

## **Chapter III**

### **METHODOLOGY**

In this chapter, the selection of the subjects, selection of variables, selection of test, orientation to the subjects, reliability of the data, instrument reliability, tester's competency, subjects reliability, reliability of tests, pilot study, training programme, administration of the test, collection of the data, experimental design and statistical technique are described.

#### **3.1: SELECTION OF THE SUBJECTS**

The purpose of the study was to analyze the effect of isolated and combined Swiss ball and flexibility training on selected physical fitness, biochemical and skill performance variables among school volleyball players. To achieve the purpose of the study, forty male volleyball players studying various schools in Vellore district of Tamil Nadu, India, during the academic year 2012-2013 were selected as subjects and their age ranged from 16 to 18 years. The selected subjects were randomly assigned into four equal groups of 10 subjects each. Group-I underwent Swiss ball training, group-II performed flexibility training, group-III underwent combined Swiss ball and flexibility training and group-IV acted as control. The selected subjects were medically examined by a qualified physician and certified that they were medically and physically fit enough to undergo the training programme. The consent form for the proposed research study was collected from the participants.

## **3.2: SELECTION OF VARIABLES**

The researcher had gone through the available literature and had discussions with various experts and with his guide before selecting variables. The availability of technique for the purpose of analysis, feasibility, reliability of the procedure and the outcome were extensively taken care before finalizing the variables. The selected independent and dependent variables are as follows.

### **3.2.1: Independent Variables**

In recent years, fitness professionals have increasingly emphasized core stability exercises in sports conditioning programs. In the past, these types of exercises were performed only by individuals with low back problems in physical therapy clinics. However, core stability exercises are now commonly performed by healthy individuals in fitness and sports conditioning centers. Some fitness professionals claim exercises performed on unstable equipment are effective for enhancing sports performance. However, these authors have not cited research that supports their claims. Additionally, there is little information that validates the effectiveness of these exercises. The majority of studies demonstrating the effectiveness of resistance exercises for enhancing sports performance have used exercises performed on a stable surface. Hence, in this study the effectiveness of exercises performed on unstable equipment for enhancing sports performance was investigated.

Flexibility training has been used successfully by trainers and coaches to increase flexibility and possibly lower the incidence of injury. It is the job of the coach or trainer to pick the method they feel is best suited for the sport and athletes. The above evidence supports the fact that flexibility training is the best solution for performance enhancement. Muscle stretching combined with resistive exercises has been described as the best intervention to decrease or prevent loss of muscle mass, strength, mobility, balance, and flexibility. These exercises have also been shown to improve the performance even when performed in isolation. However, it still has not been determined whether resistive exercise combined with stretching exercise can lead to greater improvement in sports performance compared to resistive or stretching exercise alone. Based on the above concept, in this experimental study the following three experimental treatments were selected as independent variables, to assess the difference in its effectiveness.

1. Swiss ball training
2. Flexibility training
3. Combined Swiss ball and flexibility training

### **3.2.2: Dependent Variables**

Volleyball is an extremely explosive demanding sport. At an elite level, players are often required to perform at their limits of speed, agility, flexibility, endurance and strength. On top of all of this, players must maintain a high state of concentration in order to meet the tactical/mental demands of dealing with their opponents. The varied potential stresses of competitive play are considerable. It is

therefore essential that everyone involved with the modern game ought to be familiar with the fitness requirements of the game. The changing nature of game demands better skill and increased physical abilities. It is a known fact that players should be better in morphological measures, body composition, motor fitness components and physiological traits. The application of modern training methods will improve standards of game performance. In this context, the investigator made an attempt to investigate the effects of swiss ball training, flexibility training and its combination on selected dependent variables considered in this study.

The following physical fitness, biochemical and skill performance variables were selected as dependent variables for this study.

#### **3.2.2.1: Physical Fitness Components**

1. Speed
2. Muscular strength
3. Flexibility
4. Explosive power

#### **3.2.2.2 Biochemical Variables**

5. Triglycerides
6. HDL-Cholesterol
7. LDL-Cholesterol
8. Haemoglobin

#### **3.2.2.3: Skill Performance Variables**

9. Under arm pass
10. Over hand pass
11. Serving ability

### 3.3: SELECTION OF TESTS

The investigator analyzed various literatures, has consulted the experts in the field of physical education and selected the test items to collect data on the selected physical fitness, biochemical and skill performance variables, which are standardized and most suitable to this study, they are presented in table-3.1.

**Table: 3.1**  
**TESTS SELECTION**

S. No.	Variables	Test Items
1	Speed	50 meters
2	Muscular Strength	Bent knee sit ups
3	Flexibility	Sit and reach test
4	Explosive power	Jump and reach test
5	Triglycerides	GPO-PAP method
6	HDL-Cholesterol	Enzymatic chlorimetric method recommended by Burstein <i>et al.</i> , and Lopes <i>et al.</i>
7	LDL-Cholesterol	Method recommended by triedwald, levy and fredriclyon
8	Haemoglobin	Cyanmethemoglobin method
9	Under arm pass	Bready wall volley test
10	Over hand pass	Bready wall volley test
11	Serving ability	AAHPER Volleyball serve test

### 3.4: ORIENTATION TO THE SUBJECTS

The subjects were first explained about the procedure of the tests to be administered, and then the investigator demonstrated each test item. Each subject

was asked to take as many trials they wanted to familiarize themselves with the test items.

### **3.5: RELIABILITY OF THE DATA**

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

#### **3.5.1 Instrument Reliability**

The required instruments such as stop watch, measuring tap, sit and reach box, swiss ball and volleyball were availed from Vellore Institute of Technology University, (VIT), Vellore, Tamil Nadu, India. They were in good working condition. The instruments were purchased from the reliable and standardized companies. Their calibrations were tested and found to be accurate enough to serve the purpose of the study.

#### **3.5.2 Tester's competency**

The investigator collected the data with the assistance of physical education teachers from Vellore District. The investigator had a number of practice sessions in order to familiarize the correct testing procedure. The testers' reliability was established by test and re-test method. As very high correlation was obtained, the tester competency in taking measurement and test reliability were accepted.

#### **3.5.3 Subject Reliability**

The re-test scores indicated the subject reliability as the same subjects were used under different conditions by the tester.

### **3.5.4 Reliability of Tests**

The tester's competency for test administration was evolved with the reliability of tests. To determine the reliability of tests, test and retest method was followed. For this purpose ten subjects were selected at random and used for experimentation in this study. All the chosen criterion variables were tested twice for the same subjects under identical conditions at the interval of five days. As suggested by Johnson and Nelson (1988) Univariate correlation (*intra class correlation*) was calculated separately for each criterion variables. The obtained coefficient of correlation is presented in table-3.2.

**Table: 3.2**  
**INTRA CLASS CO-EFFICIENT OF CORRELATION**  
**ON SELECTED DEPENDENT VARIABLES**

S. No.	Dependent Variables	'R' Value
1	Speed	0.89*
2	Muscular Strength	0.88*
3	Flexibility	0.89*
4	Explosive power	0.90*
5	Triglycerides	0.92*
6	HDL-cholesterol	0.93*
7	LDL-cholesterol	0.91*
8	Haemoglobin	0.92*
9	Under arm pass	0.88*
10	Over hand pass	0.89*
11	Serving ability	0.86*

*\*Significant at 0.05 level of confidence.*

*(Table value require for significance at 0.05 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.

### **3.6: PILOT STUDY**

A pilot study was conducted to assess the initial capacity of the subjects in order to fix the load of exercise. For this, 12 volleyball players other than subjects were selected and divided into three groups and administered the three different experiments, namely swiss ball training, flexibility training and combined training to be undertaken. The intensity of the swissball training, flexibility training and



combined training were given to determine the maximum heart rate reserved method. The method consisted of calculating the work heart rate and target heart rate. The working heart rate (WHR) was difference between the maximal heart rate (MHR) and resting heart rate (RHR). The target heart rate (THR) was determined as the percentage of working heart rate (WHR), resting heart rate (RHR). Training packages were administered with utmost care of the researcher.

Based on the response of the subjects in the pilot study and during the training, the training schedules for group-I, group-II and group-III were constructed. The number of the repetition assigned to each subjects was tested and it was found that they were within the reach of the individual's capacity. While constructing the training programmes, the basic principles of sports training namely progression, over load and specificity were followed.

### **3.7: TRAINING PROGRAMME**

In this study, training was done under close supervision with frequent adjustments in training intensity to maintain the desired training stimulus. When appropriate, attempts were made to increase the training load using judgment of the exercise technique and perceived exertion. Training programme was administered to the volleyball players for twelve weeks. The experimental group-I performed Swiss ball training, group-II performed flexibility training, and group-III performed combined Swiss ball and flexibility training. The training

programme lasted for twelve weeks with three training units per week on alternate days. Group-IV was the control group they did not undergo any training.

The subjects of group-I performed 8 ball exercises. Group-II performed 8 flexibility exercises for the period of 12 weeks. Whereas, the subjects of group-III performed Swiss ball training (*8 Swiss ball exercises*) for the first six weeks and flexibility training (*8 stretching exercises*) for the remaining six weeks. The training programmes for the three experimental groups are presented in appendix-I, II and III.

The following Swiss ball exercises are performed by the subjects of experimental group-I.

**Supine pelvic raises:**

The subjects were asked to lie on back. Placed the soles of their feet on a Swiss ball, knees bent to 90 degrees, kept their arms by their sides on the ground, palms facing up. Pressing their feet into the ball, raise their hips off the ground until their body forms one line, from their shoulders to their knees. As they reached the top, clench their buttocks to accentuate the work of their gluteal muscles. Lowered to a few centimetres off the ground, then raised again for their next repetition.



### **Prone fly:**

The subjects were asked to lie face down on the ball with the ball under their stomach and feet on the ground. Started with the weights in front of the ball, hands facing each other. Brought their elbows back, keeping a slight bend in them, and squeeze from their shoulder blades. Slowly returned to the start position and repeated.



**Supine side rolls:**

The subjects were asked to sit on a Swiss ball, then walk forward so the ball moves up their back, finishing under their upper back. Took their arms out to the sides, palms up, and push their hips up until their torso is horizontal. Then roll sideways along the length of one arm, moved slowly and with control. Kept the rest of their body flat and did not sink towards the ground. Repeated on the other side.

**Prone ball rolls:**

The subjects were asked to start on their knees with their elbows resting on the Swiss ball. Brace their abdominals then roll the ball forward until their upper body and thighs form a straight line. Slowly roll back to starting position and repeated.



### **Incline push-ups:**

The subjects were asked to place their hands, fingers pointing out to the sides, about shoulder-width apart on a Swiss ball then stepped back so they are in an incline push-up position. Lowered their chest as close to the ball as they can until their chest touches the ball, then push back up.



**Swiss ball back extension:**

The subjects were asked to lie face down on the Swiss ball with their hands on the ground, ball positioned under their pelvis (*not stomach or chest*). Placed their feet against the wall with their hands crossed across chest or behind head, raised their shoulders and arch back until their spine is slightly extended. Paused at the top then slowly returned to starting position.



**Wall squats:**

The subjects were asked to stand with their back against a flat wall, then position the ball in between the middle of them and the wall. Kept their feet slightly in front of their shoulders hip-width apart, bend their knees until thighs are parallel to the ground then push back to starting position.



**Swiss ball dips:**

The subjects were asked to begin by sitting on the ball with their hands beside their hips. Stepped forward so their bottom is just in front of the ball and their feet are below their knees. When their body weight resting on their palms and heels, slowly bend their elbows until their upper arms are parallel to the floor then pushed back up using their triceps. Kept their bottom close to the ball during the whole exercise.

The subjects of experimental group-II performed the following stretching exercises.





**Shoulder and Triceps Stretch:**

The subjects were asked to stand tall, feet slightly wider than shoulder-width apart, knees slightly bent. Placed both hands above their head and then slide both of their hands down the middle of their spine in order to stretch the shoulders and the triceps.

**Side bends:**

The subjects were asked to stand tall with good posture, feet slightly wider than shoulder-width apart, knees slightly bent, hands resting on hips. Lifted their trunk up and away from their hips and bend smoothly first to one side, then the other, avoiding the tendency to lean either forwards or backwards. Repeated the whole sequence with a slow rhythm, breathing out as they bend to the side and in as they returned to the centre.



### **Hip and Thigh Stretch:**

The subjects were asked to stand tall with their feet approximately two shoulder widths apart. Turned the feet and face to the right, then bend the right leg so that the right thigh is parallel with the ground and the right lower leg was vertical. Gradually lowered the body and kept their back straight and use the arms to balance, so that they felt the stretch along the front of the left thigh and along the hamstrings of the right leg. Repeated by turning and facing to the left.



**Hamstring Stretch:**

The subjects were asked to sit on the ground with both legs straight out in front of them. Bend the left leg and placed the sole of the left foot alongside the knee of the right leg and allowed the left leg to lie relaxed on the ground. Bend forward keeping the back straight in order to stretch the hamstring of the right leg and repeated with the other leg.

**Groin Stretch:**

The subjects were asked to sit with tall posture. Ease both of their feet up towards their body and placed the soles of their feet together, allowing their knees to come up and out to the side. Rested their hands on their lower legs or ankles and ease both knees towards the ground to stretch the inside of their thighs and groin.