CHAPTER – III

METHODOLOGY

In this chapter, procedures and methods applied in selection of subjects, selection of variables, selection of tests, competence of the tester, reliability of the instruments, reliability of the data, orientation to the subjects, pilot study, training programme, collection of the data, administration of the tests, experimental design and statistical technique are presented.

SELECTION OF SUBJECTS

The present study was designed to find out the Effect of Hypoxic Training and Pranayama Practices on selected Bio-Motor Variables and Soccer Performances among College Soccer Players. such as Speed, Explosive Power, Cardio Respiratory Endurance, Agility, Dribbling, Passing and Shooting of College men. For this study, forty five men students studying Under Graduate Degree course in Farook College, Calicut, Kerala, India, during the year 2007-2010 were selected at random as subjects. The age, height and weight of the subjects ranged from 18 to 21
years, 163 to 171 cms and 59 to 67 kg respectively, and the means were 19.3 years, 167 centimeters and 61 kilograms respectively.

The subjects successfully completed the minimum strength requirement test recommended by *Voight* and *Draovitch* (1991). Which consists of static stability and dynamic movement testing for thirty seconds. The subjects were assigned at random into three groups of fifteen each (n=15). Group I underwent Hypoxic Training, Group II underwent Pranayama Practices and Group III acted as Control (n=15). They underwent the respective training programme for duration of twelve weeks with a schedule of three days per week. A written consent was obtained from the subjects. However, they were free to withdraw their consent in case they felt any discomfort during the period of their participation. There were no such dropouts in this study.

**SELECTION OF VARIABLES**

**Dependent Variables**

Training involves constructing an exercise programme to develop an athlete for a particular athletic event. Thus, increasing skill and energy capacities take equal consideration. *(Fox and Mathews, 1974).*
Physical training refers to the processes used in order to develop the components of physical fitness as for example, how to improve aerobic endurance, to stretch and relax muscles, to increase arm and shoulder strength to related exercise and programmes to specific requirements or individual sports. (Hazeldine, 1985).

Sports training consist of activities and movements which generally lead to high fatigue. Fatigue is the direct product of load by physical activity or which ultimately lead to increase in performance capacity. Load therefore, is of central importance in sports training. Without load through physical exercise the performance cannot be improved, stabilized and maintained the load, results in stagnation of performance.

Actual effect of exercise depends upon several factors of which the important ones are training load, means of recovery, assessment of loading and performance capacity, sports equipment, nutrition, psychological characteristics and methods adopted for imparting theoretical instructions. If these factors are disregarded, the usefulness of the physical exercise decreases and the sports person does not realize optimal benefit.
High performance in sports is the outcome of magnitude and the quality of motor movements. These motor movements require physical fitness, technique, tactics and physiological development of athletes. Physical fitness basically depends on the motor fitness components i.e. speed strength, endurance, flexibility, coordinative abilities and buffer capacity, energy reserves and functional capacity of internal organs. Although the ratio differs from game to game, certain amount of all these qualities are the necessary prerequisites for any motor movement (Singh and Singh, 2002).

Speed is the ability of an individual to perform successive movements of the same pattern at a fast rate, or even one single movement while speed would appear to be an innate quality. It can be improved by practice of the coordinated movements and by learning proper techniques (Barrow and Mc Gee, 1991).

The rate of force development being at the maximum for any type of muscle action is explosive power. In activities requiring high acceleration and output, explosive power training is necessary for maximum development. Some examples of these activities would include soccer, hurdling and football. This type of training is effective in enhancing athletic performance.
The general exerciser doesn’t usually need to include explosive power training in a regular workout. Cardiovascular and strength training in a slow, steady manner will give adequate results. In contrast, Athletic movements need to be performed at high speeds. The muscles have to be developed and trained outside of the sport in order to do this. The types of exercises used in explosive power training are determined by the type of sport that is being trained for. For example, for a basketball player trying to improve his jump shot would have a training program that would include weighted vertical jumps. Another example would be a gymnast who would like to get more height in her back spring; she would perform jumps and pushups to improve the strength in her arms and legs.

Explosive power exercises should be taught and supervised by fitness professionals to reduce the risk of injury. They should also be done in conjunction with a regular workout program to ensure that the athlete is balanced in all exercise areas.
Cardio respiratory fitness refers to the ability of the heart and lungs to operate efficiently during exertion over an extended period. In recent years several videos have been released that incorporate martial art skills in an aerobic dance format. They have been extremely popular for use at home and health clubs and have improved the cardio respiratory fitness of the adults who use them. Unfortunately, most of these videos are geared toward adult populations and few instruct teachers in presenting martial art aerobic routines to their students. Nonetheless the martial art skills of striking and kicking performed repetitively over an extended time represent the upper- and lower-body movements that offer aerobic improvements in children and adolescents.

Agility, a motor fitness variable chosen for the study, may be explained as the physical ability which enables an individual to rapidly change body position and direction in a precise manner. Agility is another important component of motor fitness test. Variable performance in shuttle run reveals the agility of an individual (Kakushkin, 1983).
Agility is a necessary pre-requisite for all physical exercises requiring the participation of the whole body and the interplay of all the groups of muscles. Agility plays a significant role in the training of technique and in competition. The aim in training skill is to bring the athlete closer and to the ideal from sequence of movement (Schmolinsky, 1987).

Football is not an invented game but one that went through a process of evolution. The history of football is a much interwoven tangle of different threads that come to make what we call football today. In many parts of the world football evokes great passions and plays an important role in the life of individual fans, local communities, and even nations. Its simple rules and minimal equipment requirements have no doubt aided its spread and growth in popularity.

High-level performance in any game depends upon the mastering the fundamentals skills. Football is a game, which revolves around the effective utilization of fundamental skills. The fundamental skills in soccer are quite different from those of most sports because the entire body can be used to play the ball. The important ball skills in football are passing, dribbling, shooting, heading, trapping, chipping, Juggling and throw-in.
In the history of test and measurements several stages from anthropometrics to fitness have been experienced. Perhaps at the present time there is a renewed emphasis on evolution of specific sports skills. Historically sports skill testing has received significant attention from physical educators and coaches. Sports skills are administered to motivate, to grade, to diagnose and to research. Properly administered skill tests can provide players with very positive experiences.

There is an increasing awareness among football practitioners that information from scientific endeavors can contribute both to the understanding and solution of problems that confront them. This kind of knowledge can be helpful to football Managers, Coaches and Trainers. At a time when India is frantically attempting to revamp the system to recapture its lost glory in world football, the investigator felt the need for developing football skills through innovative methods such as hypoxic and pranayama practices choosing the following dependent variables:
1. Speed
2. Explosive Power
3. Cardio respiratory endurance
4. Agility
5. Dribbling
6. Passing
7. Shooting

**Independent Variables**

All athletic programs should incorporate the fundamental factors of training, namely physical, technical, tactical, psychological and theoretical training. They are an essential part of any training program regardless of the athlete’s age, individual potential, training level, or training phase. The relative emphasis placed on each factor varies, however, according to these features and the characteristics of the sport or event.

Hypoxic capacity has covered such matters as the exchange of gases in the lungs during breath holding. The Physiological effect of Hypoxia on the human body has been extensively studied throughout the world for the last few decades. Hypoxic Training is highly beneficial in a verify of ways: strengthening the body’s cardio pulmonary system, increasing strength and endurance, boosting immunity and even extending one’s life span.
Pranayama forms a vital step in the path to ascendancy through Yoga. Pranayama is derived from 2 Sanskrit words - Prana (life force) and Ayama (control). Therefore, in its broadest description, Prananyama would mean the control of the flow of life force. One of the initiation techniques into Prananyama is through the practice of Yogic Breathing or Yoga Breathing. Yogic Breathing helps us break down and understand our breathing better as being composed of diaphragmatic and thoracic breathing. Although this breathing technique forms a basis to advanced Pranayama techniques, it leads to important benefits of its own and provides us a glimpse of what we are capable of reaching through Pranayama.

During breathing for Pranayama inhalation (puraka) stimulates the system and fills the lungs with fresh air; retention (kumbhaka) raises the internal temperature and plays an important part in increasing the absorption of oxygen; exhalation (rechaka) causes the diaphragm to return to the original position and air full of toxins and impurities is forced out by the contraction of inter-costal muscles. These are the main components leading to Pranayama which massage the abdominal muscles and tone up the working of various organs of the body. Due to the proper functions of these organs, vital energy flows to
all the systems. The success of Pranayama depends on proper ratios being maintained between inhalation, exhalation and retention.

Based on the above mentioned concepts of training the following independent variables have been designed:

1. Hypoxic Training
2. Pranayama Practice

**SELECTION OF TESTS**

The present study was undertaken to find out the Effect of Hypoxic Training and Pranayama Practices on selected Bio-Motor Variables and Soccer Performances among College Soccer Players. As per the available literature, the following standardized tests were used to collect relevant data on the selected dependent variables and they are presented in Table I.
TABLE – I

TESTS SELECTION

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Criterion Variables</th>
<th>Test Items</th>
<th>Unit of Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Speed</td>
<td>50 Meters Run</td>
<td>1/10\textsuperscript{th} of a second</td>
</tr>
<tr>
<td>2.</td>
<td>Explosive Power</td>
<td>Standing Broad Jump</td>
<td>In Meters</td>
</tr>
<tr>
<td>3.</td>
<td>Cardio Respiratory Endurance</td>
<td>Cooper’s 12 Minute Run/Walk Test</td>
<td>In Meters</td>
</tr>
<tr>
<td>4.</td>
<td>Agility</td>
<td>Shuttle Run</td>
<td>1/10\textsuperscript{th} of a second</td>
</tr>
<tr>
<td>5.</td>
<td>Dribbling</td>
<td>Mor- Christian General Soccer Ability Test</td>
<td>In seconds</td>
</tr>
<tr>
<td>6.</td>
<td>Passing</td>
<td>Mor- Christian General Soccer Ability Test</td>
<td>In numbers</td>
</tr>
<tr>
<td>7.</td>
<td>Shooting</td>
<td>Mor- Christian General Soccer Ability Test</td>
<td>In numbers</td>
</tr>
</tbody>
</table>

COMPETENCY OF THE TESTER

All the measurements in this study were taken by the investigator with the assistance of Lecturers working in various departments in Farook College, Calicut, Kerala, India. To ensure that the assistants of the investigator were well versed with the technique of conducting tests, they had a number of practice sessions in the correct testing procedure. The tester’s reliability was established by test and re-test methods.
RELIABILITY OF THE INSTRUMENTS

The stopwatches, measuring tape, Sargent jump board, used in this study were availed from the Department of Physical Education, Farook College, Calicut, Kerala, India. These instruments had been purchased from reliable and standard companies and were considered accurate enough for the purpose of the study.

RELIABILITY OF THE DATA

Test and retest method was followed in order to establish the reliability of data by using ten subjects at random. The same personnel under similar conditions tested all the dependent variables selected in the present study twice for the subjects. The intra class co-efficient of correlation was used to find out the reliability of the data and the results are presented in Table II.
TABLE – II

**INTRA CLASS CO-EFFICIENT OF CORRELATION ON SELECTED DEPENDENT VARIABLES**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Criterion Variables</th>
<th>‘R’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Speed</td>
<td>0.97*</td>
</tr>
<tr>
<td>2.</td>
<td>Explosive Power</td>
<td>0.92*</td>
</tr>
<tr>
<td>3.</td>
<td>Cardio Respiratory Endurance</td>
<td>0.95*</td>
</tr>
<tr>
<td>4.</td>
<td>Agility</td>
<td>0.97*</td>
</tr>
<tr>
<td>5.</td>
<td>Dribbling</td>
<td>0.95*</td>
</tr>
<tr>
<td>6.</td>
<td>Passing</td>
<td>0.99*</td>
</tr>
<tr>
<td>7.</td>
<td>Shooting</td>
<td>0.94*</td>
</tr>
</tbody>
</table>

* Significant at 0.01 level of confidence.
(Table value required for significance at 0.01 level of confidence is 0.77)

Since the obtained ‘r’ values were much higher than the required value, the data were accepted as reliable in terms of instrument, tester and the subjects.

**ORIENTATION TO THE SUBJECTS**

The investigator explained to the subjects the purpose of the training programme and their part in the study. For the collection of data, the investigator explained the procedure of testing on selected dependent variables and gave instruction about the procedure to be adopted by them for measuring. Five
sessions were spent to familiarize the subjects with the techniques involved in undergoing Hypoxic Training and Pranayama Practice. It helped them to perform the Training exercises perfectly without causing injuries. The subjects of all the groups were sufficiently motivated to perform their assigned tasks during the testing periods.

**PILOT STUDY**

A pilot study was conducted to assess the initial capacity of the subjects to fix the load and also to design the training programme. For that purpose, ten men subjects were selected at random and they were given different Intensities of Hypoxic training and Pranayama under the watchful eyes of the investigator. Finally, limited technique, which were closely related to develop the dependent variables and design the training programme were chosen/prescribed. While constructing the training programmes the basic principles of sports training (progression of overload and specificity) were followed. During construction of the training programme, the individual differences were also being considered.
TRAINING PROGRAMME

During the training period, the experimental groups underwent their respective training programmes. Group-I underwent Hypoxic Training, Group-II underwent Pranayama Practice, for all three days per week for twelve weeks. The duration of training session in all the days was between thirty and forty five minutes approximately which included warming up and limbering down. For Hypoxic training continuous running with inhaling and exhaling with equal running stride was maintained throughout the course of training. Training progressing was given every week (i.e. first week three stride inhale and three stride exhale was given while continuous running with half an hour and following weeks one more stride of inhale and exhale was increased). All the subjects involved in this study were carefully monitored throughout the training programme to be away from injuries. They were questioned about their health status throughout the training programme. None of them reported any injuries or discomfort. However, muscle soreness appeared in the earlier period of the training programme and was reduced in due course.
COLLECTION OF THE DATA

The data on Speed was assessed by 50 Meters Run, Explosive Power was assessed by Standing Broad Jump, Cardio Respiratory Endurance was assessed by Coopers 12 Minutes Run/Walk Test, Agility was assessed by Shuttle Run Test, Soccer Performance Skill such as Dribbling, Passing and Shooting were assessed by Warner test for soccer skills and Mor-Christian soccer test. Pre test data were collected two days before the training programme and post test data were collected immediately after twelve weeks of training session. In all the cases, the data were collected on two consecutive days. On the first day Bio-Motor variables were conducted, whereas Soccer skill tests were conducted on the second day.
ADMINISTRATION OF THE TESTS

Figure: I

Speed (50 Metres Run)
1. **Speed (50 mts Run)**

**Purpose**

The purpose of the test was to measure the speed of the subject.

**Equipment**

Stopwatch, chunnam powder for marking, Scorecard

**Procedure**

The subject took a position behind the starting line. The starter used the command, “ready” and “go”. The starter was accompanied by a downward sweep of the arm as a signal to the timer. The subjects ran across the finish line. The standing start method was adopted for this purpose. The stopwatch was started on the command “Go” and stopped when the runner crosses the finish line.

**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. The fractions were rounded to the next largest one tenth of a second. One trial was permitted.
Figure: II

Explosive Power (Standing Broad Jump)
2. Explosive Strength (Standing Broad Jump)

**Purpose**

To measure explosive power.

**Facilities and Equipment**

Tape measure and an outdoor jumping pit.

**Procedures**

The subject stood behind a take off line with her feet several inches apart. Before jumping the subject dipped at the knees and swung the arms backward and then jumped forward by simultaneously extending the knees and swinging the arms forward. Three trials were permitted. Measurement was taken from the nearest break mark to the take off line. One best trail was recorded.

**Scoring**

The score is the distance between the take-off line and the nearest point where any part of the body touches the floor. It is measured in metres.
Figure: III

Cooper’s 12 Minutes Run/Walk Test
3. Cardio Respiratory Endurance
(Cooper’s 12 Minutes Run/Walk Test)

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

Facilities and Equipment
The test was administered in 400 metres track. A stop watch with calibration of 1/10 seconds, a whistle, score sheets and pencils were used to administer the test.

Procedure
Cooper’s twelve minutes run /walk test was administered with the help of qualified testers. For this test, a 400 metre track was prepared with marking at every tenth meter. The investigator and the testers served as the lap scorers. The subjects were asked to stand on the starting arc drawn at the finish line of the 400 meters track and they were given instructions to cover as much distance as possible by running / walking. They were instructed to continue the run / walk till the final whistle. The race was started with a whistle and at the end of the twelfth
minute again the whistle was blown. The number of minutes left was announced to the subjects every minute. At the twelfth minute a whistle was blown and the subjects stopped instantly and stood on that spot.

**Scoring**

The distance covered by each in twelve minutes was recorded to the nearest tenth metre. The distance covered by the subjects was used as a measure of Cardio respiratory endurance.
Figure: IV

Agility (Shuttle Run)
4. Agility (Shuttle Run)

**Purpose**

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

**Equipment and Field Marking**

Marking tape, stop watch and two blocks of wood (2”x2”x 4”) and a marked area of 10 yards

**Procedure**

The performer stands behind the starting line on the signal "go" and runs to the blocks, picks up one, returns to the starting line, and places the block behind the line; He then repeats the process with the second block; he is allowed of course some rest between the two trails. Total distance covered in one repetition was 40 yards.

**Scoring**

The score of each performer was the length of time required (to the nearest tenth of second) to complete the course. Only the best trial was recorded.
Figure: V

Dribbling
5. Dribbling

**Purpose**

To measure dribbling ability

**Field markings**

A round course with a 20 yard diameter was measured and marked. Twelve 18 inches cones are located around the circle at 5 yards intervals. A 3 foot starting line was marked perpendicular to the outside of the circle.

**Procedure**

On the “go” signal, the subjects dribble a ball, which has been placed on the starting line, around the course. The subject dribbles between the cones as quickly as possible and back to the starting line. Three trials were allowed; the first clockwise, the second counterclockwise, and the third in the direction of the subject’s choice.

**Scoring**

The final test score was the combined time of the two best trials.
Figure: VI

Passing
6. Passing

Purpose

To measure passing ability

Field Marking

A goal 1 yard wide and 18 inches high was prepared by placing two cones 1 yard apart with a 4 foot rope used as crossbar. Two cones were placed at a 45 degree angle from the goal line, and one cone was placed at a 90 degree angle from the goal line. All three cones were located 15 yards from the goal.

Procedure

From each of the three cones subjects execute four passes into the goal [12 passes in all]. Subjects were allowed to use their preferred foot when passing. Two practice passes were allowed from each spot.

Scoring

One point was awarded for each successful pass. Balls that hit the goal cones were considered successful. The final score was the total 12 pass trials.
Figure: VII

Shooting
7. Shooting

Purpose

To measure overall soccer playing ability

Filed Markings

Two ropes suspended from the goal crossbar 4 feet from each goal post divide the soccer goal into two scoring areas. Each scoring area was further divided into two circular targets by two hoops 4 feet in diameter. A restraining line was marked 16 yards from the parallel to the goal.

Procedure

From behind the restraining line, the subject shoots stationary balls towards the target. The preferred foot could be used, and the ball was placed anywhere behind the restraining line. Four practice trials were allowed followed by four consecutive attempts at each of the four target areas [a total of 16 shot trials].

Scoring

Ten points were awarded for shots going through a proper target, and 4 points were awarded for shots going through a wrong target. The final score was the total of 16 trials.
EXPERIMENTAL DESIGN AND STATISTICAL TECHNIQUE

The experimental design used in this study was random group design. The selected subjects were divided at random into three groups of fifteen each (n=15). Group I underwent Hypoxic Training, Group II underwent Pranayama Practice, and Group III acted as Control. All the subjects were tested prior to and immediately after the training for all the selected variables.

The data collected from the three groups prior to and immediately after the training programme on the selected criterion variables were statistically analyzed with dependent ‘t’ test and Analysis of Covariance (ANCOVA). Whenever the ‘F’ ratio for adjusted post test means was found to be significant, Scheffe’s test was followed, as a post hoc test to determine which of the paired mean differences was significant. In all the cases .05 level of confidence was fixed as a level of confidence to test the hypotheses.