australia Test</td>
<td>points</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for Trapping</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Shooting</td>
<td>Sir Bobby Charlton Soccer School of Australia Test</td>
<td>points</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for Shooting</td>
<td></td>
</tr>
</tbody>
</table>
3.5. ORIENTATION OF SUBJECTS

Before the collection of data, the subjects were oriented about the purpose of the study. The investigator explained the procedure of assessing motor fitness components such as speed, agility, flexibility, leg strength and cardio respiratory endurance. The investigator explained the procedure of assessing soccer techniques of dribbling, passing, kicking, trapping and shooting.

3.6. RELIABILITY OF DATA

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

3.6.1. INSTRUMENT RELIABILITY

Instruments such as stop watch, sit and reach box, leg dynamometer, football and measuring tape were used to measure selected variables. All the instruments were in good working condition. Their calibrations were tested and found to be accurate enough to serve the purpose of the study. Certificates of accuracy of the above instruments were obtained from appropriate instrument testing agencies, and also by recalibrating the scale by using amounts of variables wherever required. To determine the reliability of instruments, measurement on each of the tests of the variables were recorded five times under similar conditions using the same instrument. Hence, their calibrations were accepted as accurate enough for the purpose of the study.
3.6.2. TESTER’S RELIABILITY

To ensure the uniformity and reliability of the testing technique, the investigator had a number of practice sessions in the testing procedure with the guidance of the respective experts. The investigator took all the measurements for the study with the assistance of professional experts.

Tester’s reliability was established by test-retest process. To determine the reliability of the measurement involved in the study, the tester correlated the data from ten subjects. Care was taken to ensure the fitness of each subject before the administration of each test, so that the consistency of the result could be ensured.

The intra class correlation co-efficient obtained for test- retest data are presented in Table – 3.2
Table – 3.2

Intra class correlation co-efficient obtained for test-re test scores

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Criterion variables</th>
<th>Coefficient of correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Motor fitness components</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Speed</td>
<td>0.91*</td>
</tr>
<tr>
<td>2.</td>
<td>Agility</td>
<td>0.89*</td>
</tr>
<tr>
<td>3.</td>
<td>Flexibility</td>
<td>0.86*</td>
</tr>
<tr>
<td>4.</td>
<td>Leg strength</td>
<td>0.92*</td>
</tr>
<tr>
<td>5.</td>
<td>Cardio respiratory endurance</td>
<td>0.84*</td>
</tr>
<tr>
<td></td>
<td><strong>Soccer techniques variables</strong></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Dribbling</td>
<td>0.91*</td>
</tr>
<tr>
<td>7.</td>
<td>Passing</td>
<td>0.92*</td>
</tr>
<tr>
<td>8.</td>
<td>Kicking</td>
<td>0.89*</td>
</tr>
<tr>
<td>9.</td>
<td>Trapping</td>
<td>0.87*</td>
</tr>
<tr>
<td>10.</td>
<td>Shooting</td>
<td>0.89*</td>
</tr>
</tbody>
</table>

*Significance at 0.05 level of confidence
3.6.3. SUBJECT RELIABILITY

The intra class correlation values of the above tests and retests also indicated subject, tester and instrument reliability. As the same subjects and instruments were used under similar candidates by the same testers, the coefficient of reliability were significant at the P < 0.05 level for the above tests under investigation.

3.7. ADMINISTRATION OF THE TESTS

The investigator held a meeting with the subjects prior to the administration of the tests. The purpose, the significance of the study and the requirements of the testing procedure were clearly explained to them in detail so that there was no ambiguity in their minds, regarding the efforts which they had to put for the successful completion of the tests.

3.7.1. MOTOR FITNESS COMPONENTS TEST

50 METERS DASH

Purpose

To assess the running speed of the subjects.

Equipment

Measuring tape, starting clapper and stopwatch.
Procedure

The standing start method was adopted for this purpose. The subjects were asked to stand behind the starting line and the race was started with single clapper sound. The time elapsed from the ‘clap sound’ to the runner crossing the finish line was taken as the test score. The fractions were rounded to the next target one tenth of a second. Digital electronic watch was used for this purpose. Two trials were conducted with sufficient rest in between and the best performance was recorded. (Allen Philips and Honak, 1998)

Scoring

The elapsed time from the starting signal until the runner crosses the finish line is measured to the nearest one tenth of a second.

4 × 10 METERS SHUTTLE RUN

Purpose

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

Equipment

Stopwatch, whistle, measuring tape and two block of wood (2” × 2” × 4”).
Procedure

The subject starts from behind the starting line at the signal “Go” and runs to the blocks behind the line, and then he repeats the process with the second block. Allowed some rest between the two trails. (Barrow, et al. 1989)

Scoring

The score for each subject is the length of time required to the nearest 10\textsuperscript{th} of a second to complete the course. The best trial was recorded in seconds.

SIT AND REACH TEST

Purpose

To measure the flexibility of the subjects

Equipment

Sit and reach box was used to measure the flexibility.

Procedure

The subject sat in front of the box with both legs extended forward. The measuring stick was placed on the box in-between both the hands. The zero end of the measuring stick was placed as proximal end. The subject bent forward and extends both arms forward. The zero point of the measuring stick was placed to the tip of the middle finger. The subject slowly stretches forward the hip, back
and the arm. The maximum distance reached was recorded with the help of measuring stick in centimeters. Three trials were given with adequate rest in between. The best of the three trials was treated as the final score. (Safrit, 1981)

Scoring

Score was recorded in centimeter.

LEG LIFT WITH DYNAMOMETER

Purpose

To assess the leg strength.

Equipment

Leg Dynamometer

Procedure

The subjects stood on the dynamometer base with feet placed parallel and body weight equally balanced on both feet. A belt was wrapped around the subject’s hip to stabilize the bar, as the lifting force of the legs was too great to be held by the hands. The subjects held the centre of the bar, palms down, at the level of the pubic bone. The tester attached the belt loop to the left end of the bar. The belt was then brought around the lower portion of the sacrum to be attached to the right end of the handle. The knees were flexed, heads up and back straight. The
handle was hooked onto the chain so that the subject’s knees were flexed between 115 and 125 degrees. The bar was on the subject’s thigh during the lift and the hands either in the middle or at the ends of the bar. The subject was directed to lift straight up. At the completion of the lift the subject’s knee joint was almost completely extended to ensure the maximum effort. (Bosco and Williams, 1983)

Scoring

As instructed in the back and leg dynamometer manual, the score shown in the dial during the maximal lift was multiplied into two to arrive at the final score. The best of the three trials was recorded in kilograms.

COOPER’S 12 MINUTES RUN/WALK

Purpose

The purpose of this test was to assess the cardio respiratory endurance of the subjects.

Equipment

The test was administered in 400 meters track. Stopwatch and whistle were used to administer the test.
Procedure

For this test a 400 meters track was prepared with marking at every ten meters intervals with flags for correct calculation of the distance covered. Twelve subjects (three from each group) ran at a time. The subjects stood on the arc starting line in athletic costume. They were instructed to cover as much distance as possible by running/walking till hearing the final whistle. The race started with a whistle. The number of laps covered and number of minutes left were informed to the subjects by the respective lap scorer, when they crossing the starting line. At the end of 12th minute a long whistle was blown and the subjects stopped instantly and stood on the spot. (Clarke, 1976)

Scoring

The distance covered by each subject in 12 minutes was recorded in meters and it was used as a measure of cardio respiratory endurance.
3.7.2. SOCCER TECHNIQUES TEST

SIR BOBBY CHARLTON SOCCER SCHOOL OF AUSTRALIA
TEST FOR Dribbling

Purpose

This test was designed to improve close control whilst at pace with the ball.

Testing area

*Fig. 3.1. Dribbling*
Procedure

Seven cones were set out in a slalom effect and the competitors started the dribbling from a set distance away, fifteen meters. The idea was for the competitor to run the slalom course up and down, with the ball, and then run with the ball at his feet to the starting point, and stop the ball dead on the starting line, thus ensuring that the ball was fully under control. (www.bobbycharltonsoccer school.com.au)

Scoring

The time taken was considered as the final score.
SIR BOBBY CHARLTON SOCCER SCHOOL OF AUSTRALIA
TEST FOR PASSING

Purpose
The test was designed to develop passing accuracy and encourage the use of both feet by passing over a short distance

Testing area

Fig. 3.2. PASSING

14 and above years of age
12/13 years of age
9 – 11 years of age
Under 8 years of age
**Procedure**

The testing area was of a twenty meter width and forty meter length. Four balls placed at a ten meters distance in the middle line, drawn in the testing area, divided the area into eight equal squares, and placed four gates diagonal to the placed balls. ([www.bobbycharltonsoccerschool.com.au](http://www.bobbycharltonsoccerschool.com.au))

**Scoring**

This test was designed so that each pass was done with alternative feet, strength foot and weaken foot or vice versa. For each successful gate a player scored two points, and if a player score with his weaker foot four points were given. Each participant has four gates to pass and the total score of four chances were considered as the final score.
SIR BOBBY CHARLTON SOCCER SCHOOL OF AUSTRALIA

TEST FOR KICKING

Purpose

The test was designed to assess the kicking ability of the participants.

Testing area

Fig. 3.3. KICKING

14 and above years of age
12/13 years of age
9 – 11 years of age
Under 8 years of age
Procedure

The area was divided into four, thirty meters away from the starting line. From thirty meters, four squares were drawn with two meters of radius, so that the total landing area was sixteen meters. The participant was allowed to attempt four kicks, in which two with his weaker foot and for this he scored double point value.

(www.bobbycharltonsoccerschool.com.au)

Scoring

If the ball kicked fell within the center square ten points were given; for second square, eight points were given; for the third square five points were given and for the fourth square three points were given. The total score of the four attempts were taken as the final score.
SIR BOBBY CHARLTON SOCCER SCHOOL OF AUSTRALIA

TEST FOR TRAPPING

Purpose

This test was designed to assess the ball receiving ability of the participant.

Testing area

Fig. 3.4. TRAPPING

- 14 and above years of age
- 12/13 years of age
- 9 – 11 years of age
- Under 8 years of age
**Procedure**

The area is divided into four, ten meters away from the starting line. It was drawn with two meters of radius, so that the total landing area is sixteen meter. The participant was allowed to attempt three trials. The player was asked to stand in the center of the sixteen meter square. The balls were thrown to him from fifteen meters away so that he should trap the ball with the help of his thigh, chest and instep of the foot. Three chances were given to trap the ball with the thigh, chest and instep of the foot. ([www.bobbycharltonsoccerschool.com.au](http://www.bobbycharltonsoccerschool.com.au))

**Scoring**

If the ball trapped and fell in the center square, ten points were given, for the second square eight points were given, for the third square five points were given and if the ball trapped and fell in the fourth square three points were given. Total of three chances was considered as the final score.
SIR BOBBY CHARLTON SOCCER SCHOOL OF AUSTRALIA
TEST FOR SHOOTING

Purpose

The test was designed to develop accuracy in shooting.

Testing area

**Fig. 3.5. SHOOTING**
**Procedure**

The participants were asked to take four shots at a divided goal from a set distance away, 20 meters. The goal was divided into six, and each shot had to be realistic in terms of shooting for goal, and a side footed attempt would not be acceptable. ([www.bobbycharltonsoccerschool.com.au](http://www.bobbycharltonsoccerschool.com.au))

**Scoring**

Each participant had four chances; if the ball hit in the right or left bottom corner five points were given; for right or left top corner four points were given; and for top middle two points; and for bottom middle one point was given. The total score of four chances were considered as the final score.

**3.8. TRAINING PROGRAMME**

Plyometrics are training techniques used by athletes in all types of sports to increase strength and explosiveness ([Chu, 1998](#)). Researchers have shown that plyometric training, when used with a periodized training programme, can contribute to improvements in vertical jump performance, acceleration, leg strength, muscular power, increased joint awareness and overall proprioception ([Adam et al. 1992](#)). Plyometric activities have been used in sports such as football, tennis and other sporting events that agility may be useful for their athletes ([Jones et al. 1998](#)).
After the initial measurements the subjects were divided into four equal groups, the control group (n=30), the low intensity plyometric training group (n=30), the medium intensity plyometric training group (n=30) and the high intensity plyometric training group (n=30). The control group did not undergo any training. The other three training groups trained for 12 weeks, three days per week. Before the initiation of the training periods, the subjects of all the groups were instructed about proper execution of all the exercises to be used during the training period for all training regimens. None of the subjects had used plyometric exercises before. Subjects agreeing to participate signed an institutionally approved consent form.

A twelve week plyometric training programme was developed using three sessions per week. The training programme was based on the recommendation of intensity and volume from Piper and Erdmann (1998) using similar drills, sets and repetitions. Three days per week are perfectly acceptable for juniors, given that there are no competition days at the end of each weekly cycle training (Chu 1998). Plyometrics are performed thrice per week to allow for sufficient recovery between workouts as recommended by researchers (Adam et al. 1992).

The training volume ranged from 90 foot contacts to 140 foot contacts per session while the intensity of exercises increase for 10 weeks before tapering off during 11th and 12th weeks as recommended by Piper and Erdmann (1998). The plyometric exercises are classified into low, medium and high intensity based on
the difficulty in performing (Ebben, 2007). The intensity of training was tapered, so that fatigue would not be a factor during post testing. The plyometric training groups trained at the same time of the day. During training all the subjects were under direct supervision and were instructed on how to perform each exercise.

In each training session the training was imparted for a period of 45 to 60 minutes, which included 5 minutes warming up and 5 minutes relaxation procedure after the training programme for three days per week for a period of 12 weeks. The American college of sports medicine recognizes that the adult should engage in medium intensity physical activity for atleast 30 minutes or more, on five or more days of the week, those interested fully in obtaining basic health benefits (American college of sports medicine, 2006).

The training schedule for the experimental groups were designed as per the results of the pilot study and also based on the guidelines given by Miller et al. (2006).
FIG. 3.6. FLOW CHART SHOWING THE METHODOLOGY ADOPTED IN THIS STUDY

Junior soccer players. N = 120; No equated groups

Control group (CG); N = 30

Experimental group I (LIPT); N = 30

Experimental group II (MIPT); N = 30

Experimental group III (HIPT); N = 30

Experimental treatment

Pre - test

Post - test

Pre - test

Post - test

Statistical analysis
FIG. 3.7. FLOW CHART SHOWING THE EXPERIMENTAL TREATMENT ADOPTED FOR EXPERIMENTAL GROUP-I

LOW INTENSITY PLYOMETRIC TRAINING (LIPT) ON JUNIOR SOCCER PLAYERS

EXPERIMENTAL GROUP-I (LIPT)

Monday
Low intensity plyometric

Wednesday
Low intensity plyometric

Friday
Low intensity plyometric
FIG. 3.8. FLOW CHART SHOWING THE EXPERIMENTAL TREATMENT ADOPTED FOR EXPERIMENTAL GROUP-II

MEDIUM INTENSITY PLYOMETRIC TRAINING (MIPT) ON JUNIOR SOCCER PLAYERS

EXPERIMENTAL GROUP-II (MIPT)

Monday
Medium intensity plyometric

Wednesday
Medium intensity plyometric

Friday
Medium intensity plyometric
FIG. 3.9. FLOW CHART SHOWING THE EXPERIMENTAL TREATMENT ADOPTED FOR EXPERIMENTAL GROUP-III

HIGH INTENSITY PLYOMETRIC TRAINING (HIPT) ON JUNIOR SOCCER PLAYERS

EXPERIMENTAL GROUP-III (HIPT)

Monday
High intensity plyometric

Wednesday
High intensity plyometric

Friday
High intensity plyometric
### 3.9. TRAINING SCHEDULE FOR LOW INTENSITY PLYOMETRIC TRAINING GROUP

<table>
<thead>
<tr>
<th>Training week</th>
<th>Volume (Foot contacts)</th>
<th>Drills</th>
<th>Sets × Reps</th>
<th>Intensity &amp; Rest</th>
</tr>
</thead>
<tbody>
<tr>
<td>I &amp; II</td>
<td>90</td>
<td>Side to side ankle hops, Standing jump and reach, Front cone hops</td>
<td>2×15, 2×15, 5×6</td>
<td>Low &amp; Two minutes between the sets</td>
</tr>
<tr>
<td>III &amp; IV</td>
<td>120</td>
<td>Side to side ankle hops, Diagonal cone hops, Hexagonal drill, Squat jump</td>
<td>2×15, 5×6, 2×15, 5×6</td>
<td>Low &amp; Two minutes between the sets</td>
</tr>
<tr>
<td>V &amp; VI</td>
<td>120</td>
<td>Diagonal cone hops, Squat jump, Split squat, Standing long jump, Cycled split &amp; squat jump</td>
<td>2×12, 4×6, 2×12, 3×8</td>
<td>Low &amp; Two minutes between the sets</td>
</tr>
<tr>
<td>VII &amp; VIII</td>
<td>140</td>
<td>Diagonal cone hops, Medicine ball sit ups, Plyometric sit ups, Hexagonal drill, Front cone hops</td>
<td>4×8, 4×8, 2×12, 4×7, 4×6</td>
<td>Low &amp; Two minutes between the sets</td>
</tr>
<tr>
<td>IX &amp; X</td>
<td>140</td>
<td>Diagonal cone hops, Standing long jump, Two foot ankle hops, Lateral bound, Squat jump, Star jump</td>
<td>2×7, 4×7, 4×7, 2×7, 4×7, 4×7</td>
<td>Low &amp; Two minutes between the sets</td>
</tr>
<tr>
<td>XI &amp; XII</td>
<td>120</td>
<td>Diagonal cone hops, Hexagonal drill, Front cone hops, Lateral bound, Star jump</td>
<td>2×12, 2×12, 4×6, 3×8, 4×6</td>
<td>Low &amp; Two minutes between the sets</td>
</tr>
</tbody>
</table>

(Miller et al. 2006).
### 3.10. TRAINING SCHEDULE FOR MEDIUM INTENSITY PLYOMETRIC TRAINING GROUP

<table>
<thead>
<tr>
<th>Training week</th>
<th>Volume (Foot contacts)</th>
<th>Drills</th>
</tr>
</thead>
<tbody>
<tr>
<td>I &amp; II</td>
<td>90</td>
<td>Lateral jump over barrier&lt;br&gt;Double leg hops&lt;br&gt;Lateral cone hops</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2×15&lt;br&gt;2×15&lt;br&gt;5×6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium &amp; Two minutes between the sets</td>
</tr>
<tr>
<td>III &amp; IV</td>
<td>120</td>
<td>Lateral jump over barrier&lt;br&gt;Double leg hops&lt;br&gt;Lateral cone hops&lt;br&gt;Standing long jump &amp; later sprint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2×15&lt;br&gt;5×6&lt;br&gt;2×15&lt;br&gt;5×6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium &amp; Two minutes between the sets</td>
</tr>
<tr>
<td>V &amp; VI</td>
<td>120</td>
<td>Lateral jump over barrier&lt;br&gt;Double leg hops&lt;br&gt;Lateral cone hops&lt;br&gt;Tuck jump with knee up&lt;br&gt;Scissors jump</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2×12&lt;br&gt;3×8&lt;br&gt;2×12&lt;br&gt;2×12&lt;br&gt;4×6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium &amp; Two minutes between the sets</td>
</tr>
<tr>
<td>VII &amp; VIII</td>
<td>140</td>
<td>Standing long jump &amp; later sprint&lt;br&gt;Lateral cone hops&lt;br&gt;Tuck jump with knee up&lt;br&gt;Scissors jump&lt;br&gt;Alternate leg bound</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4×8&lt;br&gt;2×12&lt;br&gt;4×8&lt;br&gt;4×7&lt;br&gt;4×6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium &amp; Two minutes between the sets</td>
</tr>
<tr>
<td>IX &amp; X</td>
<td>140</td>
<td>Standing long jump &amp; later sprint&lt;br&gt;Lateral cone hops&lt;br&gt;Cone hops with 180° turn&lt;br&gt;Alternate leg bound&lt;br&gt;Double leg zig zag hops&lt;br&gt;Scissors jump</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4×7&lt;br&gt;4×7&lt;br&gt;4×7&lt;br&gt;2×7&lt;br&gt;2×7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium &amp; Two minutes between the sets</td>
</tr>
<tr>
<td>XI &amp; XII</td>
<td>120</td>
<td>Cone hops with change of direction sprint&lt;br&gt;Double leg hops&lt;br&gt;Double leg zig zag hops&lt;br&gt;Tuck jump with heel kick&lt;br&gt;Scissors jump</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4×6&lt;br&gt;3×8&lt;br&gt;4×6&lt;br&gt;2×12&lt;br&gt;2×12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium &amp; Two minutes between the sets</td>
</tr>
</tbody>
</table>

(Miller et al. 2006).
### 3.11. TRAINING SCHEDULE FOR HIGH INTENSITY PLYOMETRIC TRAINING GROUP

<table>
<thead>
<tr>
<th>Training week</th>
<th>Volume (Foot contacts)</th>
<th>Drills</th>
<th>Sets×Reps</th>
<th>Intensity &amp; Rest</th>
</tr>
</thead>
</table>
| I & II        | 90                     | Single leg bounding  
                |            | Lateral jump single leg  
                |            | Split pike jump  
                |            | 5×6  
                |            | 2×15  
                |            | High & Two minutes between the sets |
| III & IV      | 120                    | Single leg bounding  
                |            | Lateral jump single leg  
                |            | Split pike jump  
                |            | Double leg vertical power jump  
                |            | 2×15  
                |            | 5×6  
                |            | 2×15  
                |            | High & Two minutes between the sets |
| V & VI        | 120                    | Single leg bounding  
                |            | Lateral jump single leg  
                |            | Single leg vertical barrier hop  
                |            | Split pike jump  
                |            | Lateral jump over barrier  
                |            | 2×12  
                |            | 4×6  
                |            | 2×12  
                |            | 3×8  
                |            | 2×12  
                |            | High & Two minutes between the sets |
| VII & VIII    | 140                    | Lateral jump single leg  
                |            | Single leg bounding  
                |            | Straight pike jump  
                |            | Single leg tuck jump  
                |            | Single leg speed jump  
                |            | 2×7  
                |            | 4×8  
                |            | 2×12  
                |            | 4×7  
                |            | 4×6  
                |            | High & Two minutes between the sets |
| IX & X        | 140                    | Lateral jump single leg  
                |            | Single leg bounding  
                |            | Single leg tuck jump  
                |            | Single leg speed jump  
                |            | Box jump 18”  
                |            | Depth jump landing  
                |            | 2×7  
                |            | 4×7  
                |            | 4×7  
                |            | 4×7  
                |            | 2×7  
                |            | High & Two minutes between the sets |
| XI & XII      | 120                    | Single leg bounding  
                |            | Double leg vertical power jump  
                |            | Box jump 18”  
                |            | Lateral bound single leg  
                |            | Depth jump landing  
                |            | 2×12  
                |            | 2×12  
                |            | 4×6  
                |            | 3×8  
                |            | 4×6  
                |            | High & Two minutes between the sets |

(Miller et al. 2006).
3.12. COLLECTION OF DATA

The data on motor fitness components and soccer techniques were collected by various tests explained above. The pre-test and post-test data were collected before and after the training programme for a period of 12 weeks. All the data were collected on the same day.

3.13. EXPERIMENTAL DESIGN

The collected data when in number, though it is valid and reliable, would not give us useful meaning in terms of what we need. The data has to be processed with the help of statistics, analyzed scientifically, interpreted and intelligently concluded. In this study the data have been collected on variables such as motor fitness components of speed, agility, flexibility, leg strength and cardio respiratory endurance, Soccer techniques of dribbling, passing, kicking, trapping and shooting. Experimental design is a blue print of the procedure that enables the researcher to test the hypothesis by reaching valid conclusions in testing the relationship between independent variables and dependent variables. The investigator used pre and post test random group design in this study. This procedure involves dividing a sample into two or more groups based on random selection. The investigator did not make any attempt to equate the groups in this study. The selected one hundred and twenty subjects were divided into four equal groups consisting of 30 each such as experimental group I (n = 30), experimental group II
(n = 30), experimental group III (n = 30) and a control group (n = 30). The treatment was administered to all the experimental groups for a period of 12 weeks. At the end of 12th week the post test were administered to all the groups.

3.14. STATISTICAL TECHNIQUES

The pre-test and post-test data of the experimental and control groups on the respective variables were analyzed with various statistical techniques. The following statistical techniques were used for analyzing the data of variables.

Descriptive statistics such as mean and standard deviation were found inorder to get the basic idea of the data distribution. ‘t’ test was done for finding whether there is any statistically significant pre-test to post-test mean differences in their respective variables of each groups.

It is to be noticed that the individuals in the experimental and control groups may vary widely in the initial pre-test scores. If we use analysis of variance (ANOVA) for testing the significance of the difference between the post-test means of the experimental and control groups, then we are ignoring the influence of the initial pre-test scores to the final post-test scores. These pre-test scores are called ‘covariates’. Therefore we have to eliminate or to keep under control the effect due to these covariates (pre-test scores) from the final scores (post-test scores). Hence, the data should be analyzed by the technique of analysis of covariance (ANCOVA) rather than analysis of variance (ANOVA). ANCOVA tests the significance of ‘adjusted
post test mean’ differences between the experimental and control groups for each variable. Adjusted post-test means are the post test means after eliminating the effect due to the pre-test (initial) scores. The adjusted technique serves to remove from the final scores that portion which is due to the relation between covariate (pre-test scores) and the final scores, and, in doing so, adjusts for the initial inter subject differences.

Whenever the ‘F’ ratios were found to be significant, scheffe’s post hoc test was applied to test the significant difference between the paired adjusted means. 0.05 level of confidence was fixed for motor fitness components and soccer techniques to test the level of significance.