Chapter III

METHODS AND MATERIALS

This chapter illustrates the selection of subjects for the study, selection of variables for the experiment, selection of tests used for measuring the different variables, tester competency while assisting and collection of data for the study, reliability of instruments used for the data collection, reliability of data collected, orientation of the subjects about the experimental variables that they had to undergo, administration of tests, collection of post test data, experimental design employed in this study and statistical technique used for analyzing the data collected.

3.1 Selection of subjects

The present study was to compare and critically analyze the impact of resistance training, mental training and combined training on the selected motor fitness, psychological and volleyball playing skill related variables among men volleyball players of age between 19 and 24 years. To achieve this purpose, 120 male volleyball players were selected at random from among the players who had participated in some form of competitive volleyball representing Velammal engineering college, Chennai city who expressed their willingness to participate in the study. They were explained about their role in the study and they were requested to extend their best cooperation in making the purpose of the study meaningful and useful to other public at large. They were informed of the purpose of the study and that they had to be in the experiment for a period of 12 weeks and follow the guidelines of the scholar.

3.2 Selection of variables

The important components required of the volleyball players are strength, power, speed, endurance, flexibility, technique, coordination, recovery, mental preparation and diet. Hence, the scholar in his present study, decided to experiment the motor behaviour after a due consideration and experimentation.
The physical and psychological benefits of resistance training are well established. Resistance training exercises have been shown to raise the level of protective high-density lipoprotein, to improve physical fitness, and to reduce blood pressure among hypertensive. Exercises also seem to have positive psychological effects, which have been partially attributed to biochemical changes such as increased levels of endorphins and nor epinephrine. There is promising evidence that strength training and other forms of exercise in older adults preserve the ability to maintain independent living status and reduce the risk of falling sick. Physical activity appears to relieve symptoms of depression, anxiety and improve mood status.

The scholar identified serving, receiving, volleying, setting, spiking, and blocking as the most desirable skills of any volleyball player who play in a very competitive tournaments and matches. Every player should possess all the skills or most of the skills. For the present study, the researcher selected the three volleyball playing skills.

### 3.3 Dependent Variables

**Motor Variables**

1. Agility
2. Speed
3. Leg explosive power

**Psychological Variables**

1. Sports competition anxiety
2. Achievement motivation
3. Self confidence

**Volleyball playing skills**

1. Service skill
2. Volleying skill
3. Spiking skill

### 3.4 Independent Variables

#### 3.4.1 Resistance training group

All the members of this group started each resistance training session with a warm-up and ended with a cool-down. This warm-up was beneficial to their body because it got
it ready. Once they felt their body was okay to start, then they started at that moment. After they had properly warmed their body up and gone through three rounds of the routine, they were asked to cool-down. The cool-down did just what it implied. After putting their body through the stress of resistance training, it needed to slowly relax. This was the purpose for the cool-down. ([Warm-up and cool-down, n.d](#))

They were informed that their body needed to make a slow transition to a relaxed state and did some form of aerobic activity. This group consisted of 30 men volleyball players who performed a set of 7 resistance training exercises, three times daily for 45 minutes for 2 days (Mondays and Fridays) in a week under the supervision of the scholar in the school auditorium between 5 and 6 pm. The schedule is given below. The same group walked on sand track for 100 metres and ran back as fast as they can for 3 days (Tuesdays, Wednesdays and Thursdays) in a week. They were asked to take complete rest for two days. They also played volleyball with the other groups regularly. ([Creative Commons Exercise Images, n.d](#))

### 3.4.1.1 Bench Press

![Fig: 3.1 Bench Press](#)

Lie on a flat bench with your feet flat on the floor, keep your back flat on the bench. Grasp the bar a little wider than shoulder width apart. Raise the barbell above your body and move it over the middle of your chest, this is your starting position. Lower the bar down so it just touches your chest. Raise the bar till your arms are fully extended and your elbows are locked. Return to starting position
3.4.1.2 Seated Military Press

Sit on the bench with your toes pointing straight out, back straight and abs drawn in. Grip the bar with your palms facing outwards and your hands shoulder width apart. With bar in front of your head, press upwards extending your arms but not locking them. Pause at the top and then in a controlled movement lower the bar to the starting position.

Fig: 3.2 Seated Military Press

3.4.1.3 Push ups

Start with a basic push up, lay face down on the floor, or a mat; with your feet together curled slightly so you rise onto the ball of your feet. Place you hands shoulder width apart on the either side of your chest. Draw your abs in. Inhale as you raise your body up till your arms are straight. Keep your head and neck level with your body (don’t look up or down) and don’t allow your back to rise or fall. Exhale out as you lower your body back to the ground. Repeat.

Fig: 3.3 Figure 2. Push Ups
3.4.1.4 Chin-ups

Grasp the bar with an supinated (overhand) grip. Let your body hang from the bar with your arms straight. Slowly pull yourself up so that your chin is higher than the bar. With a controlled movement lower yourself to the starting position.

Fig: 3.4 Chin-ups

3.4.1.5 Barbell Front Raise and Pullover

Lie on a flat bench and grasp a barbell using a medium grip (about 15” apart). Place the barbell on your upper thighs and lock your arms straight with a slight bend in your
elbows. Draw your abs in and keeping your back flat on the bench, raise your arms up in an arc over and behind your head (as if you were performing a reverse pullover). Slowly return the barbell to the starting position on your thighs.

3.4.1.6 Barbell Squat

Lifting a barbell off of a weight rack, position it on your shoulders. Place your feet slightly wider than shoulder width apart with your knees and toes pointed slightly outward. Drawing your abs in descend slowly by bending at the knees and hips as if you are sitting down (squatting). Lower yourself as far as you can control without letting your body shift towards your toes (this will cause you to lose balance). Pause in the downward position and slowly return upright to the starting position.

3.4.1.7 Flat bench leg raise

Lie on a flat bench with your hands under your hips supporting your back. Your legs should be unsupported by the bench from below your knees. With your feet together and your toes flexed upwards, raise your straight legs up a few cm off the bench; both of your legs should have no contact with the bench. This is your starting position. Keep your legs straight with a slight bend in the knees and raise your legs to just before 90 degrees with your hips. Pause at the top and lower your legs in slow controlled manner back to the starting position. Repeat
3.4.2 Mental training group

Sports psychology is a broad term used to describe the division of psychology related to the study of sport and exercise. Mental training is a more specific term used to describe the mental techniques necessary for consistent high performance. Mental training for athletes often includes goal setting, visualization, mental imagery, self-talk retraining, mind control training, emotion control and in general, ways to establish true ideal thoughts, images and emotions to enhance sports performance.

Performance anxiety is perhaps the most common problem experienced by athletes. The athlete feels anxiety as the competition is approaching, or during specific times during the competition, that produces mistakes and errors in judgment. Mental skills have been developed specifically for this condition. Calm, confident and carefree are words used by athletes to describe how it feels during periods of high performance. The ‘zone’ is the opposite of performance anxiety and can be controlled by any athlete who has the discipline to learn and practice mental skills. (Mental training, n.d.)

A brief list of the nine mental skills is discussed daily with the group members by the psychological counsellor and the coach. They were given the important nine qualities of the successful players and stressed to possess them. They are given below:
1. Choose and maintain a positive attitude.
3. Set high, realistic goals.
4. Deal effectively with people.
5. Use positive self-talk.
6. Use positive mental imagery.
7. Manage anxiety effectively.
8. Manage their emotions effectively.

Care was taken to train the group with the Mental Skills and to insist that these nine mental skills are necessary for performing well in sport as well as in non-sport performance situations. At the psychological training sessions,

- It was believed that these skills were learned and can be improved through instruction and practice.
- The work was begun with each individual by assessing his current proficiency in each of the skills.
- A plan was developed for teaching and enhancing the specific skills that needed improvement for the individual.
- The member’s proficiency was periodically reassessed in each of the skills in order to evaluate the progress.

The group was taught about the Performance Pyramid daily. Although each of the nine skills is important, its primary importance will occur during one of three phases: long-term development, immediate preparation for performance, and during performance itself.

Level I - These mental skills constitute a broad base for attaining long-term goals, learning, and sustaining daily practice. They are needed on a day-by-day basis for long periods of time, often months and years.

Level II - These skills are used immediately before performance to prepare for performance. They may be used just before competition begins, or immediately before a specific performance action, such as a golf shot or a free throw in basketball.
Level III - These skills are used during actual performance behavior.

The pyramid below represents the relationship of the nine skills to one another. Each of the higher levels incorporates and is based upon the skills of the preceding levels.

Out of all the nine components given under psychological skills, main concentration was given to the anxiety, motivation and self confidence since they were the variables under study. Also they were considered by the scholar that they decide the performance of the players.

To deal effectively with anxiety, it was time and again impressed up on the members of the experimental group that the qualities of the successful athletes would accept anxiety as part of sport, realize that some degree of anxiety can help them perform well and know how to reduce anxiety when it becomes too strong, without losing their intensity.

To deal effectively with motivation, it was impressed up on the experimental group that the successful players are aware of the rewards and benefits that they expect to experience through their sports participation, are able to persist through difficult tasks and difficult times, even when these rewards and benefits are not immediately forthcoming and realize that many of the benefits come from their participation, not the outcome.
To make an impact on self-confidence, the group was taught that the successful athletes maintain their self-confidence during difficult times with realistic, positive self-talk. Talk to themselves the way they would talk to their own best friend, use self-talk to regulate thoughts and feelings and behaviors during competition. (*Mental skills, n.d.*)

Also, every day before the closure of the mental training session, video displays of best play-offs in volleyball matches of national and international matches were shown to the members to give them the positive ideas of the competitions.

This programme of mental training was given for five days a week from Monday through Friday for 12 weeks. This group was involved in the daily practice sessions with the other groups as usual. No special training on volleyball was given to any of the groups.

### 3.4.3 Combined training group

The combined training group was having the following weekly schedule:

- **Monday:** Weight training for 1 hour with resistance training group
- **Tuesday:** Mental Training session with mental training group
- **Wednesday:** Sand running programme for 1 hour with the resistance training group
- **Thursday:** Mental Training session with mental training group
- **Friday:** Weight training for 1 hour with resistance training group

This schedule was followed for 12 weeks and the group also played volleyball with the other groups regularly.

### 3.4.4 Control group

The control group with 30 members was instructed that they should not indulge in any type of organized physical training programmes or some other types of psychological counselling. But they were allowed to play usual volleyball practice sessions with the other group members.
From the available literature, the following standardized tests were selected and used to collect relevant data pertaining to the selected dependent variables and are presented in Table 3.1.

### Table 3.1 Selection of tests

<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>Agility</td>
<td>Boomerang Run (Right) test</td>
<td>Seconds</td>
</tr>
<tr>
<td>2</td>
<td>Speed</td>
<td>50 metres run</td>
<td>Seconds</td>
</tr>
<tr>
<td>3</td>
<td>Leg explosive power</td>
<td>Standing Broad Jump</td>
<td>Centimetres</td>
</tr>
<tr>
<td>4</td>
<td>Sports competition Anxiety test</td>
<td>SCAT Questionnaire</td>
<td>Score</td>
</tr>
<tr>
<td>5</td>
<td>Achievement motivation</td>
<td>Achievement motivation scale</td>
<td>Score</td>
</tr>
<tr>
<td>6</td>
<td>Self confidence</td>
<td>Self Confidence Questionnaire</td>
<td>Score</td>
</tr>
<tr>
<td>7</td>
<td>Volleyball service skill</td>
<td>Scott and Esther French’s Service Placement Test</td>
<td>Score</td>
</tr>
<tr>
<td>8</td>
<td>Volleyball volleying skill</td>
<td>Brady’s Wall volley test</td>
<td>Score</td>
</tr>
<tr>
<td>9</td>
<td>Volleyball spiking skill</td>
<td>Standing spike test</td>
<td>Score</td>
</tr>
</tbody>
</table>

3.5 Tester Competency

The investigator took all the measurements in this study with the assistance of his colleagues and experts working with the scholar. To ensure that the investigator was well versed with the technique of conducting tests, he had a number of practice sessions by using the correct testing procedure. The tester's reliability was established by test and re-test method.

3.6 Reliability of Instruments

The stopwatch and Standing Broad Jump Mattress with measurements marked on it were purchased from reliable and branded companies and are considered to be accurate enough. The Blood tests were made with the help of a famous and reliable laboratory for measuring, low density lipoprotein, high density lipoprotein and random blood sugar. The resting pulse rate was done by the scholar himself through the radial artery for 15 seconds and the data was multiplied by 4 for getting pulse rate per minute. The systolic blood pressure was measured by a qualified physician.

3.7 Reliability of Data

Test and retest method was used in order to establish the reliability of data by using ten subjects at random. The same personnel under similar conditions tested all the selected
dependent variables twice for all 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.2.

Table: 3.2 Intra Class Co-Efficient Of Correlation
On Selected Variables

<table>
<thead>
<tr>
<th>S.No</th>
<th>Variables</th>
<th>Intra-class R Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Agility</td>
<td>0.95*</td>
</tr>
<tr>
<td>2</td>
<td>Speed</td>
<td>0.96</td>
</tr>
<tr>
<td>3</td>
<td>Leg explosive power</td>
<td>0.92*</td>
</tr>
<tr>
<td>4</td>
<td>Sports competition Anxiety test</td>
<td>0.97*</td>
</tr>
<tr>
<td>5</td>
<td>Achievement motivation</td>
<td>9.90*</td>
</tr>
<tr>
<td>6</td>
<td>Self confidence</td>
<td>0.95</td>
</tr>
<tr>
<td>7</td>
<td>Volleyball service skill</td>
<td>0.96*</td>
</tr>
<tr>
<td>8</td>
<td>Volleyball volleying skill</td>
<td>0.93*</td>
</tr>
<tr>
<td>9</td>
<td>Volleyball spiking skill</td>
<td>0.90*</td>
</tr>
</tbody>
</table>

*Significant at 0.01 level of confidence.

Since the table value required for significance at 0.01 level of confidence was 0.77. Since the obtained 'R' values are higher than the required value, the data were accepted as reliable in terms of instrument, tester and the subjects.

3.8 Orientation of the subjects

The investigator explained the purpose of the study to the subjects and their role in the study. For the collection of data, the investigator explained the procedure of testing the selected dependent variables and gave instructions about the procedure to be adopted by them for measuring. The subjects of all the groups were sufficiently motivated to perform their maximum level during the testing periods.

3.9 Administration of Tests

Agility was measured using Boomerang Run (Right) test by marking with plastic cones as prescribed in the basketball mud court for all the subjects. The same procedure was performed once before the experiment and next after 10 weeks after the experiment.

3.9.1 Boomerang Run Test

By using the Boomerang Run (Right) test, the Agility of all the members was measured and recorded in seconds. Participants ran in the direction indicated by arrows. The orange circles are the cones with the cone numbers showing the order of running from the center.
station after completing right quarter turns, beginning from “Start” and finishing at “End.” (Boomerang Run n.d).

Fig: 3.9 Boomerang Run (Right)

3.9.2 Speed Test

50 Meter Dash

Sprint or speed tests could be performed over varying distances, depending on the factors being tested and the relevance to the sport. The 50 Meter Sprint was part of the International Physical Fitness Test, and their protocol was listed here.

- **purpose:** The aim of this test was to determine acceleration and speed.

- **equipment required:** measuring tape or marked track, stopwatch, cone markers, flat and clear surface of at least 70 meters.

- **procedure:** The test involved running a single maximum sprint over 50 meters, with the time recorded. A thorough warm up was given, including some practice starts and accelerations. The subjects started from a stationary standing position (hands cannot touch the ground), with one foot in front of the other. The front foot was behind the starting line. Once the subject was ready and motionless, the starter gave the instructions "set" then "go." The tester provided hints for maximizing
speed (such as keeping low, driving hard with the arms and legs) and the participant was encouraged to not slow down before crossing the finish line. The time taken to cross 50 metres was recorded in seconds to the nearest 1 decimal place as the score of speed test. (50 meter dash, n.d.)

3.9.3 Standing Broad Jump

The leg explosive power was measured by using the marked standing broad jump mattress inside the school auditorium for all the 120 subjects. The same procedure was performed once before the experiment and next after 10 weeks after the experiment. (Standing Broad Jump test n.d).

The subject stood in one spot, and used her muscles to jump really far without any kind of lead-in. This test required concentration and focus. The distance jumped from the base line on the mat to the heel of the landing was measured as the performance. Three trials were given to the subjects and the best of the three trials were noted as the score of Leg Explosive power in centimeters.

Fig: 3.10 Standing Broad Jump

3.9.4 Sports competition anxiety test (SCAT)

Objective: To find out the amount of anxiety.

Equipment and Materials: Anxiety was assessed through the Sports Competition Anxiety Test questionnaire. (SCAT)
Procedure

Sports Competition Anxiety Test questionnaire (SCAT) prepared by Rainer Martens has been widely used for measuring anxiety related to sports situation in most of the advanced countries. The test was reliable and valid and designed to measure the degree of anxiety prior to the competition. The SCAT questionnaire was administered to all the subjects. Each subject was asked to answer all the 15 items of the tests and was instructed to express the choice most honestly. The SCAT has fifteen items out of which five are spurious questions, which have been added to the questionnaire to diminish biased responses. The subjects were instructed to respond to each item according to how they generally feel in competitive sports situations.

Every statement had three possible responses as mentioned below.

a. Hardly ever
b. Sometimes
c. Often

The ten test items, which were taken for scoring purpose, are 2, 3, 5, 6, 8, 9, 11, 12, 14 and 15. The remaining items were spurious items, which were not taken for scoring purpose are 1, 4, 7, 10 and 13. The scholar scrutinized the completed questionnaires in order to ensure that the subject had responded to every item and there was no question left unanswered. The items 2,3,5,8,9,12,14 and 15 were evaluated in a uniform manner using the following key.

**Response Score**

- Hardly ever = 1
- Sometimes = 2
- Often = 3

In case of items 6,11 scoring was carried out using the following key.

**Response Score**

- Often = 1
- Sometimes = 2
- Hardly ever = 3
However, spurious question i.e. 1, 4, 7, 10 and 13 were not scored out as suggested by Rainer Martens. Scores obtained by each subject on each statement was added up and that represented one’s total score on sports competition anxiety. There was no right or wrong answers. The subjects were not allowed to spend too much time on any statement. The subjects were asked to choose the word that described the best opinion that they usually feel while participating in sports and games. (Johnson and Nelson 1982)

### 3.9.5 Achievement motivation test

To test the achievement motivation, a scale with 22 questions was given to all the subjects. They were asked to read each statement and answer True or False to indicate if that statement generally described them. Based on their responses, each subject was assessed about their motivation level. Lower the score they got, better their achievement motivation was. (Safrit and Wood 1995)

**Interpretation***

- 22-20: High need for achievement.
- 19-17: Moderate need for achievement.
- 16-10: Average need for achievement.
- 9-6: Moderately low need for achievement.
- < 5: Low need for achievement.

### 3.9.6 Self confidence test

Self confidence with Agnihotry’s,1987, Self Confidence Inventory (ASCI) developed by Rekha Agnihotry was used to measure self confidence. The ASCI questionnaire was given to all the subjects to measure self confidence. All the items were adopted for this investigation. The inventory was scored by hand. One point was awarded for a response indicative of lack of self confidence, which is for making cross (X) to wrong response to item numbers 2,7,23,31,40,41,43,44,45,53,54,55 and for marking cross (X) to right response to the rest of the items. The lower the score, the higher would be the level of self confidence and vice versa. (Safrit and Wood 1995)
3.9.7 Volleyball service skill test

Scott and Esther French’s service placement test was administered for the three groups.

**Objective:** To measure the serving ability with which a player could serve a ball against the target areas

**Equipment and Methods:** Three volleyballs. Net, measuring tape, chalk powder, scoring sheet and a standard volleyball court.

**Directions:** After a 10 minute warm up period, the subject was standing behind the end line in the service area with a volleyball and serve into the marked court over the net as shown in figure. The ball should be hit or bat over the net fulfilling the service rules. The foot fault and the ball served out of the target area were scored as zero.

**Scoring:** The score was in point value of the target area into which the ball was served. Each member was given three trials consisting of 10 services. The test score was the sum of scores of the best of the three trials served by each individual. (Scott and French 1959)

![Volleyball Placement Test Diagram](image)

*Fig: 3.11 Volleyball placement test*
3.9.8 Volleyball volleying skill test

Brumbach forearm (underarm) pass wall volley test was used to measure the volleying skill.

**Objective:**

This test was to measure the ability and speed with which a player could volley (underarm) volleyball against a wall.

**Equipment and materials:**

A solid wall with a height of 1.5 to 3 metres height and a line with 1 inch thickness was marked parallel to the ground at a height of 2.44 meters (8 feet) above the floor level. A stop watch, scoring sheet, 3 volleyballs were required for the test.

**Directions:** The player with volleyball in hand stood ready facing the wall and on signal ‘go’, the ball was tossed against the wall into the area marked above 2.44 metres line. On the rebound, the ball was again volleyed by underarm into the wall above the line drawn at the height of 2.44 metres from the floor as shown in the figure.

![Diagram of Brumbach forearm (underarm) pass wall volley test](image)

**Fig: 3.12 Brumbach forearm (underarm) pass wall volley test**
Scoring: The total number of legal volleys executed with in sixty seconds was recorded as the score. Each subject was allowed three trials and the best of the three trials were recorded as the score. With in 1 minute, if the rally is broken, the subject could collect the ball and start volleying. If the ball hits below the target line, then that was not counted as a legal volley. (Bosco and Gustafson, 1983).

3.9.9 Volleyball spiking skill test

Method: A target 2 m high and 1 m wide was placed on a wall 7 m from the player. The target was divided into five 20-cm segments. A coach positioned approximately 5 m from the spiking player threw an overhead pass to the player. Players were required to make a spike approach and spike (hit) the ball toward the target.

Scoring: If players were able to hit the middle 20-cm segment, they were awarded 5 points. For successfully hitting the two 20-cm segments on either side of the middle segment 3 points were awarded. Hitting the 2 outer 20-cm segments of the target they were awarded 1 point. If players successfully hit the target between the 3-point and 5-point segments Score 4 points were awarded. If players successfully hit the target between the 1-point and 3-point segments 2 points were awarded The aggregate from 6 trials was recorded as a player’s accuracy score. (Gabbett and Georgieff, 2006)
3.10 Experimental Design and Statistical Technique

The data were collected from the Resistance training, Mental training, the Combined and the Control groups on selected motor, psychological and volleyball playing skills variables among men volleyball players of age groups between 19 and 24 years. The experimental design for the study was static group comparison design. Analysis of covariance ANCOVA (Analysis of covariance n.d) was used to find out the difference among the Resistance training, Mental training, the Combined and the Control groups on selected motor, psychological and volleyball playing skills variables. If the obtained F-ratio was significant, the Scheffe's test was used as a post-hoc test to find out the significant difference between each variable. In all the cases, 0.05 level of significance was used to test the hypotheses. (Clarke & Clarke, 1972).