Chapter III
Methodology

The present study is a normative study with the aim a view to develop norms which can be used for selection, evaluation, and assessment of performance variables of volleyball players in Maharashtra state. Standard procedures were followed to conduct this research project. The researcher followed step-wise methods of developing and establishing standard norms. In this chapter the selection of subjects, selection of tests, reliability of data, test administration and statistical techniques for analyzing data have been described.

3.1 Subjects
Population
Since the purpose of the study is to develop norms for the male senior volleyball players so for this study the male Senior Volleyball players, aged between 18 to 25 years from various districts of Maharashtra would be considered as the total population of the study.

Sample
The purposive sampling method\(^1\)\(^,\)\(^2\) was used to select the sample for the current study. For this study the male Senior Volleyball players, aged 18 to 25 years from various districts of Maharashtra participating at the State Level Volleyball Competition conducted by the Maharashtra State Volleyball Association (MSVA), are the sample for the current study. Considering the last three years around thirty teams participate in the competitions organised by MSVA participate in the state level competition conducted by the Maharashtra State Volleyball Association. Every district team, representing each district, consists of twelve players. The approximate population of Senior Volleyball players is 1188. The data collection was done for three consecutive years and the details of data collections are presented in table 3.1. The data was collected from total of 756 samples.

Table 3.1
Details of Sample

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Competition</th>
<th>Venue</th>
<th>Date</th>
<th>No. of Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Open State Level</td>
<td>Udgir</td>
<td>5 to 9 Nov 2008</td>
<td>240</td>
</tr>
<tr>
<td>2</td>
<td>Open State Level</td>
<td>Saswad</td>
<td>9 to 13 Dec 2009</td>
<td>252</td>
</tr>
<tr>
<td>3</td>
<td>Open State Level</td>
<td>Dahiwadi</td>
<td>30 Oct to 3 Nov 2010</td>
<td>264</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>756</strong></td>
</tr>
</tbody>
</table>

3.2 Procedure of the Study
The procedure of study has been given detail as follows:

3.2.1 Identification of performance variables
After going through various reviews and related literatures the performance variables were selected and further classified into three major dimensions.

Table 3.2
Details of Dimensions, Performance Variables and Tests

<table>
<thead>
<tr>
<th>No.</th>
<th>Dimensions</th>
<th>Variables</th>
<th>Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Morphological</td>
<td>Standing Height</td>
<td>Height</td>
</tr>
<tr>
<td>2.</td>
<td>Physical Fitness</td>
<td>Muscular Endurance of Shoulder</td>
<td>Push-ups</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Muscular strength of forearm</td>
<td>Grip Strength</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flexibility of back and hamstring</td>
<td>Sit &amp; Reach test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Speed</td>
<td>50 Meter Dash</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Agility</td>
<td>Shuttle Run</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Explosive leg strength</td>
<td>Vertical Jump</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Upper Hand Pass ability</td>
<td>Upper Hand Pass test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Serving ability</td>
<td>Serving test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ball passing ability</td>
<td>Ball Passing test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Setting ability</td>
<td>Setting up test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Smashing ability</td>
<td>Smashing test</td>
</tr>
</tbody>
</table>

3.2.2 Selection of Test Items
The investigator after going through various, reviews, articles and books has considered three major dimensions, which included the performance variables of
volleyball players. With a view to discriminate talented players for composing a standard State level Volleyball team, the following tests were selected for purpose of testing the selected performance variables. The test has following items:

**Table 3.3**

**Details of Tests Items and Scoring**

<table>
<thead>
<tr>
<th>No.</th>
<th>Tests</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Height</td>
<td>Centimetres</td>
</tr>
<tr>
<td>2</td>
<td>Push-ups</td>
<td>Number of Repetitions</td>
</tr>
<tr>
<td>3</td>
<td>Grip Strength</td>
<td>Kilograms</td>
</tr>
<tr>
<td>4</td>
<td>V-sit test</td>
<td>Centimetres</td>
</tr>
<tr>
<td>5</td>
<td>50 Meter Dash</td>
<td>Seconds</td>
</tr>
<tr>
<td>6</td>
<td>Shuttle Run</td>
<td>Seconds</td>
</tr>
<tr>
<td>7</td>
<td>Vertical Jump</td>
<td>Centimetres</td>
</tr>
<tr>
<td>8</td>
<td>Under Hand Pass test</td>
<td>Correct Volleys</td>
</tr>
<tr>
<td>9</td>
<td>Upper Hand Pass test</td>
<td>Correct Volleys</td>
</tr>
<tr>
<td>10</td>
<td>Serving test</td>
<td>Total Service Points</td>
</tr>
<tr>
<td>11</td>
<td>Ball Passing test</td>
<td>Total Passing Points</td>
</tr>
<tr>
<td>12</td>
<td>Setting up test</td>
<td>Total Setting Points</td>
</tr>
<tr>
<td>13</td>
<td>Smashing test</td>
<td>Total Smashing Points</td>
</tr>
</tbody>
</table>

There were several tests available to measure the performance variables of volleyball players. The test selected were feasible, standard and best suited to measure the performance variables. The tests selected in this list were included, after a deep study of various related literature, Internet and related study and after taking opinions of various experts in the area of Physical Education and Sports and considering the long-standing professional experience of the present investigator.

**3.2.3. Criterion Measures and Tools Used**

The following criterion measures were chosen for the administration of the test used to measure the performance variables of volleyball players are presented in table 3.3.
3.2.4 Pilot Study

‘First try-out’ of these new test-items was conducted on twenty four (n=24) male Senior Volleyball players of Kolhapur and Sangli district. The limitations, if any, in administering each test-item were recorded for further improvement of the test battery. Final data from 756 samples was collected. The above test-items were further confirmed to be included in the test, after taking opinions of various experts in the area of Physical Education and Sports and considering the long-standing professional experience of the present investigator. This, in fact, ensured the content validity of the test.

3.2.5 Collection of Data

The data on selected test items were collected from the male Senior Volleyball players, aged 18 to 25 years from various districts of Maharashtra participating at the State Level Volleyball Competition conducted by the Maharashtra State Volleyball Association (MSVA). The data was collected at three senior volleyball championships. Before the testing program was conducted the researcher assembled the subjects together to brief them on the objective of the study and demonstrated the tests so that the subjects were prepared for the tests. The details schedules of data collection have been presented in Table 3.1.

3.3 Reliability of Data

The reliability of data was ensured by establishing the instruments reliability, testers competency, reliability of test and subject reliability.

3.3.1 Instrument Reliability

Standard test were administered to measure the items of each dimension (see Table) for the collection of data. Based on the nature of the variables (i.e. morphological variables, physical fitness variables, volleyball skill variables) and criterion measures, the investigator collected proper equipments. The equipment used to conduct test were of standard quality which were calibrated, these equipments were thoroughly checked and their functional status has been verified to ensure accuracy in data collection. Thus the instruments were considered reliable for the purpose of testing. The checklist of the equipments has been presented as follows:
Table 3.4
Checklist of the equipments/instruments

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Item</th>
<th>Quantity</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Electronic spilt stopwatch</td>
<td>15</td>
<td>Functional</td>
</tr>
<tr>
<td>2</td>
<td>Measuring tape</td>
<td>2</td>
<td>Usable</td>
</tr>
<tr>
<td>3</td>
<td>Measuring tape</td>
<td>8</td>
<td>Usable</td>
</tr>
<tr>
<td>4</td>
<td>Portable weighing machine</td>
<td>2</td>
<td>Usable</td>
</tr>
<tr>
<td>5</td>
<td>Flex measure</td>
<td>1</td>
<td>Functional</td>
</tr>
<tr>
<td>6</td>
<td>Grip Dynamometer</td>
<td>2</td>
<td>Working</td>
</tr>
<tr>
<td>7</td>
<td>Volleyball</td>
<td>8</td>
<td>Usable</td>
</tr>
<tr>
<td>8</td>
<td>Chalk Box</td>
<td>2</td>
<td>Usable</td>
</tr>
<tr>
<td>9</td>
<td>Wooden potato</td>
<td>12</td>
<td>Usable</td>
</tr>
<tr>
<td>10</td>
<td>String</td>
<td>01 Bundle</td>
<td>Usable</td>
</tr>
<tr>
<td>11</td>
<td>Pencils</td>
<td>50</td>
<td>Usable</td>
</tr>
<tr>
<td>12</td>
<td>Pens</td>
<td>15</td>
<td>Usable</td>
</tr>
<tr>
<td>13</td>
<td>Pads</td>
<td>12</td>
<td>Usable</td>
</tr>
</tbody>
</table>

3.3.2 Testers Competency
The tester competency was evaluated together with reliability of the test. The research scholar had a number of practice sessions in the testing procedures under the guidance of the expert in the field. To have greater accuracy in data collection the tester who are professionally qualified and technically experts were given training for data collection and the tester’s reliability was checked. To determine the reliability of the test, test-retest method was employed and the research scholar himself recorded the performance of 25 subjects selected at random were recorded twice on each item. From the test-retest coefficients of correlation was as shown in table. It was obvious that the tester reliability was significantly high, establishing the competency of the scholar to administer the test. The reliability of the testers valid from \( r = 0.92 \) to \( 0.95 \).
### Table 3.5

Testers Reliability

<table>
<thead>
<tr>
<th>Testers Name</th>
<th>Reliability Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr. Sandip Babar</td>
<td>.95</td>
</tr>
<tr>
<td>Mr. Sudarshan Savgabe</td>
<td>.92</td>
</tr>
<tr>
<td>Mr. Amol Saranjame</td>
<td>.94</td>
</tr>
<tr>
<td>Mr. Sagar Dongare</td>
<td>.93</td>
</tr>
<tr>
<td>Mr. Ganesh Chavan</td>
<td>.95</td>
</tr>
<tr>
<td>Mr. Mahesh Jiwaje</td>
<td>.92</td>
</tr>
<tr>
<td>Mr. Sarjerao Tambade</td>
<td>.93</td>
</tr>
<tr>
<td>Mr. Ajay Dethe</td>
<td>.95</td>
</tr>
<tr>
<td>Mr. Dinesh Karad</td>
<td>.95</td>
</tr>
<tr>
<td>Mr. Shivraj Gaikwad</td>
<td>.95</td>
</tr>
</tbody>
</table>

### 3.3.3 Reliability and Objectivity of the selected test:

The reliability of the test items was computed by calculating coefficient of correlation with test retest method. The objectivity of the test was computed by calculating coefficient of correlation with the test score of first test scores of first recorder and second recorder in each test.

The below test-items were further confirmed to be included in the test, after going through various related research, taking opinions of various experts in the area of Physical Education and field Volleyball. This, in fact, ensured the content validity of the tests. The correlation coefficient also indicated the reliability of the test selected, as very high correlations were obtained when the test was repeated. The reliability and objectivity coefficient scores are presented in table 3.6.
3.3.4 Subject Reliability

The test-retest coefficient of correlation also established for establishing subject reliability. The subject reliability was there as the same tester used the same subjects under similar conditions. The reliability of the testers valid from \( r = 0.95 \) to \( 0.97 \).

3.4 Administration of Test-Items on Large Sample

The direction about the process of test-administration, rules for participation in each skill and scoring principles were explicitly determined.

3.4.1 Morphological Test-Items

- **Body Height**

  **Purpose:** To measure the total body height of Senior Volleyball players.

  **Equipment:** Wall scale perpendicular to a flat surface, measuring tape, scale etc.

  **Procedure:**
  
  - Each subject, one by one, stands on the flat surface adjacent to the perpendicular wall where the measuring tape has been fixed.
Subjects stand without footwear in front of wall (fixed with scale) contacting heels, buttocks, upper back and back of the head making firm contact.

The scale was placed on the subjects’ head that forms right angle to the wall as well as to the measuring tape.

Keeping the scale at its position, the subject was instructed to come out of the wall and the scores of height of each subject were recorded.

**Scoring:** The score was recorded in cm. nearest to 0.5 cm.

### 3.4.2 Physical Fitness Tests

- **Handgrip Strength Test**

**Purpose:** The purpose of this test is to measure grip or forearm muscle strength.

**Equipment:** Handgrip Dynamometer

**Procedure:**

- The subject to be tested holds the dynamometer in one hand in line with the forearm and hanging by the thigh.
- Maximum grip strength is then determined without swinging the arm.

![Figure 3.1: Handgrip Strength Test](image)

**Scoring:**

The better of the two trials for each hand is recorded and is the score of the subject.

**Suggestions:**

- Check if the subject is swinging or folding the arm.
- See that the grip dynamometer is adjusted at zero at every grip.
- It can also be used to determine the dominant/strong hand of the subject.
- Considering the above mentioned tests it also found important by the researcher to know the Body Mass Index (BMI) of the subjects. Hence the subjects’ height and weight was also measured and the BMI was also calculated.

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• **Push-Up test**

**Purpose:** This test measures upper body strength and endurance.

**Equipment:** Flat non slippery surface.

**Procedure:**

- Start in the push up position - with the hands and toes touching the floor, the body and legs are in a straight line, feet slightly apart, arms shoulder width apart, extended and at right angles to the body.
- Keeping the back and knees straight, the subject lowers the body until there is a 90-degree angle at the elbows, with the upper arms parallel to the floor.
- The subject being tested goes down until their shoulder touches the floor and then back up. The subject continues until he can do no more.

![Push-Up Test](image)

**Figure 3.2: Push - Up Test**

**Scoring:**

- Record the number of correctly completed push-ups that were performed.
- Suggestions:
  - See that the subject performs push-ups in a proper way or should not be recorded.

The Push-ups to be unrecorded are:

- 90° angle not kept at back and elbows. Bends at back and lowers hips rather than shoulders.
- Subject does not lower the shoulder until chest touches the floor.
- Touches fore head instead of chest and do not lower the hips or shoulder.

• **V-Sit Test**

**Purpose:** This test measures lower back and hamstring muscle flexibility.

**Equipment:** Measuring tape and tape for marking the ground.

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Marking (Fig. 3.3): With the tape create a straight baseline (blue line) with a length of 30 cm and, perpendicular to the midpoint, a measurement line/ measuring tape (orange line). The intersection of both lines marks 38.1 centimetres.

![Figure 3.3: Marking of V-Sit Test](image)

Procedure:
- Take off shoes and sit on floor with legs straight and heels placed directly on the measurement line, feet 30 cm apart.
- Bring hands together, clasp thumbs and keep palms facing down. Flex feet. (Fig 3.4)

![Figure 3.4: Starting and Execution Position of V-Sit Test](image)

- Shuttle Run

**Purpose:** To measure speed and agility.

**Equipment:** A level floor or ground with a smooth surface, two blocks of wood 2 inches by 2 inches by 4 inches, a stopwatch, a measuring tape, marking tape, scorecards or recording sheets, and pencil.

**Procedure:**
- Two blocks of wood 2 inches by 2 inches by 4 inches are placed side by side on the line 10 meter from the starting line.
- On command to start, the player runs from behind the starting line to retrieve one of the blocks.
After placing it behind the starting line, the player run to pick up the block and it carries it back across the starting line.

**Scoring:**
The time taken to correctly retrieve both blocks is recorded in second to the nearest tenth.

**Organizational Hints**
Dropping or throwing block disqualifies the subject for that trail. Player should warm prior up to the test.

- **50 Meter dash**
  
  **Purpose:** To measure forward running speed.
  
  **Equipment:**
  A level floor or ground with a smooth surface, a stop watch, a measuring tape, marking tape, whistle, score cards or recording sheets, and pencil.
  
  **Procedure:**
  - The player assumes a ready position behind the marked starting line.
  - On the command “GO”, the players run fifty meter as fast as possible. (Stopwatch starts)
  - The tester stops the stopwatch as soon as the subject crosses the finish lines.

  **Scoring:**
The amount of time elapsed between the start and the moment the student crosses the finish line is the recorded score. Time is reported to the nearest tenth of second.

  **Organizational Hints:**
The teacher should be positioned at the finish line and should simultaneously lower the arm from a raised positioned and shout “go” to signal the start. Using and assistant to record the time will allow more efficient test administration.

- **Vertical Jump**
  
  **Purpose:**
  This test measures the power of legs in jumping vertically and can be applied to children of both sexes aged nine years and above.
**Equipment:** A black board of (4.5’ x 2’) painted with green and red lines (parallel to the ground), one inch apart (green lines) and one feet apart (red lines) respectively. (The board is firmly fixed to a wall, preferably 6 inches from the wall and seventy inches above the ground) chalk powder and a weighing scale (optional).

**Procedure:**
- In the beginning a demonstration of the vertical jump, is given to a group of five to ten subjects, either by the tester himself or through earlier trained helper.
- The subject is asked to stand erect facing the board.
- The subjects dominant hand’s fingertips are marked with chalk powder and the subject is asked to raise the marked fingertips to maximum height on the blackboard without lifting the heels so as to mark his/her maximum reach point.
- The fingertips are rechalked.
- With the chalked hand side towards the wall, a vertical jump is to be performed by the subject to make another mark at the maximal height of the jump.
- A subject is not allowed to run or hop. However, the subject is properly instructed to take a good jump by bending the knees and swinging the arms. The subject may be given three to five trials at his/her will and the best performance is considered.

![Figure 3.5: Execution Position of Vertical Jump Test](image)

**Scoring:**
The maximum distance (among all the trials) between the reaching height and the jumping height provides the score of the test. But majority of the testers routinely use directly the distance jumped irrespective of body weight as the score of the test.

**Comments:**
The test is more suitable and reliable for college age boys and girls than young children. This test is considered as quite a reliable and practical test for measuring the athletic power of the legs.
3.4.3 Volleyball Skills

- **Under Hand Pass**

**Purpose:** To measure the ability of volley the ball vertically and to determine the accuracy in Under Hand Pass in Volleyball.

**Equipment:** One standard size Volleyball and a Volleyball court, Volleyball net, Score card, Pen or Pencil, Measuring tape, Lime Powder, Stop watches.

**Ground Marking:** Standard size Volleyball court was, marked with the following dimensions. A square 1.5 m drawn in the attack area near the net by side of the centre line. The lines are not included in the centre line. The lines are not included in the square (as shown in Fig.3.6).

**Procedure:**

- The player stands in the square, with the ball in his hand on signal “start” the player starts under hand passing within the square continuously for 30 seconds each.
- The pass should be made above the net height without any fault and without touching the lines of the squares.

![Figure 3.6: Under Hand Pass test](image)

**Scoring:**

Two trials of 30 seconds each within an interval of one minute in between are given. Correct volleys were recorded as the score. The one better score of two trials shall be the final score of the player. No score is accredited if the player touches the lines of the square or the net or commits a fault with hands.
• **Upper Hand Pass**

**Purpose:** To determine the ability of volley the ball vertically and to determine the accuracy in Upper Hand Pass in Volleyball.

**Equipment:** On standard size Volleyball and a Volleyball court, Volleyball net, Score card, Pen or Pencil, Measuring tape, Lime powder, Stop Watches.

**Ground Marking:** Standard size Volleyball court was marked with the following dimensions. A square 1.5 m. drawn in the attack area near the net by side of the centre line. The lines are not includes in the centre line. The lines are not included in the square

**Procedure**

- The player holding the ball stands in the square.
- On the signal “GO” the player starts upper hand pass in the square continuously for 30 seconds.
- Each volley (Pass) should be above the net height without fault of the hands and without touching to the lines of the square.

![Figure 3.7 Upper Hand Pass test](image)

**Scoring:** Two trials of 30 seconds within an interval of one minute in between are given. Correct volleys were recorded as the score. The better score of two trials shall be the final score of the player. No score is accredited if the player touches the lines of the square or the net or commits a fault with hands.

(Note: when the ball goes out of control, the player may recover it and start to pass again)
• **Serving Test**

**Purpose:** To measure the volleyball serving ability.

**Equipment:** A standard size Volleyball court.

**Procedure:**
- The test item aimed to measure the volleyball serving skill, is conducted in a standard volleyball court.
- The server (subject) is asked to stand at the proper service position and asked to serve over the net on the opposite side where marking are made for the test scoring.
- The subject may use any legal serve to hit the ball over the net into the opposite court.

![Figure 3.8 Serving test](image)

**Scoring:** Each examinee is given 10 trials for scoring.

• **Passing Test**

**Purpose:** To measuring the passing ability.

**Equipment:** A standard size Volleyball court.

**Procedure:**
- The subject is asked to stand at the centre back position of the court, receives a high throw from the thrower
- The subject executes a pass so that the ball goes over an 8-foot high rope and onto the specifically marked areas on the court.
- The subject is given 20 trials and asked to perform passes alternately to the right and to the left.
**Set – Up Test**

**Purpose:** To measuring the Set-Up ability.

**Equipment:** A standard size Volleyball court.

**Procedure:**

- The subject is asked to stand in midcourt position with the 6 feet by 5 feet area marked near a 10 feet high rope tied in the volleyball court.
- The set up person receives a high throw from the thrower.
- The subject executes a set-up so that the ball goes a 30 feet long rope tied at a height of 10 feet for boys and 8 feet for girls, and lands onto the marked area between the rope and usual volleyball net.
- The examinee is given 10 correct throw for set-up to the right side.
Scoring: One point is awarded for each set-up that goes over the rope (without touching rope and the net) and lands over the correct marked area.

- **Smashing Test**

**Purpose:** To assess the ability of accurate Spiking in volleyball on the set up Pass.

**Facilities & Equipment:** Standard size volleyball and a Volleyball court, Volleyball Net, Score card, Pen or Pencil, Measuring Tape, Lime Powder, Stop watches.

**Ground Marking:** In one side of the standard size Volleyball court- Draw a line across the court 1.5 m inside the parallel to end line. Draw attack line 3 m parallel to centre line. Draw the lines 1.5 m inside and parallel to each side line, extending from the centre line to line and give numbers according to the value of the areas shown in fig.

**Procedure:**

- The player takes the Setter as his own choice.
- He himself gives the First pass to the setter or another player (Person).
- After making a set up by setter the testing spiker should make spike without any fault. Spiker should make spike only straight arm spike.
- He can spike from any zone as he wishes.
- Total ten trials are allowed.
Figure 3.11: Smashing Test

Scoring:
Each testing player will be allowed 10 trials and scoring will be total points made in 10 trials. Two judges are deputed for guarding of spike, good spike scores according to the marked area value will be counted.

3.5 Data Analysis:
Descriptive statistics was used for obtaining mean and standard deviation. The descriptive statistics of the collected score was done. The mean and median were calculated. To find out the normality of the scores the skewness and the kurtosis were found out. Some of the scores from the data were removed as they were outliers. The outliers were found with the help of Box plots through SPSS. The Percentile method was used to create norms. The descriptive statistics and the percentile norms of the tests are presented below in detail. The percentile method\(^6\) was used to prepare the norms. The detailed analysis, interpretation is given in Chapter IV.