Chapter III

METHODOLOGY

This chapter described the selection of subjects, selection of variables, selection of tests, procedure of scoring the questionnaire, tester competency, reliability of instruments, reliability of data, orientation to the subjects, collection of data, administration of tests and inventory, and experimental design and statistical technique for analyzing the data.

Selection of Subjects

The study under investigation was intended to identify the factors influencing the playing ability of university women basketball players from selected physical, physiological, anthropometrical, psychological and performance variables.

To achieve the purpose of the study, two hundred women university basketball players were selected randomly from various universities who participated in the South Zone Inter University Basketball Tournament during the academic year 2009-2010. The age of the subjects ranged from 18 to 25 years.

Selection of Variables

Players who are going to win medals at any standard are neither simply born nor made. Natural ability is no longer enough at any level but is, in sprinting especially, an essential basis upon which the carefully nurtured product is molded.
Strangely enough, natural talent is very readily recognized, but the "stuff" which goes to make up the talent is most difficult to analyse.

In all sports, speed, strength, agility, endurance and power are important qualities. Generally it requires developing performance in sports and games. Power is a magic work in sports. The person who can run faster, throw harder and more quickly is likely to be a better athlete and win more contests. Power is an essential quality in many sports, for it represents the effective combination of strength and agility. Increase in strength or speed will increase power, and when power increases, more work can be done in less time.

Physiological parameters are one of the most important factors that determine the performance level of an individual. Sports performance depends largely on physical fitness factors and the psychological status of the players. Sports activity is a physical activity which is not possible without these abilities. Fitness factors are most important for predicting performance of the players along with physiological parameters. Natural ability is the promise of potential but fundamentals are the foundations of excellence.

Anthropometrical measurements have been a part of physical education since its inception in this country. The earliest research was in the area of anthropometry with the emphasis on changes in muscle size brought about though exercises. The modern physical education is often assigned the task of measuring the height, length and weight of students. It is indeed true that growth does not constitute a valid criterion up on which a student is graded. However height,
length, weight and certain anthropometrical measures, used in conjunction with other pertinent data do present potentially valuable information.

Through intensive study of literature of sport and on the basis of the experience oriented observation and a number of factors affecting sports performance were identified. Some of these factors were found to be intrinsic while some extrinsic. The intrinsic factors were found to be internal whereas that of the extrinsic factors was found to be external. Internal factors are related to the player's own "interest, will, ability, inherited or acquired qualities" through genetics and environment while external factors are related to socio-cultural mile in which the players operates.

The present study has taken into consideration a court game that is basketball. Court games are unique in the sense that they are played in a relatively small area and involve the handling of a ball or similar object and often an implement. It requires a high degree of running, maneuverability and total body agility in order to gain good court position and compete with one’s opponent on both offensive and defensive maneuvers. Fast starting, stopping, dodging, darting and acceleration are the fundamental requirements to a good court play. Since court games often involve condition bouts of play at a vigorous rate, a high level of anaerobic endurance and also good jumping ability is of great importance.

Anthropometrical, physical, physiological and psychological parameters are the ideal indicators of sports performance status of an individual. Anthropometrical, physical variables, motor fitness, psychological and physiological parameters play an important role in almost all games and sports. Hence, the following variables were selected for this study.
Performance Variables

Passing
Shooting
Dribbling
Playing Ability

Physical Variables

Speed
Grip Strength
Agility
Leg Explosive Power

Physiological Variables

Resting Pulse Rate
Breath Holding Time

Psychological Variables

State Anxiety
Self-confidence
Achievement Motivation
Aggression

Anthropometrical Variables

Height
Weight
Arm Length
Leg Length
Selection of Tests

The present study was undertaken primarily to identify the factors influencing the playing ability of university women basketball players from selected physical, physiological, anthropometrical, psychological and performance variables. As per the available literatures, the following standardized tests were used to collect relevant data on the selected dependent variables and they were presented in the Table I.
<table>
<thead>
<tr>
<th>S. No</th>
<th>Criterion Variables</th>
<th>Test items</th>
<th>Unit of Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Speed</td>
<td>50 M Run</td>
<td>In seconds</td>
</tr>
<tr>
<td>2</td>
<td>Grip Strength</td>
<td>Grip Dynamometer</td>
<td>In kilograms</td>
</tr>
<tr>
<td>3</td>
<td>Agility</td>
<td>Shuttle Run</td>
<td>In seconds</td>
</tr>
<tr>
<td>4</td>
<td>Leg Explosive Power</td>
<td>Vertical Jump</td>
<td>In centimeters</td>
</tr>
<tr>
<td>5</td>
<td>Resting Pulse Rate</td>
<td>Radial Pulse Method</td>
<td>In beats per minute</td>
</tr>
<tr>
<td>6</td>
<td>Breath Holding Time</td>
<td>Manual Nostril Clip Method</td>
<td>In seconds</td>
</tr>
<tr>
<td>7</td>
<td>State Anxiety</td>
<td>State Anxiety Inventory</td>
<td>In numbers</td>
</tr>
<tr>
<td>8</td>
<td>Self-confidence</td>
<td>SCAT Questionnaire</td>
<td>In numbers</td>
</tr>
<tr>
<td>9</td>
<td>Achievement Motivation</td>
<td>SAMT Questionnaire</td>
<td>In numbers</td>
</tr>
<tr>
<td>10</td>
<td>Aggression</td>
<td>Smith’s Aggressive Questionnaire</td>
<td>In numbers</td>
</tr>
<tr>
<td>11</td>
<td>Height</td>
<td>Stadiometer</td>
<td>In metres</td>
</tr>
<tr>
<td>12</td>
<td>Weight</td>
<td>Weighing Machine</td>
<td>In kilograms</td>
</tr>
<tr>
<td>13</td>
<td>Arm Length</td>
<td>Measuring Tape</td>
<td>In centimeters</td>
</tr>
<tr>
<td>14</td>
<td>Leg Length</td>
<td>Measuring Tape</td>
<td>In centimeters</td>
</tr>
<tr>
<td>15</td>
<td>Passing</td>
<td>AAHPERD Basketball Skill Test</td>
<td>In numbers</td>
</tr>
<tr>
<td>16</td>
<td>Shooting</td>
<td>AAHPERD Basketball Skill Test</td>
<td>In numbers</td>
</tr>
<tr>
<td>17</td>
<td>Dribbling</td>
<td>AAHPERD Basketball Skill Test</td>
<td>In Seconds</td>
</tr>
<tr>
<td>18</td>
<td>Playing Ability</td>
<td>Judges rating</td>
<td>In Numbers</td>
</tr>
</tbody>
</table>
Competency of the Tester

The investigator took all the measurements in this study with the assistance of coaches/Managers of concerned university. To ensure that the investigator was well versed with the technique of conducting tests, they had a number of practice sessions in the correct testing procedure. The tester's reliability was established by test and re-test method.

Instruments Reliability

The weighing machine, stadiometer, stopwatches, measuring tape, vertical jump board, grip dynamometer and basketball used in this study were availed from the Dept. of Physical Education and Sports, Avinasilingam University for Women, Coimbatore, TamilNadu. The instruments were purchased from reliable and standardized companies and were considered accurate enough for the purpose of the study.

Reliability of the Data

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

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

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Variables</th>
<th>'R' Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Speed</td>
<td>0.87*</td>
</tr>
<tr>
<td>2</td>
<td>Grip Strength</td>
<td>0.89*</td>
</tr>
<tr>
<td>3</td>
<td>Agility</td>
<td>0.85*</td>
</tr>
<tr>
<td>4</td>
<td>Leg Explosive Power</td>
<td>0.86*</td>
</tr>
<tr>
<td>5</td>
<td>Resting Pulse Rate</td>
<td>0.95*</td>
</tr>
<tr>
<td>6</td>
<td>Breath Holding Time</td>
<td>0.96*</td>
</tr>
<tr>
<td>7</td>
<td>State Anxiety</td>
<td>0.96*</td>
</tr>
<tr>
<td>8</td>
<td>Self-confidence</td>
<td>0.94*</td>
</tr>
<tr>
<td>9</td>
<td>Achievement Motivation</td>
<td>0.95*</td>
</tr>
<tr>
<td>10</td>
<td>Aggression</td>
<td>0.92*</td>
</tr>
<tr>
<td>11</td>
<td>Height</td>
<td>0.98*</td>
</tr>
<tr>
<td>12</td>
<td>Weight</td>
<td>0.97*</td>
</tr>
<tr>
<td>13</td>
<td>Arm Length</td>
<td>0.99*</td>
</tr>
<tr>
<td>14</td>
<td>Leg Length</td>
<td>0.99*</td>
</tr>
<tr>
<td>15</td>
<td>Passing</td>
<td>0.89*</td>
</tr>
<tr>
<td>16</td>
<td>Shooting</td>
<td>0.88*</td>
</tr>
<tr>
<td>17</td>
<td>Dribbling</td>
<td>0.86*</td>
</tr>
<tr>
<td>18</td>
<td>Playing Ability</td>
<td>0.89*</td>
</tr>
</tbody>
</table>

*Significant at 0.01 level of confidence. (Table value required for significance at 0.01 level of confidence is 0.77).
Since the obtained 'R' values were much higher than the required value, the data were accepted as reliable in terms of instrument, tester and the subjects.

**Orientations to the Subjects**

The investigator explained the purpose of the study 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 instructions about the procedure to be adopted by them for measuring. The subjects of all the groups were sufficiently motivated to perform their maximal level during testing periods.

**Validity of the Questionnaires**

Many researchers have used these questionnaires for research. The questionnaire used by them were State Anxiety Inventory, Smith’s Aggressive Questionnaire, Sports Competition Anxiety Test (SCAT) and Sports Achievement Motivation Test (SMAT). There can be no better evidence to prove the validity of the questionnaire than this.

**Procedure of Scoring**

**State Anxiety Inventory (SAI)**

The inventory consists of 20 statements about the subjects of each item, the subject has to select and tick in one of the four columns following: ‘almost never’, ‘sometimes’, ‘often’ and ‘almost always’.

The scores for each item were assigned based upon the items 2,5,8,10,11,15,16,19 and 20 are Almost never-4, Sometimes-3, Often-2 and
Almost always-1 respectively. Rest of the items scoring is to be done in the opposite way.

**Competitive State Anxiety Inventory (CSAI)**

The tool was constructed to find the level of cognitive anxiety, somatic anxiety and self confidence. The inventory consists of 27 statements about the subjects feeling. The response sheet is scored in accordance with the response intensity key. Three sets of responses are summated separately. The self confidence was scored by the response of 3, 6, 9, 12, 18, 21, 24 and 27 numbered questions. In each case to summated scores are obtained. Response loading was done of feeling as mentioned below as

- Not at all - 1
- Some what - 2
- Moderately so - 3
- Very much - 4

Player performance during the game was subjectively rated by three experts on a ten points scale. The average of the three experts rating was taken as a score.

**Sports Achievement Motivation Test (SAMT)**

In the SAMT questionnaire there are twenty test items. Among them, for questions 1, 3, 4, 9, 10, 11, 12, 13, 15, 16, 17 and 20, the expected answer is 'a'. For the questions 2, 5, 6, 7, 8, 14, 18 and 19 the expected answer is 'b'. For correct statement 2 marks and for incorrect zero mark are awarded.
Aggression

Standardized Smith's questionnaire for sporting aggression was used to scale the aggressiveness. The test consists of four questions with five levels of responses. The level changes from strongly disagree to strongly agree. The respondents were made to encircle the approximate number, which suited their attitude.

The inventory was scored with the help of the scoring key given below. The range of score was from 4 to 20. The higher the score, the more aggressive the player is.

<table>
<thead>
<tr>
<th>Response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>1</td>
</tr>
<tr>
<td>Disagree</td>
<td>2</td>
</tr>
<tr>
<td>Undecided</td>
<td>3</td>
</tr>
<tr>
<td>Agree</td>
<td>4</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>5</td>
</tr>
</tbody>
</table>

Collection of Data

The investigator administered the questionnaire and other tests to measure the criterion variables to 200 women participants. The investigator collected the data from the subjects before their matches during their rest time. The purpose of the study was clearly mentioned. The investigator explained the subjects about the uses of the question and meaning of each questions and how to fill the questionnaire. Care was taken to see that the subjects answered the entire questions. The filled up questionnaires from respondents were collected after
checking all the items were responded and using the scoring key the total scores obtained by each subjects were tabulated.

**Administration of Tests**

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

**Purpose**

The purpose of the test was to measure the speed of an individual.

**Equipments**

Stopwatch, chunnam, Scorecard

**Procedure**

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 subjects ran across the finish line. The standing start method was adopted for this purpose. The stopwatch is started on the command “Go” and stopped when the runner crosses the finish line.

**Scoring**

The score was the elapsed time to the nearest one tenth of a second between the starting signal and the instant the subject crossed the finished line. The fractions were rounded to the next largest one tenth of a second. One trial was permitted.
2. Grip Strength

Purpose

The purpose of this test is to measure the maximum isometric strength of the hand and forearm muscles.

Equipment required

Hand grip dynamometer, pen, pencil and pad.

Procedure

A grip dynamometer is used to measure grip strength, both right and left hands being tested. Place the concave edge of the manometer between the first and second joints of the fingers with the dial toward the form. The subject is allowed any movement while squeezing her instrument, provided the subject does not hit any object with her fist. The most common movement is the upper cut.

Scoring

The right grip is tested first and then the left scores should be read to the nearest pound. The indicator should be returned to zero after each test. The total of right and left hand were taken as a score.

3. Agility (Shuttle Run)

Purpose

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

Marking tape, stop watch and two blocks of wood (2”x2”x 4”)

Procedure

The performer start behind the starting line on the signal "go" and runs to the blocks, pick up one, return to the starting line, and places block behind the line; She then repeats the process with the second block allow some rest between the two trails. Total distance covered in one repetition was 40 yards.

Scoring

The score for each performer is the length of time require (to the nearest tenth of second) to complete the course record only the best trial.

4. Explosive Power (Vertical Jump Test)

Purpose

The purpose of the vertical jump that was to measure the ability to exert maximum energy in one explosive act projecting the body through space

Equipments

The Sargent Jump Board, Chalk, Tape and Rope.

Procedure

The subject was asked to stand next to the concrete pillar with heels together on the floor and the side her dominant hand holding a piece of chalk. The sargent board was fixed at the concrete pillar with 2 mts height. From this
position the subject reached upward as high as possible and mark on the board. To execute the jump, the subject was asked to squat next to the board and jump as high as possible and make a mark on the board. Once in the starting position, the subject was not allowed to move her feet, that is, to walk in or step in to the jump.

**Scoring**

The height of the jump was measured from the distance between standing and jumping heights. Measurement was taken to the nearest centimeter. Three trials were given and best trials were taken for the final score.

5. **Resting Pulse Rate**

**Purpose**

To record the resting pulse rate per minutes.

**Equipments**

Stop watch and chair were used.

**Procedure**

The pulse rate of all the subject were recorded in a sitting position in the morning session between 6 am before taking the pulse rate, the subjects were asked to sit in a chair and relax for 15 min. To record the pulse rate, the three finger tips were placed on the left radial artery at the wrist in such a manner that pulse was clear and the number of pulse were conducted for 15 seconds and then multiplies by four to record for full minute.
6. Breath holding time

Purpose

The purpose was to measure the ability of the subject to hold the breath for longer time.

Equipment

A stop watch and a score sheet, were used to administer this test.

Procedure

The subject stood at ease and inhaled deeply after which she held her breath for a length of time possible to her. The index finger of the respondent serves as an indicator to the investigator to know the start and end of the recording time. The thumb and middle finger were used to hold the nose to avoid letting the air through the nostrils. The subjects were requested not to let the air out by opening the mouth while recording the breath holding time.

Scoring

The time of holding the breath till one subject let the air out was clocked by using the stopwatch to the nearest one tenth of a second as breath- holding time.

7. Height

Purpose

To measure the height of the subject
Equipments

Stadiometer, scale, piece of chalk, pencil and score sheet.

Procedure

The subject stood on the stadiometer with barefoot. At the time of measuring the heels were on the platform without elevating it. The scale was brought down firmly in contact with vertex. A mark was made with chalk piece on the side of scale in the stadiometer after that the subject stepped away from the stadiometer stand board.

Scoring

The vertical distance from the stadiometer stand board to chalk piece mark was measured. The measurement was taken to the nearest one centimeter.

8. Weight

Test objective

To measure weight of the subject

Equipments

Weighing machine, pencil and score sheet were used.
Procedure

The subject stood on the weighing machine with barefoot and with ideal clothes. At the time of measuring the heels were on the weighing scale without elevating it, and the body was erect in position after the stop of the scale vibration the reading was taken and the subjects stepped away from the weighing machine.

Scoring

The reading was taken nearest to the one kilogram.

9. Leg Length

Objective

To assess the length of the leg

Equipments

Measuring tape, paper and pencil

Procedure

The subjects should stand erect don't bend the knee and measure the length of leg from the end of the spinal column to the floor.

10. Arm length

Objective

To assess the length of the arm
Equipment

Measuring tape, paper and pen

Procedure

The subjects should stand erectly; the hand must be kept straight. The length of the arm from the acromion process to the tip of the third finger is measured.

11. Shooting (Speed Spot Shooting)

Purpose

To measure skill in rapidly shooting from specified positions

Equipments

Basketballs, regulation basketball court and board.

Preparation

Five floor makers 2 feet long and 1 inch wide are placed on the floor for grades 5 and 6 the markers are 9 feet from the backboard. For grades 7, 8, and 9 12 feet from the backboard and for 10, 11, 12 and college, 15 feet from the backboard. The distance for spots B, C and D must be measured from the center of the basket.

Procedure

There were three trials of 60 seconds each. The first was a practice trial and the next two are recorded. The performer stands behind any marker
designated for her age level. On the signal “Ready” “go” The performer shoots, retrieves the ball dribbles to and shoots from another designated spot. One foot must be behind the marker during each attempt. A maximum of four layup shots may be attempted during each trial, but no two may be in succession. The performed must attempt at least one shot from each designated spot. The player continues until “stop” is called.

**Scoring**

Two points are awarded for each shot made. One point is awarded for an unsuccessful shot that hits the rim from above either initially (or) after rebounding from the backboard. If a ball handling infraction (traveling, double dribbling) occurs, the shot following the violation will be scored as zero points. If two layups in succession occur, the second layup shall be scored as zero. If more than four layups are attempted, the excessive ones will be scored as zero. If more than the performer does not shoot from all the designated spots, the trial will be repeated. The final score is the total of two trials.

**12. Passing**

**Purpose**

To measure skill in passing and recovering the ball accurately while moving.

**Equipments**

Basketballs, Stop watch, measuring tape, wall
Preparation

Six squares of 2 feet each are marked on the wall, so that the base of the square is either 3 (or) 5 feet from the floor. All adjacent squares are 2 feet apart. A restraining line is marked on the floor at a distance of 8 feet from the wall and parallel to it.

Procedure

A total of three trials of 30 second each. The firsts is a practice trial and the last two are recorded. The performer with a ball stands behind the restraining line and faces the target on the far left. On the signal “Ready”, “go” the performer chest passes to the first target recovers the rebound while moving to a location behind the second target and behind the restraining line and chest passes at a target B. This pattern continues until target 7 is reached where two chest passes are executed, following which the performer then passes to repeating the sequence by moving to the left.

Scoring

Each pass that hits the target (or) the boundary line of the target counted as two points. Each pass hitting the intervening spaces on the wall counts one point. If a pass is made from a point in front of the restraining line no points are awarded for the pass. If passes are made at a target B, C, D or E twice in succession, no points are scored for the second pass. If the pass is not a chest pass, no points are awarded for the pass. The final score is the total of the two trials.
13. Dribbling (Control Dribble)

Purpose

To measure skill in handling the ball while the body is moving.

Equipments

Basketball, stop watch, measuring tape and pencils

Preparation

An obstacle course marked by six cones is set up in the free throw lane as shown in figure.

Procedure

Three timed trials are given. The first is a practice trial, and the last two are scored for the record. With the ball, the performer starts on her non-dominant hand side of cone A. On the signal, “Ready”, “Go”. The performer dribbles with the non-dominant hand to the non-dominant hand side of cone B. The performer will then proceed to follow the course using the preferred hand, changing hands as demand appropriate until the finish line is crossed by both feet. If there is a ball handling in fraction (traveling, double dribble) the performer (or) the ball remains outside the cone, or the performer fails to begin at the point in course where control was last, the trial is stopped, the performer returns to the start and the trial timing begins again.
Scoring

The score for each trial is the elapsed time required to legally complete the course. Scores are recorded to the nearest tenth of a second for each trial and the final score is the sum of two trials.

14. Playing Ability

Playing ability was subjectively rated during the South Zone women basketball interuniversity tournaments during the year 2009-2010 by three experts with ten points scale on the selected game of Basketball. The average of the three experts rating was taken as a score.

Research Design and Statistical Technique

The present study consists of one dependent variable, namely playing ability of basketball players, and seventeen independent variables. Collected data was subjected to statistical analysis as explained below. To determine the relationship between dependent variable and independent variable Pearson product moment correlation was used. The computation of multiple regressions was also used. In multiple regressions, a criterion variable was predicted from a set of predictors. Forward selection method of multiple regressions was used in this study to find out the predictor variable that has the highest correlation with the criterion variables and it is entered into the equation first. The rest variables are entered into the equation depending on the contribution of each predictor. In all the cases 0.05 level of significance was fixed to test the hypothesis.