CHAPTER III

METHODOLOGY

In this chapter, the selection of subjects, selection of variables, orientation of subjects, reliability of instruments, competency of tester, reliability of data, test administration, experimental design and the statistical procedure used have been explained.

3.1 SELECTION OF SUBJECTS

To facilitate the study, 40 male volleyball players from various engineering colleges in Chennai were randomly selected as subjects and their age ranged between 18-21 years. They were further divided into four groups namely skill training group (STG), plyometric training group (PTG), combined plyometric and skill training (CTG), and control group (CG), on random basis.

Before the commencement of the training, purpose of the study and method of performing, skill training, Plyometric training exercises and combined plyometric and skill training were explained to the subjects for their cooperation to get accurate results.

3.2 SELECTION OF VARIABLES

The researcher reviewed the various scientific literatures pertaining to the topic from books, journals, and research papers near reviewed Taking into consideration the feasibility and availability of instruments the following variables were selected.

3.2.1 DEPENDENT VARIABLES

Physical Variables

1. Explosive power
2. Muscular Strength
3. Speed
4. Agility

Physiological Variables

1. VO_2 max

Skill Performance Variables

1. Service
2. Attack hit

3.2.2 Independent variables

1. Skill Training (STG) for 12 weeks
2. Plyometric Training (PTG) for 12 weeks
3. Combined Plyometric and Skill Training (CTG) for 12 weeks

3.3 EXPERIMETNAL DESIGN

The study was formulated as a true random group design consisting of a pre-test and post test. The subjects (N=40) were randomly assigned in to four groups of ten each male volleyball players. The groups were designed as experimental group I – skill training group

(STG), experimental group II – plyometric training group (PTG) experimental group III combined plyometric and skill training group (CTG), and control group (CG) respectively. Pre test was conducted for all the 40 subjects on chosen variables of the study. The experimental groups (isolated and combine training) underwent in respective training for a period of twelve weeks. The control group did not given any training. The post test was also conducted on the chosen dependent variables after an experimental period of twelve weeks for all the four groups. The different between initial and final mean scores of the groups was the effect of respective experimental treatment on the subjects. The differences in the mean scores was subjected to statistical treatment using ANCOVA In all cases 0.05 level was fixed test the hypothesis of the study.

3.4 PILOT STUDY

Pilot study was conducted for the subjects to know the status of their physical fitness level, thereby to fix the intensity. For the purpose, ten subjects were selected at random. The initial load of the subjects was fixed for plyometrics training; skill training and combined training programme based on the performance in the pilot study. While constructing the training programmes the basic principles of sports training, progression of overload and specificity were followed. During scheduling the training programme, the individual differences were also considered.

3.5 CRITERION MEASURE

The criterion measures of the study were given below:

1. Explosive power was measured through vertical jump and scores recorded in centimeters.
2. Muscular strength was measured through sit - ups and the scores recorded to number of sit ups made.
3. Speed was measured through 50 meters run and the scores recorded in seconds.
4. Agility was measured through 4 x 10 meters shuttle run and the scores recorded in seconds.
5. VO2 max was measured through treadmill test the distance covered to nearest meters was calculated.
6. Serve was measured by Russel - lange Serve Test
7. Attack hit was measured through Volleyball Spike test

3.6 Orientation to the subjects

The investigator held a meeting with the subjects prior to the administration of tests. The purpose and 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 mind, regarding the efforts required from them. All the subjects voluntarily came forward to co-operate in the testing procedures and treatment to put in their best

efforts in the interest of the scientific investigation in order to enhance their own performance. The subjects were very enthusiastic and co-operative throughout the stands.

3.7 Competency of the tester

To ensure that the investigator was well versed in the technique of conducting the tests, the investigator had a number of training 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. The tester's competency was obtained by test; re-test process whereby the consistencies of results were obtained. As very high correlation was obtained, the tester competency in taking measurement and test reliability were accepted and presented.

3.8 Reliability of the data

Test and re-test method were followed in order to establish the reliability of the data by using ten participants at random. All the dependent variables selected in the present study were tested twice by the same person under similar conditions. The intra class co-efficient of correlation was used to find out the reliability of the data.

3.9 INSTRUMENT RELIABILITY

Stop watches calibrated to $1/10^{th}$ of a second were used in this study for recording timings and this time were compared with other standard watches in different situations and they were considered reliable. A standard steel tape was used for measuring. Spiromter and

sphygmomanometer used were standard equipments and was found reliable. All the instruments used were standard and therefore their calibrations were accepted accurate enough for the purpose of the study.

The interclass correlation coefficient obtained for test-retest data are presented in Table I.

TABLE I

INTRA CLASS CORRELATIONS COEFFICIENT ON RELIABILITY OF CRITERION VARIABLES

S.No	Variable	correlation
	Physical Variables	
1	Explosive Power	0.87*
2	Muscular Strength	0.81*
3	Speed	0.70*
4	Agility	0.83*
	Physiological Variables	
	VO_2 max	0.86*
5	[illegible]	[illegible]
	Skill Performance Variables	
6	Serve	0.91*
7	Attack Kit	0.92*

3.10 SUBJECTS RELIABILITY

The interclass correlation value of the above test and retest also indicated subject reliability as the same subjects were used under similar conditions by the same tester. The co-efficient of reliability were significant at 0.05 level, for the above test under investigation.

3.11 COLLECTION OF DATA

The initial scores were collected prior to the experimental treatment from all the three groups on all the dependent variables selected for the study. After the completion of experimental treatment for 12 weeks, the subjects were again tested on the selected variables through standard tests and this forms the post test scores

3.12 TRAINING PROCEDURE

The Selected subjects were given skill training as explained below. The training was carried out in the volleyball court.

Table -II

Skill Training Programme

Exercise	**1st three weeks**	**2nd three weeks**	**3rd three weeks**	**4th three weeks**
Toss and Service	Eight attempts	Ten attempts	Twelve attempts	Fifteen attempts
Toss and Attack	Eight attempts	Ten attempts	Twelve attempts	Fifteen attempts
Service to the Partner	Eight attempts	Ten attempts	Twelve attempts	Fifteen attempts
Attack to the Partner	Eight attempts	Ten attempts	Twelve attempts	Fifteen attempts
Base line service	Eight attempts	Ten attempts	Twelve attempts	Fifteen attempts
Cross Court attack	Eight attempts	Ten attempts	Twelve attempts	Fifteen attempts
Dip and service	Six attempts	Eight attempts	Ten attempts	Twelve attempts
Dip and attack	Six attempts	Eight attempts	Ten attempts	Twelve attempts
Roll and Service	Six attempts	Eight attempts	Ten attempts	Twelve attempts
Roll and attack	Six attempts	Eight attempts	Ten attempts	Twelve attempts
Block and service	Five attempts	Eight attempts	Ten attempts	Twelve attempts
Block and attack	Five attempts	Eight attempts	Ten attempts	Twelve attempts

3.12.1 Toss and service:

Two players with a ball stand at distance of 10 meters facing each other. To start with, a player tosses the ball up and makes service hit to his partner, in turn other player who stands opposite, receives the ball and make the service hit back to the first man. In the first three weeks eight times they have to execute the service skill. The number of service execution would be increased from eight to ten in the second three weeks. During the third and fourth weeks the number of hits would be twelve and fifteen respectively.

3.12.2 Toss and attack:

The same as service execution two players stands at a distance of 10 meters with a volleyball, they have to make attack hit to the partner. The number of hits should be eight during the first three weeks and would be increased in to ten in the second three weeks twelve and fifteen in the third and fourth weeks respectively.

3.12.3 Base line service:

This exercise will be done in the volleyball court. The subject will stand at the service area and do service over the net to the opposite site. He will be supplied with balls for this purpose. For the first three weeks the subject has to service the ball in eight times and it will be increased to ten, twelve and fifteen times accordingly.

3.12.4 Cross Court attack:

This exercise also will be done in the volleyball court. The subject will stand at the attacking area. The setter will receive the ball from zone 6 and make set to the attacker. The attacker will make attack hit continuously. This exercise will continue for eight, ten, twelve and fifteen attempts.

3.12.5 Dip and service:

These exercises are also done in the playing court. The subject has to make one finger dip and execute the service to the fixed area. The number of attempts will be increased in gradually from eight to twelve.

3.12.6 Dip and attack:

This time the attack hit is made after a finger dip, the subjects' should attack the ball over the net as done earlier. The total number of attempts will also be increased from first weeks to fourth weeks.

3.12.7 Roll and Service:

These exercises include a front roll before executing the service. The subject has to do one front roll in the service area and immediately he will be given ball to execute service to the target. The number of attempt will be increased by every three weeks.

3.12.8 Roll and attack:

The same as roll and service, but here the ball will be supplied from the setter as set for attack hit. The subjects are directed to hit the ball to the target. These exercises also to be carried out as mentioned in the table.

3.12.9 Block and service

Here the subject has to execute three blocking action at the zone 2, and then proceed to execute the service from the service area. The number of attempt is also fixed as five, eight ten, and twelve respectively

3.12.10 Block and attack

In this exercise the subject has to make three blocking actions near the net and come back to attacking area. He will be given set by the setter as previous exercises.

TABLE-III

PLYOMETRIC TRAINING GROUP

Exercise	First 3 week				Second 3 week				Third 3 week				Fourth 3 week			
	Set	Rep.	Ht.	Rest	Set	Rep.	Ht.	Rest	Set	Rep.	Ht.	Rest	Set	Rep.	Ht.	Rest
Depth jump	3	5	30	30	3	8	40	30	4	8	50	30	4	8	60	30
Lateral hop	2	5	20	30	3	5	30	30	4	8	30	30	4	12	30	30
Huddle jump	3	5	30	30	3	8	30	30	4	7	30	30	4	10	40	30
Rim jump	3	5	-	30	3	8	_	30	4	8	_	30	4	8	_	30
Lateral hope	2	5	20	30	3	5	30	30	4	8	30	30	4	10	30	30
Over back toss	3	8	-	30	3	8	_	30	4	7	_	30	4	12	_	30

The plyometric training group performed six plyometric exercises – Depth jump, lateral hope,huddle jump, Rim jump, and over back toss. The depth jump height started three sets of five repetitions at 30 centimeters bench height with a rest of 30 seconds in between sets. In the second three week it was three sets of eight repetitions at 40 centimeters bench height with 30 seconds rest. During the third three week the exercise performed were four sets of eight repetitions at 50 centimeters height with 30 seconds rest and four sets of eight repetitions at 60 centimeters height with 30 seconds rest in the forth three week.

Lateral hop (from left to right) jump was performed by two sets of five repetitions with 30 seconds rest, again in the second three weeks, three sets of five repetitions with 30 seconds rest and in the third three weeks four sets of eight repetitions with 30 seconds rest; and in last week it was four sets of twelve repetitions with 30 seconds rest.

The huddle jump was performed as follows: In the three week it was three sets of five repetitions at 30 centimeters bench height with a rest of 30 seconds in between sets. In the second three week it was three sets of eight repetitions at 30 centimeters bench height with 30 seconds rest. During the third three week the exercise performed were four sets of seven repetitions at 30 centimeters height with 30 seconds rest and four sets of ten repetitions at 40 centimeters height with 30 seconds rest in the forth three week.

The Rim jump was performed by three sets of five repetitions with 30 seconds rest, again in the second three weeks, it was three sets of eight repetitions with 30 seconds rest and in the third three weeks four sets of seven repetitions with 30 seconds rest; and in last week it was four sets of ten repetitions with 30 seconds rest.

Lateral hop jump (from right to left) was performed by two sets of five repetitions at 20 cm height with 30 seconds rest, again in the second three weeks, three sets of five repetitions at 30cm height with 30 seconds rest and in the third three weeks four sets of eight at 30cm height repetitions with 30 seconds rest; and in last week it was four sets of ten repetitions at 30cm bench height with 30 seconds rest.

The five kg of medicine ball was used for this exercise. Here also the same sets and same repetitions of the previous exercises were followed. The subject was asked to throw the medicine ball over back and it was collected by the helpers.

3.13 COMBINED TRAINING GROUP

The plyometric-skill training group performed a combination of the two training programmes as for the table IV given below (plyometric-skill training programme) but the volume and intensity of the work was reduced by 25 %(Adams,et al 1992).

Table IV

COMBINED TRAINING GROUP

Exercise	**First 3 Session**				**Second 3 Session**				**Third 3 Session**				**Fourth 3 Session**			
	Set	Rep.	Het.	Rest	Set	Rep.	Het.	Rest	Set	Rep.	Het.	Rest	Set	Rep.	Het.	Rest
Depth jump	2	4	30	30	3	4	40	30	3	6	45	30	4	6	60	30
Lateral hop	2	4	20	30	3	4	30	30	3	6	30	30	4	8	30	30
Huddle jump	2	4	30	30	3	6	30	30	3	7	30	30	4	8	40	30
Rim jump	3	4	-	30	3	6	-	30	4	7	-	30	4	9	-	30
Lateral hope	2	4	20	30	2	6	30	30	3	8	30	30	4	8	30	30
Over back toss	2	6	-	30	3	6	-	30	4	6	-	30	4	8	-	30

Toss and Service/ Attack	Five attempts Five attempts	Eight attempts Eight attempts	Ten attempts Ten attempts	Twelve attempts Twelve attempts
Service to the Partner Attack to the Partner	Five attempts Five attempts	Eight attempts Eight attempts	Ten attempts Ten attempts	Twelve attempts Twelve attempts
Base line service Cross Court attack	Five attempts Five attempts	Five attempts Five attempts	Five attempts Five attempts	Five attempts Five attempts
Dip and service Dip and attack	Four attempts Four attempts	Five attempts Five attempts	Eight attempts Eight attempts	Ten attempts Ten attempts
Block and service Block and attack	Four attempts Four attempts	Five attempts Five attempts	Eight attempts Eight attempts	Ten attempts Ten attempts

3.14 TEST ADMINISTRATION

3.14.1 VERTICAL JUMP TEST (EXPLOSIVE POWER)

Purpose

To measure the explosive power.

Equipments

A measuring tape and a smooth wall surface at least 12 feet from the floor are required.

Description

The subject stood with one side towards a wall heels together kept on the floor, he reached upward as high as possible and made a mark on the wall. The subject then jumped as high as possible and made another mark at the peak height of their jumped and arched.

Score

The score was the vertical distance between the reach and jump and reached marks recorded in centimeters

3.14.2 SIT UPS - (MUSCULAR STRENGTH)

Purpose

This test measures the muscular strength of the individual

Equipment required

floor mat or flat ground, stopwatch

Procedure

The aim of this test is to perform as many sit-ups as possible in one minute. To assess the muscular strength of the subjects this test was used. The subject was asked to lie down on back with knees bent at a 90-degree angle. Feet were up to 12 inches apart. Fingers must be interlocked behind head. Helpers hold the ankles of the subject with the hands only. On the command 'go,' the subject started the sit-up by raising upper body forward to the knee and touched the knee and lowered the body until the bottom of shoulder blades and the backs touch the ground. The subject was asked to perform the sit ups for one minute.

Scoring

The maximum numbers of correctly performed sit ups were recorded.

3.14.3 50 Meter Run (SPEED)

Purpose

To measure the speed

Facilities and Equipments

An area on a running track, a 50 meter and a finish line. Two stop watches.

Procedure

After a short warm up period the subject took a position behind the starting line. The starter used the command, ready? and Go. The latter was accompanied by a downward sweep of the arm as a signal to the timer. The subject ran across the finish line. One trial was permitted.

Score

The score is the elapsed time to the nearest one hundred of a second recorded from starting signal to the time the subject crossed the finish line. (Yobu, A. 1988).

3.14.4 Shuttle Run 4 x 10 meters (AGILITY)

Objective

To measure the agility of the subject

Apparatus used:

Stopwatch, measuring tape, 2 blocks of wood.

Procedure:

Two parallel lines were marked 10 meter apart as starting line and end line Two blocks were placed behind the end line at the time of start .The subject on the signal go , ran to the blocks , picked up one returned to the starting line and placed the block behind the line .He repeated the same process with second block .

Scoring:

The score for each performer was the time required to complete 60 meter and recorded to nearest one tenth of a second.

3.14.5 (VO2 max) Cooper 12 minutes run / walk test

Purpose

To measure the VO2 max

Equipment

Tread mill, stop watch

Procedure

The subject had a 10 to 15 minute warm up. The test had been conducted by running on a treadmill for 12 minutes, set to level 1 (1 percent) incline to mimic outdoor running. Participants ran for 12 minutes, and the total distance covered was recorded. The pace was adjusted in the treadmill for each individual, from 3 to 9 km per hour, according to their capacity. Walking was allowed, though the participants must be encouraged to push themselves as hard as they can. The assistant recorded the total distance covered to the nearest meters.

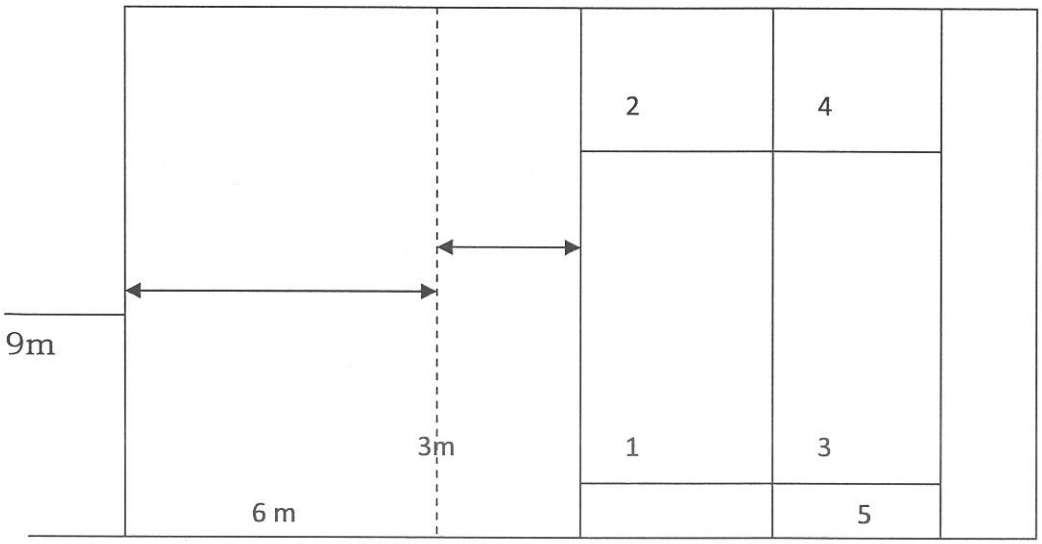
Scoring

The distance covered to nearest meters was calculated.

3.14.6 VOLLEY BALL SERVE (Russel – Lange Volleyball Test)

This test was found to be quite effective to finding out the serving and volleyball ability of the subjects.

FIGURE I



Serving Are 12½ 5

The court with special markings as shown in the Figure V was used to asses the serving ability of the subjects. And the numbers written indicate the value of the respective areas.

The players stood behind the end line in the serving area, and in given 10 serves he executed the service into the target across the net. All legal services were recorded.

Scoring System

The score was the point value as the spot on which the served ball land. A ball land on a line was scored the high values of the two areas. Serves in which foot fault occur were scored as zero marks. Two trials

were given before the test. Ten serving chances were given and the sum of the scores in the areas for the best trial was recorded. (Johnson and Nelson, 1973)

3.14.7 ATTACK HIT (Spiking)

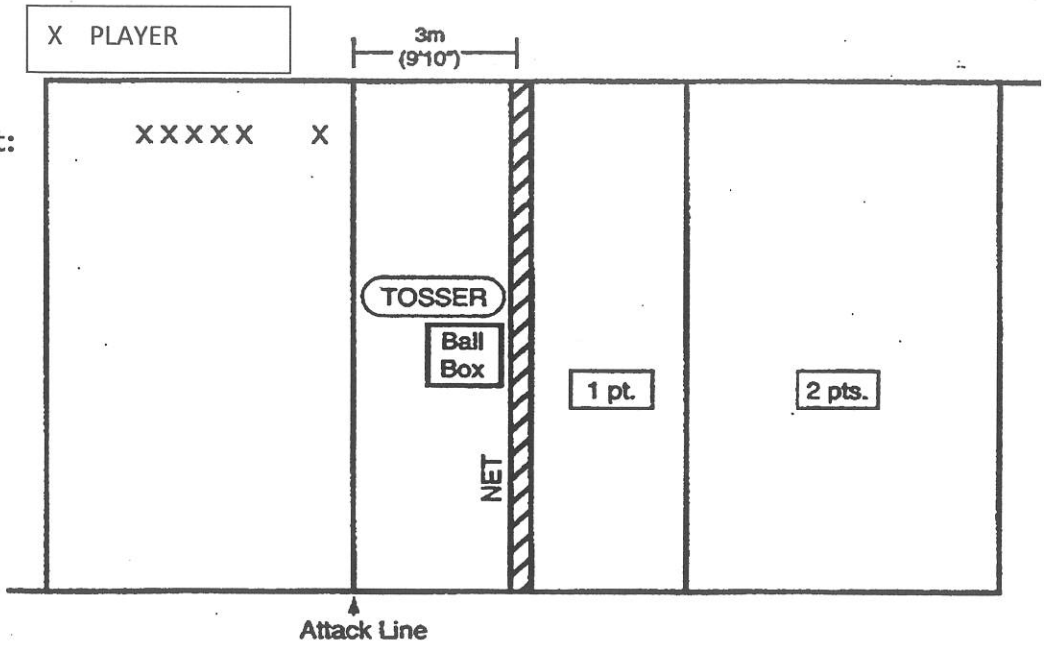
Purpose:

To measure the spiking ability of the subjects,

Field Marking

Use a regulation size court of 18m long and 9m wide, five volleyballs, net (2.43m standards, antennas, measuring tape, floor tape or chalk and ball box as shown in Figure.

Volleyball Test – Spike **FIGURE II**



Tosser will toss the ball in front of the player and 2m (6' 6 3/4") above the net. Tosses that were not at the proper height were repeated.

The player stood in the court 3.05-4.57m (10-15') off the net, made a spiking approach, and spikes the ball over the net and within the boundaries of the opponent's court. Each player was given 0 attempts.

Scoring:

Subject received two points for each spike that landed beyond the attack line in the backcourt and one point for each spike that landed between the net and the attack line within the opponent's front court. A tip (dink) or half-speed shot was not recorded as a spike. The subject's final score should be the total of all 10 attempts.

Staging:

Volunteers helped to administer the test and were not to interfere with any subject who was performing the test. Volunteer 1 would instruct the group doing this particular test while Volunteer 2 demonstrated the actual test. Volunteer 3would toss the volleyball to the subject who performed. Volunteers would retrieve the volleyballs after they landed and would roll them to a volunteer who was standing near the ball box. When the subject was finished, Volunteer 1 would give the score to Volunteer 4 who was the scorekeeper. Each volunteer was to administer the test and manage their area only.

3.15 STATISITICAL PROCEDURE

The following statistical procedures were followed to estimate the effect of isolated combined skill and plyometric training on selected

physical, physiological and skill performance variables among men volleyball players.

The pre and test scores were analysed by using ANCOVA statistical technique. When the F ratio was found to be significant, Scheffe's post hoc test was used to find out the paired mean significant difference. (Thirumalaisamy, 1998).