Chapter – III

Methodology
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METHODOLOGY

In this chapter, procedures and methods applied in selection of subjects, selection of variables, selection of tests, reliability of the instruments, competence of the tester, 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

Soccer is a game of physical and mental challenges. Soccer players must execute skilled movements under generalized conditions of restricted space, limited time, physical and mental fatigue and opposing players. The Soccer players must be able to run many miles during a game, mostly at sprint like speed and respond quickly to a variety of rapidly changing situations during play. Finally he needs a thorough understanding of an individual, group and team tactics. His ability to meet all these challenges determines how well he performs on the Soccer field (Joseph, 1996).
Soccer is a game which calls for strenuous, continuous and thrilling action and therefore, appeals to the youth the world over. Although the skills involved in the game are simple, natural yet highly stimulating and satisfying to any one who participates in the game.

The present study was designed to find out the effect of combined weight and plyometric training in series and parallel methods on selected power related factors such as speed, explosive power and elastic power and performance factors such as shooting, dribbling and passing abilities of Soccer players. For this purpose, forty five Soccer players were selected randomly from Adhiyamaan Educational and Research Institutions, Hosur, Tamil Nadu, India. The age group of the subjects ranged between 19 and 22 years as per the college record. The selected subject’s height ranged from 152 cm to 174 cm and weight ranged from 48 kg to 61 kg respectively.

The selected subjects were randomly assigned to two experimental and a control group of fifteen each as group I (combined weight and plyometric training in series method group), group II (combined weight and plyometric training in parallel method group) and group III (control group). The experimental groups underwent their respective training
programmes twice a week for 12 weeks duration in addition to regular Soccer training whereas control group did not participate in any form of specific strength training but they involved in their regular Soccer training.

The selected subjects successfully completed the minimum strength requirement test as recommended by Voight and Draovitch, (1991). In addition to that they are the regular and seasoned Soccer players represented in various levels of competitions. But they had no exposure to weight training and plyometric training during those days. The subjects were free to withdraw their consent in case they felt any discomfort during the period of their participation, however there were no drop outs in the study. A written informed consent was obtained from the subjects to participate in the training.

**SELECTION OF VARIABLES**

**Dependent Variables**

Natural ability is no longer enough at any level for an essential basis upon which the carefully nurtured product is moulded. Strangely enough, natural talent is very readily recognized, but the "stuff" which goes to make up the talent is most difficult to analyze. When training for sports or games is
introduced, it is likely to improve physical and bio-motor abilities. The performance of the sports depends largely on physical fitness.

**Power Related Variables**

Power is a product of both absolute strength and the speed of movement. Power is an essential quality in many sports and games for it represents the effective combination of strength and speed. Increase in strength or speed will increase power, and when power increases, more work can be done in less time (*Sharkey, 1975*).

Excellent Soccer speed can impact the game. The key point to remember is that Soccer speed is not only straight ahead speed. It is the ability to accelerate quickly, run on diagonals and bow shaped curves. Soccer speed consists of running shoulder to shoulder with opponents trying to either react to their next move or out pace on defender.

Since speed and power play an important role in almost all games and sports more particularly in Soccer, the following power related factors have been selected as dependent variables for this study.
1. Speed

2. Explosive power

3. Elastic power

**Performance Factors**

Technique refers to a player's ability to perform specific mechanical movements such as shooting, dribbling and passing the ball. The mark of an experienced player is smooth, efficient motion and the ability to elegantly transit between different techniques.

Technique refers to the relationship and harmony in which a player demonstrates with ball and describes the performance of a solitary action in isolation from the game, e.g. a shot or a pass. A technical practice involves players working in isolation on the various aspects of the game such as shooting, passing and ball control. In technique practice, decision-making is minimal and is usually concerned with how to perform the technique or required action. To practice these techniques in isolation from the game or game-type situation is unproductive for gifted players relevant for beginners of the game. Technical mastery of the ball is essential but ultimately technical practice must take place in an environment where tactical decision-making is also required.
Shooting is an action involving quick decisions in football making correct decisions is very important and depends on the ability of the attacker to quickly and correctly analyse the game situation. So, taking a decision is most important. But the sense of responsibility and the anxiety whether it will be successful or not causes higher psychological load. The player who takes the decision without wasting time has more chances of achieving his aim.

The ability to shoot well and the positional sense to avail the chances of scoring which appear and disappear within a very short time to be an in-born quality in a player. Such a player will make himself available at the right spot at the right movement. He should have the sense of opportunity, playing intelligence, i.e., moving into the striking distance quickly and without much interference by the defender. These qualities largely seem to be in-born. But this does not mean that training will have no positive effect. It requires hard practice over a long time (Mal and Kaka, 1986).

Dribbling involves moving a ball along the ground while jogging or running and having it under full control and taking on an opponent and beating him while still retaining possession of
the ball. It is probably the most difficult technique of Soccer, but it is most spectacular of all Soccer-skills.

Having the skill to take an opponent and beat him while in possession of the ball can provide a player's team with a great advantage. Whenever an opponent is beaten by a man who is dribbling, the team in possession of the ball may often gain a numerical advantage in attack since the beaten opponent now finds himself behind the ball and temporarily out of play.

To take on and beat opponents while dribbling, a player must have the ability to manipulate the ball while moving at speed. He must master not only the technique of handling the ball while dribbling but also that of feinting with all parts of his body to deceive opponents. Quick changes of direction often can catch an opponent unbalanced and leave the dribbler with the opportunity to move past him, while sudden bursts of speed may well be more effective than overall running speed (Beim, 1977).

Passing skills for Soccer a critical for the success of any team. If as a team every one has this skill mastered, the team will be able to control the game. Possession time with the ball will go up with better passing skills. If a team passes the ball better the team will be a better team. If a team passes the ball better than
their opponents, the team will win more games. A result of passing the ball better is more goals. Also, if a team passes well, sometimes they will find the other team chasing the ball around resulting in more fatigue at the end of the game (eliteSoccerconditioning, 2007).

Football passing technique is vital for keeping possession and controlling the game, and many parts of the foot can be used. The simplest and most accurate method for short passes is to use the inside of the foot, which presents a large flat surface to the Soccer ball. The instep is used for long passing, the heel can be used to pass behind, and the outside of the foot can be used to pass the ball quickly to the side, or to bend the ball to pass it around an opponent (mastersport, 2007).

Since basic performance of Soccer playing ability is an important role in Soccer, the following performance related factors have been selected as dependent variables for this study.

1. Shooting

2. Dribbling

3. Passing
Independent Variables

All athletic programmes should incorporate the fundamental factors of training, namely physical, technical, tactical, psychological and theoretical training. They are an essential part of any training programme 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.

Resistance training is an anaerobic form of exercise. Many training programmes can be used to enhance the ability of the body to perform at very high force and/or power and to improve the ability of the body to perform repeated bouts of maximal activity.

Plyometric training is the key to develop maximal explosive power and speed of movement which in turn are the elements involved in all sports. By doing various exercises one can greatly increase the performance level.

Strength and speed are integral components of fitness found in varying degrees in virtually all athletic movements. For many years coaches and athletes have sought to improve power in order to enhance performance. Throughout this century and no doubt
long before, jumping, bounding and hopping exercises have been used in various ways to enhance athletic performance. In recent years, this distinct method of training for power or explosiveness has been termed Plyometrics. Whatever may be the origin of the word, the term is used to describe the method of training which seeks to enhance the explosive reaction of the individual.

Based on the above-mentioned concepts of combined weight and plyometric training, the following independent variables have been designed.

1. Combined weight and plyometric training in series method - (CWPSG)

2. Combined weight and plyometric training in parallel method - (CWPPG)

**SELECTION OF TESTS**

The present study was undertaken to find the effect of combined weight and plyometric training in series and parallel methods on selected power related factors such as speed, explosive power and elastic power, and performance factors such as shooting, dribbling and passing abilities of Soccer players. Even though many test available, the investigator, as per the available literature, selected the following standardized test to
collect relevant data on selected dependent variables because they are ideal for the chosen subjects and most suitable for the purpose of the present study. They are presented in Table I.

**TABLE – I**

**TESTS SELECTION**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Testing periods</th>
<th>Criterion Variables</th>
<th>Test Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Day -1 (Evening)</td>
<td>Speed</td>
<td>50 Meters Run</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Explosive Power</td>
<td>Standing Broad Jump</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elastic Power</td>
<td>Bunny Hops Test</td>
</tr>
<tr>
<td>2.</td>
<td>Day -2 (Evening)</td>
<td>Shooting</td>
<td>Mor- Christian General Soccer Ability Test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dribbling</td>
<td>Mor- Christian General Soccer Ability Test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Passing</td>
<td>Mor- Christian General Soccer Ability Test</td>
</tr>
</tbody>
</table>

**RELIABILITY OF THE INSTRUMENT**

The stopwatches, measuring tapes and Soccer balls required for this study were all procured from reliable standard companies. These instruments were taken from the Department of Physical
Education, Adhiyamaan Educational and Research Institutions, Hosur, Tamil Nadu, India and were considered accurate enough to serve the purpose of the study.

**COMPETENCE OF THE TESTER**

All the measurements in this study were taken by the investigator with the assistance of staff from the Department of Physical Education, Adhiyamaan Educational and Research Institutions, Hosur, Tamil Nadu, India. To ensure that the investigator was well versed with the technique of conducting tests, the investigator had a number of practice sessions in the correct testing procedure after a series of practice sessions.

**RELIABILITY OF THE DATA**

Test and retest methods were followed in order to establish the reliability of data by using ten subjects at random. All the dependent variables selected in the present study were tested twice for the subjects by the same personnel under similar conditions. The intra class co-efficient of correlation was used to find out the reliability of the data as suggested by Johnson and Nelson (1982) 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>Dependent Variables</th>
<th>‘R’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Speed</td>
<td>0.91*</td>
</tr>
<tr>
<td>2.</td>
<td>Explosive Power</td>
<td>0.95*</td>
</tr>
<tr>
<td>3.</td>
<td>Elastic Power</td>
<td>0.90*</td>
</tr>
<tr>
<td>4.</td>
<td>Shooting</td>
<td>0.97*</td>
</tr>
<tr>
<td>5.</td>
<td>Dribbling</td>
<td>0.89*</td>
</tr>
<tr>
<td>6.</td>
<td>Passing</td>
<td>0.87*</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 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 the purpose of the training programme to the subjects 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 combined weight and
plyometric training in series and parallel methods. It helped them perform the series and parallel method training exercises perfectly without injuries. The subjects 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 in order to fix the load. For this, twelve Soccer players were selected at random from the selected subjects and divided into two groups of six each, in which group I underwent combined weight and plyometric training in series method and group II performed combined weight and plyometric training in parallel method under watchful eyes of the experts and the investigator. Based on the responses of the subjects in the pilot study the training schedule for series group and parallel group were constructed. However the individual differences were considered while constructing the training programme. The basic principles of training (progression, over load and specificity) were also followed.

**TRAINING PROGRAMME**

During the training period the two experimental groups namely combined weight and plyometric training in series method
group and combined weight and plyometric training in parallel method group underwent their respective training programme, two days per week for twelve weeks in addition to their regular Soccer training sessions. Group I underwent weight training for seven weeks followed by plyometric training for the next five weeks. Group II underwent weight and plyometric training in the alternative sessions. Every day work out lasted for about 45-60 minutes including warm-up and warm down exercise. Group III acted as control which did not participate in any specific training. However, they participated in the regular Soccer training sessions.

The subjects of the experimental groups underwent their respective programmes under strict supervision. All the subjects involved in the training programme were questioned about their status throughout the training period. None of them reported injuries, however muscle soreness was reported in the early weeks but subsided later. On the basis of the pilot study the initial load and their further progression was fixed for this study which is explained in load dynamics.

Attendance was calculated for both the training groups separately by dividing total number of training sessions by the
number of sessions presented. It was 96.18% for series method group and 97.26% for parallel method group.

**COLLECTION OF THE DATA**

The data on speed, explosive power, elastic power, shooting, dribbling and passing were collected by administering 50 mts. run, standing broad jump, bunny hops test and Mor-Christian Soccer tests respectively. Pre test data were collected two days before the training programme and post-test data were collected two days after the training programme. While 50 mts. run, standing broad jump, and bunny hops tests were conducted on the first day, Mor-Christian Soccer test were conducted on the second day. All the tests were conducted during the evening sessions.

**ADMINISTRATION OF THE TEST**

Pre-test data was collected two days before the commencement of the programme and post-test data was collected two days after the training programme. The following tests were administered for speed, explosive power, elastic power, shooting, dribbling and passing as explained below.
50 METRES RUN

Purpose

To measure running Speed.

Facilities and Equipment

An area on track with a starting line, a 50 metres running course and a finish line. Two Stopwatches.

Procedure

After a short warm-up period, the subject took position behind the starting line. Better results were obtained when two subjects ran at the same time. The starter used the verbal commands 'Ready' and 'Go'. The command was accompanied by a downward sweep of the arm as a signal to the timer. The students ran across the finish line. One trial was permitted.

Scoring

The performance was taken to the next largest 1/10th of a second (Seagrave, 1996).
STANDING BROAD JUMP

Purpose

To measure the explosive power in horizontal direction.

Facilities and Equipment

Long jump pit and steel measuring tape.

Procedure

The subjects were taught how to perform standing broad jump perfectly by the investigator. Before the execution of standing broad jump test, subjects were directed to practice for a few minutes. A horizontal line (take off line) was marked one metre before the long jump pit. The subjects stood behind the line facing the pit, foot parallel and then swung his arm forward and backward assuming a crouched position with knees bent at about right angles. The subjects then jumped forward as far as possible. Three trials were allowed with a minute rest in between.

Scoring

Distance between the nearest break point to the horizontal line was recorded as his performance in the nearest centimetre. The best of the three trials was taken as the test score.
ELASTIC POWER (Bunny Hops Test)

**Purpose**

To measure the elastic power.

**Facilities and Equipment**

Smooth plain surface and steel measuring tape.

**Procedure**

The procedure prescribed by *Seagrave (1996)* was employed to measure the elastic power. The subject took the position behind the horizontal line (take off line). The five stride bounding test (Bunny hops) for distance will provide the best assessment of an individual’s power capacity. When the subject completed the five strides bounding (Bunny Hops), the performance was measured from the nearest break to the take off line. Three trials were given.

**Scoring**

The best of three trials was recorded to the nearest 0.01 metres.
Administration of Soccer Shooting Test

Purpose

To measure the shooting ability in Soccer.

Field Markings

The Soccer goal was divided into two scoring areas by two ropes suspended from the crossbar 4 feet from each goal post. In addition, each scoring area was divided into two circular targets by two circular hoops 4 feet in diameter. A line was drawn 16 yards from the designated target area and parallel to it.

Directions

The players were instructed to shoot a stationary ball with the preferred foot from the 16-yard line. The players were allowed to place the ball at any point along the line. Four practice trials were given, and then four consecutive balls were attempted at each of the four target areas. There were a total of 16 trials.

Scoring

When aiming towards the upper right target, the subject received a score of 10 points each time the ball was shot through the upper target; a score of 4 points was scored if the ball was
shot through the lower right target when aiming at the upper right target. The scoring procedure was identical when the player was aiming at the lower target, 10 points for the lower and 4 for the upper target. The targets on the left side were measured in the same way. Balls that rebound from the circular targets were considered as successful trails. No points were given for balls that roll or bounce through the target area.
Figure-I: Measurement of Mor- Christian Soccer

Ability Test for Shooting
DRIBBLING

Purpose

To measure Soccer dribbling ability.

Field markings

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

Procedure

On the “go” signal, the subject dribbles 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 choice of the subject.

Scoring

The final test score was the combined time of the two best trials.
Figure-II: Measurement of Mor- Christian Soccer

Ability Test for Dribbling
PASSING

Purpose

To measure Soccer passing ability.

Field Marking

A goal of 1 yard wide and 18 inch high was prepared by placing two cones, 1 yard apart with a 4 feet rope used as a 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 yard away from the goal.

Procedure

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

Scoring

One point was awarded for each successful pass. Ball that hit the goal cones were considered successful. The final score was the total of 12 successful passes.
Figure-III: Measurement of Mor- Christian Soccer
Ability Test for Passing
EXPERIMENTAL DESIGN AND STATISTICAL TECHNIQUE

The experimental design used for this study was random group design involving forty five subjects who were divided at random into two experimental groups and a control group of fifteen each. No attempt was made to equate the groups in any manner. This study consisted of two different experimental regime namely combined weight training and plyometric training in series and parallel methods. Among the three selected groups, group I underwent combined weight training and plyometric training in series method (CWPSG), group II underwent combined weight training and plyometric training in parallel method (CWPPG) and group III acted as control group (CG). The subjects were tested prior to and after the training programme on the selected criterion variables such as speed, explosive power, elastic power, shooting, dribbling and passing.

The collected data from the three groups prior to and after the training programme on selected criterion variables were statistically analyzed by using the concept of 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 means difference was significant. In all the cases .05 level of confidence was fixed as a level of confidence to test the hypothesis.