Chapter III

PROCEDURE

In this chapter the procedure adopted for the selection of subjects, selection of variables, criterion measures, reliability of test items, administration of tests, along with the procedures for collection of data and statistical techniques employed for the study have been presented.

Data on selected anthropometric and physical variables were collected on the national and international volleyball players from various coaching camps of the country.

SELECTION OF SUBJECTS

A total of one hundred and four male volleyball players were purposively selected for this study. Out of these, eighteen universal, sixteen libero, sixteen setters, twenty middle blockers, and thirty-four attackers, within an age group of 19-33 years were selected from the top eight teams of Senior National Volleyball Championship, 2013. These volleyball players were selected from the different coaching camps and sports academies across the country. The academies and coaching camps from where the data was collected are as follows:

1. Indian Army Volleyball Team (Services), Secunderabad
2. Indian Railways Volleyball Team, Secunderabad
3. Tamilnadu Volleyball Team, Chennai
4. Kerala Volleyball Team.
5. Uttaranchal Volleyball Team, ONGC Dehradun
6. Punjab Volleyball Team
7. Haryana Volleyball Team
8. Rajasthan Volleyball Team
SELECTION OF VARIABLES

After literature review and consulting experts in the area, research scholar had selected the following variables for the study.

- **Anthropometric variables:**
  1. Standing height
  2. Body weight
  3. Arm length
  4. Hand length
  5. Palm width
  6. Arm girth relaxed
  7. Arm girth flexed
  8. Fore arm circumference
  9. Wrist circumference
  10. Chest circumference
  11. Thigh circumference
  12. Calf circumference
  13. Ankle girth
  14. Leg length
  15. Foot length

- **Specific Physical Performance Variables:**
  1. Speed
  2. Explosive leg strength
  3. Flexibility
  4. Shoulder Strength
  5. Abdominal strength
  6. Agility
  7. Skin fold total
     - Biceps
     - triceps
     - sub-scapular
     - super-iliac
**Criterion variables:** Playing position (Universal, Libero, Setter, Middle blocker & Attacker)

**CRITERION MEASURES**

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RELIABILITY OF TEST

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

Reliability of Instrument

The research scholar used the equipments that were available at the Lakshmibai National Institute of Physical Education, Gwalior, for the collection of data. These instruments were procured from the standard companies of India. Hence, the instruments were considered to be reliable.

Tester's Competency

During the course work of six months for the PhD programme the research scholar had undergone the training for using various equipments that were used in the data collection. Hence, systematic training of the research scholar in using the equipments in the study was considered to be good enough to ensure the tester's competency in data collection.

Administration of Tests and Collection of Data

In this section the procedure of data collection on different variables which the research scholar had used in the study are explained.

The research scholar had briefly explained the subjects about the parameters to be tested. All the subjects cooperated voluntarily. Before administering the tests the subjects were given a chance to practice so as to make them familiar with the testing procedure. They were explained about the use of the apparatus during the testing procedure. All the data on different parameters were collected by the researcher scholar himself with the help of the experts. The procedure adopted in testing different parameters has been discussed in the following sections:

ANTHROPOMETRIC VARIABLES

1. **Height**

   To measure the height of the subjects, the researcher calibrated the wall in the nearest centimeter. The subjects were asked to stand erect with back touching the wall. A stiff hard scale was held vertically on their head, slightly pressing the heads and touching the scale marked on the wall at right angle. The subject were asked to step out by lowering the heads and reading was taken by measuring through marked
scale on the wall. The heights of the subjects were recorded nearest to the 0.1 centimeter.  

2. **Weight**

The weights of the subjects were taken with the help of calibrated weighing machine in kilogram. Before taking the weight the subjects were asked to wear the shorts and T-shirts. They were asked to remove their shoes and stand at the centre on the weighing machine. The subjects’ weight was recorded to the nearest quarter of kilograms.  

3. **Arm length**

The arm lengths of the subjects were measured with the non-stretchable steel tape. To measure the arm length the subjects were asked to stand in a side view, and the arm length was measured by putting the steel tape from the acromion process above the shoulder joint to the tip of the middle finger. Measurement was recorded to the nearest half centimeters.  

4. **Hand length**

The measurement was taken as the shortest distance of the marked midstyline to the dactyline. The subjects placed the hand in a supinated position and the fingers fully extended. One end of the caliper was placed on the marked midstyline line while the other end was positioned on the most distal point of the third digit.  

5. **Palm width**

Palm width was the distance between the metacarpale laterale and metacarpale mediale when the subject placed the palm of the hand with fingers together firmly on a table. The anthropometrist held the small bone caliper pointed downwards at a 45° angle and palpated the landmarks with the third finger, then applied the faces of the caliper with firm pressure, but not to the extent of compressing the width.

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2 Ibid, 176.
6. **Arm girth relaxed**

The girth of the upper arm (hanging in a relaxed position by the side of the body) was measured at the level of the mid-acromiale-radiale. The tape was positioned perpendicular to the long axis of the humerus\(^4\).

7. **Arm girth flexed and tensed**

This was the maximum circumference of the right upper arm which was raised interiorly to the horizontal with the forearm at about 45 degree to the upper arm. The measurer stood to the side of the subject and with the tape loosely in position asked the subject to partially flex the biceps to identify the point where the girth was maximal. Loosening the tension on the casing end, asked the subject to “clench your fist, bring your hand towards your shoulders so your elbows at about 45 degree and fully tense the biceps and hold it” while the measurement was made\(^5\).

8. **Fore arm circumference**

The measurement was taken at the maximum girth of the forearm with the subject holding the palm up while relaxing the muscles of the arm. Using the cross hand technique it was necessary to slide the tape, measure up and down the fore arm and make serial measurements in order to correctly locate the level of the maximal girth. It usually occurs just distal to the elbow\(^6\).

9. **Wrist circumference**

The measurement was taken distal to the styloid process. It was the minimum girth in this region. Manipulation of the tape measure is therefore, required to be sure that the minimal girth is obtained\(^7\).

10. **Chest circumference**

This measurement was taken at the level of the mesosternale. The anthropometrist stood to the right side of the subjects who slightly abducted the arms allowing the tape to be passed around the chest in a near horizontal plane. The subject

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\(^5\) Ibid, 55.

\(^6\) Ibid, 58.

\(^7\) Ibid, 56.
breathed normally and the measurement was taken at the end of the normal expiration (end tidal) with arms relaxed at the sides\(^8\).

11. *Thigh circumference*

The measurement was taken perpendicular to the long axis of the thigh. It was taken at the level midway between the trochanterion and tibiale laterale sites\(^9\).

12. *Calf circumference*

The subject stood facing away from the measurer in an elevated position, with the weight equally distributed on both feet. The measurement was taken at the level of the largest circumference of the calf. The maximal girth is not always obvious and the tape may need to move up and down to find the point of maximum circumference\(^10\).

13. *Ankle girth*

The minimum girth of the ankle was taken at the narrowest point superior to the sphyriorn tibiale. The tape needs to be manipulated up and down this region ensures that the minimal girth is obtained\(^11\).

14. *Leg length*

Leg length of an athlete to be measured was marked by the scholar and he was asked to stand erect with feet together under the shoulder width and the body weight equally distributed between the both foot. The measuring tape measured the mark area and then the scores were recorded in centimeter (Norton, 2006)\(^12\).

15. *Foot length*

The distance from the longest toe (which may be the first or second phalanx) to the most posterior point on the heel of the foot while the subject is standing with the weight equally distributed on both feet. The caliper was kept parallel to the long axis of the foot and minimal pressure was applied\(^13\).

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\(^8\) Ibid, 56.
\(^9\) Ibid, 59.
\(^10\) Ibid, 60.
\(^11\) Ibid, 60.
\(^12\) Ibid.
\(^13\) Ibid, 68.
PHYSICAL PERFORMANCE VARIABLES

**50 M Dash Test**

The objective of the test was administered to measure the acceleration and speed of the subjects. The following equipments were arranged by the researcher before commencement of the final test, stopwatch, pencil, paper and clip-board.

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. Subjects were asked to start from a stationary standing position, with one foot in front of the other. The front foot was behind the starting line. Once the subject was ready and motionless, instructions "set" then "go" was given by the starter. The tester provided hints for maximizing speed (such as keeping low, driving hard with the arms and legs) and the participant was encouraged for not slowing down before crossing the finish line.

Two trials were given and the best time was taken as the score of the test. The timing started from the first movement and finished when the chest crossed the finish line.

**Sargent Jump Test (Explosive Leg Strength)**

The objective of the test was administered to measure the explosive strength of legs of the subjects. The following equipments were arranged by the researcher before commencement of the final test measuring tape or marked wall, chalk powder.

The subject was asked to stand erect on the board. His dominant hands fingertips were marked with chalk powder and the subjects were asked to raise the marked fingertips to a maximum height on the blackboard without lifting the heels so as to mark his maximum reach point. The finger tips were rechalked. With the chalked palm side towards the wall, a vertical jump was performed by the subjects to make another mark at the maximal height of the jump. The subject was not allowed to run or hop. However, the subject was properly instructed to take a good jump by bending the knees and swinging the arms. The subject was given three trails but the best performance was considered.
**Sit and Reach Test (Trunk Flexibility)**

The objective of the test was administered to measure the trunk flexibility of the subject by using sit and reach test. Sit and reach box was arranged by the researcher before commencement of the final test.

While testing, the subject was asked to remove the shoes and place his feet against the testing box while sitting on the floor with straight knee. He was asked to place one hand on the top of the other so that the middle fingers of both the hands were together at the same length. With this position the subject was asked to lean forward and place his hands over the measuring scale lying on the top of the box with its 10 inch mark coinciding with the front edge of the testing box. He was asked to slide his hands along the measuring scale as far as possible without bouncing and to hold till farthest possible for at least one second. The maximum distance reached, taken to the nearest centimeter was recorded as the score of the subject as a measure of his trunk flexibility. Each subject was given three trials and the highest score of the three measurements was recorded as the final score.\(^{14}\)

**Medicine Ball Throw Test (Shoulder Strength)**

The objective of the test was administered to measure the strength of the arms and shoulder of the subjects. The following equipments were arranged by the researcher before commencement of the final test, a medicine ball, measuring tape, paper and clip-board.

The subject was asked to stand in a line with the feet side by side and slightly apart. The subject stood facing the direction to which the ball was to be thrown. The ball was held with the hands on the side and slightly behind the center. The ball was brought back behind the head, and then thrown vigorously forward as far as possible. The distance from the starting position to where the ball lands, is recorded. The measurement was recorded to the nearest 0.5 foot or 10 cm. Three attempts were given and the best result of three throws was considered as the final score.

Figure 1: Demonstration of the Medicine Ball Throw Test

One Minute Sit-Ups Test (Abdominal Strength)

The objective of the test was administered to measure the abdominal strength of the subject by using the bend knee sit-ups. The following equipments were arranged by the researcher before commencement of the final test, A flat surface, stopwatch, recording sheet and pen. To test the abdominal strength the subject was asked to lie on the back with the knees bent on the floor and heels not more than 12 inches from the buttocks. The subject was asked to put the hand on the back of the neck with fingers clasped and to place the elbows squarely on the mat. The subject's foot was held by an assistant to keep them in touch with the surface. He was then asked to tighten the
abdominal muscles and bring the head and elbows forward as he sits-up finally to touch the elbows to the knees. This complete count was counted as one sit-up. Each subject was asked to perform as many sit-ups as possible in one minute time.

Three trails were given and the maximum number of complete sit-ups performed by the subject in one minute was noted as the final score

**T-Shuttle Run Test**

The objective of the test was administered to measure the agility of the subjects. The following equipments were arranged by the researcher before commencement of the final test. A Marked volleyball court, 4 cones, and stopwatch. Three lines were marked on the floor with a distance of five meters between them, and labeled as “A”, “B”, “C” and “D”. The participant started from point “A” (a timer was started), then moved fast to point “B”, after touched the ball at “B” with a single hand he returned to point “A”. Then, the participant ran from point “A” to point “C”, after touching the ball at “C” with a single hand then ran back to point “A”. Finally, the participant moved from point “A” to point “D”. When all movements completed, the timer was stopped, and total time spent was recorded . Time taken to complete the entire course was recorded.

Two trails were given (with an interval of 2-3 minutes) and the best one was recorded as the score of the subject.

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**Skin Fold Total**

The skin fold total was taken as a variable in the study. It was obtained by adding the skinfolds of four sites namely biceps, triceps, sub-scapular and supra-iliac by using harpenden caliper. The measurements of these four sites of skin folds have been explained below\textsuperscript{16}.

- **Biceps skinfold**

  Biceps skinfold of the subject was measured at the anterior side of upper arm, over the biceps muscle at a level, mid way between the point acromiale and radiale, measured at a pressure of 10 gram per mm square. The subject with naked arm was asked to stand at ease with hanging arms. The midpoint of the upper-arm marked for measuring upper-arm circumference helped to provide a landmark for measuring bicep skinfold. The skin and subcutaneous fat fold was picked at about 1 cm above the marked level on the anterior side of the bicep muscle. The jaws of the caliper were

applied on the fold so that the marked horizontal line was approximately at a level of the midpoint of the jaws and that the jaws held a double layer of skin plus subcutaneous fat. The lighter arm of the caliper was slowly released so as to put full pressure of the jaw on the vertical skin fold. The reading was noted from the dial of the caliper about two seconds after leaving a smaller arm of the caliper when the reading was quite stable. The measurement was recorded nearest to .02 mm.

- **Triceps skinfold**
  Triceps skin fold of the subject was measured in the same manner as explained in the case of biceps skin fold except that the fold in this case was picked up on the posterior side of upper arm over the triceps muscle.

- **Sub scapular skinfold**
  This skinfold was measured by picking the sub scapular skinfold diagonally below the inferior angle of the scapula almost parallel to the medial border of scapula, in such a way that the skinfold forms an angle of roughly 45° to the horizontal, with its lower end pointing outward. The jaws of caliper were applied about half a centimeter below the fold picking tip of the thump. The measurement was recorded after two seconds of releasing full pressure on the fold.

- **Supra-iliac skinfold**
  This measurement was taken by lifting the supra-iliac skinfold about 1 centimeter above and 2 cm medial to the anterior superior iliac spine on the left side. The jaws of the skinfold caliper were applied parallel to the natural direction of the picked up skinfold which was slightly oblique pointing upward latterly and downward medially. The reading was recorded correct up to 0.2 mm.
STATISTICAL TECHNIQUE

The data in the study was analyzed by using the following statistical techniques:

- Descriptive analysis was carried out for describing the data and comparing the profile of the volleyball players playing at different positions. In descriptive analysis various statistics Like Mean, Standard Deviation, Standard Error of Mean, Variance, Range, Maximum, Minimum, Skewness, Standard Error of Skewness, Kurtosis, and Standard Error of Kurtosis etc. were computed for understanding the nature of the data.

- One way analysis of variance was employed to compare the volleyball players among different playing positions in volleyball.

- Logistic regression analysis was applied to develop a logistic model for guiding the volleyball players to choose an appropriate playing positions in volleyball.

- The level of significance was set at 0.05.

- Graphical representation was used to depict the profiles of players playing at different positions.