CHAPTER - III
METHODOLOGY

The source and selection of subjects, selection and administration of test items, statistical procedures adopted for analyzing the data and construction of norms are described in this chapter.

3.1. SELECTION OF SUBJECTS

To achieve the purpose of the present study 30 inter collegiate men volleyball players were selected as subjects at random. Their age was between 18 to 25 years. The selected subjects hailed from various majors such as arts and science courses. The subjects were youthful players and have had enough experience to justify their inclusion in the study. On this subject, the test items were streamlined and modified. After the modification process was over, 1000 collegiate volleyball players were randomly selected from colleges teams for the purpose of working out norms.

3.2. FINALIZATION OF SKILL TEST ITEMS

Keeping in mind that the fundamental skills are the bed-rock of a competitive game like volleyball, the investigator analyzed of literature-search and personal experience as a player. Consequently, after
discussion with experts, with a detailed preliminary questionnaire on various skills in volleyball was prepared (Appendix-A). This questionnaire was sent to different experts such as physical directors at college level, lecturers and coaches of the N.S.N.I.S. at sports authority of Tamilnadu and those working with different departmental teams in Tamilnadu. These experts were requested to poll their opinion on the priority and importance of each skill as a contributive factor to the total performance of the game. The experts were also given free hand to add more skills if they deemed fit.

The opinion responses were summated and the skills with priority and preference weightage of 75 percent and above were retained for consideration of the modification of skill tests. The percentage of priority of skills for test modification is given in below.

<table>
<thead>
<tr>
<th>SKILL'S</th>
<th>PRIORITY (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Serving</td>
<td></td>
</tr>
<tr>
<td>Overhead Float Serve</td>
<td>89.79%</td>
</tr>
<tr>
<td>Underhand Serve</td>
<td>69.10%</td>
</tr>
<tr>
<td>Jump Serve</td>
<td>74.20%</td>
</tr>
<tr>
<td>Topspin Serve</td>
<td>74.20%</td>
</tr>
</tbody>
</table>
2. Passing

Overhead Passing 87.53%
Underhand Passing or Forearm Passing 65.45%

3. Spiking

60.56%

4. Digging

58.21%

5. Blocking

51.15%

3.2.1. Trial Run

For further development and setting of all the five test items in an appropriate manner, a trial run of all the skill tests items were conducted on 20 volleyball players of college volleyball teams of Tamilnadu state.

From the outcome of the trial run only two skills were selected for further analysis and research as per the table given below in Table-I

**TABLE – I**

**LIST OF SKILL TEST ITEMS IN VOLLEYBALL**

<table>
<thead>
<tr>
<th>Category</th>
<th>Name of the variable</th>
<th>Item No:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Overhead float Service</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Overhead Passing</td>
<td>2</td>
</tr>
</tbody>
</table>
3.3. SUBJECT’S RELIABILITY

In order to determine the subject’s reliability, thirty inter-collegiate men volleyball players were selected at random as subjects. The two modified tests were conducted and recorded thrice under similar conditions by the investigator. These tests were administered in two days. On the first day service placement test was conducted and on the second day, the overhead pass skill test was conducted. These tests were repeated on subsequent days in the same order. In order to determine the subject’s reliability for the modified tests, the test and retest procedure was adapted by the investigator for all thirty subjects.

3.4. INSTRUMENT’S RELIABILITY

Standard Indian made stop watches were used for this study after careful testing of watches. A standardized and inflated volleyball approved by the Volleyball Federation of India was used for the conduct of the tests and they were considered reliable. Standard regulation size volleyball court with full markings according to the latest changes in service area rules was used to administer the test and for the collection of data. A standard size volleyball net, measuring tape, lime powder and coloured wall square marking on the wall were also used for the collection of data.
3.5. TESTER’S COMPETENCY

The tester’s competency was established together with the reliability of the data. To determine the reliability of the test and tester’s competency, the performance of thirty subjects were selected at random and tested on the modified test under identical condition. The data were collected thrice under the identical condition by the investigator. This was done on three consecutive days. The subjects were selected randomly from the total population under study. The scores thus obtained for the modified tests were correlated using Intra-class Correlation and presented below.

TABLE – II
TESTER’S COMPETENCY IN MODIFIED SKILL TESTS IN VOLLEYBALL

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of the variable</th>
<th>Co-efficient of Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Overhead Pass Skill</td>
<td>0.91</td>
</tr>
<tr>
<td>2.</td>
<td>Service Placement Skill</td>
<td>0.94</td>
</tr>
</tbody>
</table>

3.6. THE TEST SELECTION

3.6.1. The Serve (Service Test)

The ability to serve was measured on the court marked specially for this skill as shown in figure-A and B.
FIGURE-A
MODIFIED GLADY'S SCOTT & ESTHER FRENCH'S SERVICE
PLACEMENT TEST
FIGURE-B
MODIFIED GLADY’S SCOTT & ESTHER FRENCH’S
SERVICE PLACEMENT TEST - I

SERVICE AREA

SIDE LINE

NET
Description of Modified Skill Test in Volleyball

Test – I Volleyball Service Placement Test

Objective

To measure the serving ability of the player

Equipment

A regulated size of volleyball court, three numbers of approved size of volleyballs, approved size of volleyball net, measuring tape, lime powder, and scoring sheet were required for this test in the collection of data.

Direction and Administration

The volleyball playing court was marked according to the specifications as shown in the figure -B. The investigator demonstrated the test to the subjects with full explanation. The subjects were allowed for a ten minute warm-up on the same court.

The serving target had been divided into nine zones as shown in the figure -B. On command the subject must serve the ball to any one of the target area over the net without violating the serving rules. Three trials were given to the subject. Each trial consists of ten numbers of service attempts. The number of correct service fulfilling the service
rules were taken into consideration for assessing the ability of the subjects. Every service landed in the target area was counted on the basis of the value of the target area. Balls served out of the service target area, foot faults were counted as zero. The ball served on the lines got the maximum points.

Scoring

The sum of the score of ten services were calculated as the final score of one trial and like that three trials were given to the trainees.

While constructing the service test the investigator tried to find out the suitable zone for the effective service, since the service has been considered as an act of attack, so the investigator decided to divide the playing court into nine zones as shown in the figure -B. After conducting a pilot study and in consultation with the experts the investigator tried a number of combination of the zones in the playing court. Finally the investigator confined himself to the present zone markings as drawn in the figure -B.

3.6.2. The Overhead Pass Test

The ability to overhead pass was measured on the court marked specially for this skill as shown in figure- C and D.
FIGURE – C

MODIFIED BRADY VOLLEYBALL OVERHEAD PASS SKILL

TEST –II
FIGURE-D
MODIFIED BRADY VOLLEYBALL OVERHEAD PASS SKILL
TEST -II

Wall

Floor

Restraining Line

12'

3'

3'

3'
Test – II Volleyball Overhead Pass Skill Test (Wall Volley Test)

Objective

To measure the ability on accuracy and speed with which a player can volley (Overhead Pass) the ball within the target area drawn on the wall.

Equipment

A smooth plain wall with a solid face in nature is needed for this test. A square with three feet and one inch thick lines were drawn on the wall in colour contrast to the wall. The bottom of the square outer edge was exactly 12 feet above from the floor as shown in the figure-D. This square was called as the target area. Another line was marked on the floor 3 feet away from the wall called as restraining line. A stopwatch, scoring sheet and three volleyballs are required for each test station.

Direction and Administration

The investigator demonstrated the test before the subjects and ten minutes warm-up on the same target area will be allowed. The player with volleyball in his hands should stand behind the restraining line drawn three metres away from the wall in a ready position. On signal “Go” the ball will be tossed against the wall in the target area specially
marked as target. On the rebound, the ball is again volleyed against the wall on the target area repeatedly. If the ball goes out of control it must be retrieved by the subject and put into play again from behind the three feet restraining line.

**Scoring**

The score was the total number of legal volleys (Overhead) pass executed with in one minute (60 seconds) on the target area drawn on the wall includes the thickness of the square. Each subject was given three trials. The toss of the ball was not counted as score.

While constructing the overhead pass skill test the investigator tried to find out the suitable wall marking for effective and accurate pass, since the overhead pass was considered to be more important one. The investigator had finally chosen the wall square drawn in the figure -D after conducting a pilot study with different sized wall square and also in consultation with the experts in the game.

**3.7. ORIENTATION OF SUBJECTS**

To orient and obtain full co-operation from the subjects, the researcher explained the tests verbally in detail, then demonstrated the test and the test procedure was explained to them, so that there will be no
ambiguity in their minds regarding the efforts required by them. Some of
the subjects were utilized as models for the demonstration.

3.8. TEST ADMINISTRATION

The administration of two modified skill tests and collection of
data were as follows. The investigator selected appropriate measurement
techniques for administration of fundamental skills. All the necessary
equipments were collected and appropriate markings were done on the
court. All the tests were clearly indicated. The skill tests figure -C and
figure -D were conducted for each test individually. The testers were
tested and their scores on the three trials were correlated by using Intra-
class correlation to get the testers competency.

The data was collected during the competition period. This period
was said to be the best for collection of data from the player’s
performance. The performance of the players during the said period was
expected to be at the peak level on account of the Inter-collegiate level
tournament.

The responses of the subjects to the tests were fairly good during
the period of collection of data. The tests were administered both in the
morning & evening sessions. Further with the view of getting a correct
data and to ensure the maximum co-operation, the purpose and
significance of the present study was well explained to the subjects. Before administering the tests the subjects were asked to do proper warm-up both in general and specific format. Administration of each skill tests was done with adequate explanation. The subjects were allowed to practice once for each test.

The collected data on modified skill tests from the 30 subjects were processed by test-retest Intra-class correlation to estimate the reliability of the tests. The details of the same are given in tables in the IV Chapter.

3.9. THE CRITERIA PROCEDURES

3.9.1. RELIABILITY

The reliability may be explained as the consistency of the test in measuring a phenomenon. There are many methods in the literature to ascertain the reliability of a test which is best suited for testing, that measures the sports skill is test-retest method.

The test was conducted under the supervision of the investigator and an expert and second time under the same system. On both the occasions, the tests were conducted under uniform conditions. The reliability of the test items was computed by Pearson product moment correlation method of calculating coefficient of correlation with test – retest method. For this analysis of reliability only 30 subjects were selected.
3.9.2. VALIDITY

The validity of the test items was ensured by correlating the scores of the test items with criterion measure by Pearson product moment method of coefficient of correlation.

For the modification of skill test which assess the skill performance ability, the prime duty of the investigator is to find out a method to establish the validity and the reliability for the modified test. The performance of the modified test's validity could be compared between each items and scores. For this analysis of validity 120 subjects were selected.

3.9.3. OBJECTIVITY

Objectivity of the tests was calculated by Pearson product moment method of calculating coefficient of correlation with the test scores of different rater in each test conducted under the supervision of both the testers at the same time. This correlation coefficient scores indicate the degree of agreement between the two raters that gives the objectivity of the test. For this analysis of objectivity 30 subjects were selected.
3.10. CONSTRUCTION OF NORMS

After establishing the reliability, validity and objectivity for service and overhead pass in volleyball norms were constructed for the above said skill tests, with one thousand inter-collegiate men players as subjects.

3.11. STATISTICAL TECHNIQUES EMPLOYED

The investigator for establishing the validity, reliability and objectivity of the two modified tests for the construction of norms for each skill has used the following statistical procedures for analyzing the collected data.

3.11.1. RELIABILITY FOR THE MODIFIED TESTS

The following steps for the calculation of Intra class correlation $R_{xx}$ or $R$ were used in this study.

Step by step procedure:

Step-1 Calculate $\sum X_t = \sum X_1 + \sum X_2 + \sum X_3$

Step-2 Calculate $\sum (X_t)^2$

Step-3 Calculate the sum of square of all trials scores $(\sum X)^2$

Step-4 Calculate the $\sum X_t^2$ (sum of square of trials total).

Step-5 Calculate $K \times N$. Where $K$: Number of trials, $N$: Number of subjects.

Step-6 Calculate the values of
a) \( SB^2 = \) Between the set variance
\[
SB^2 = \frac{\sum x_t^2}{K} - \frac{(\sum x_t)^2}{N \times K}
\]

b) \( SW^2 = \) with in set variance
\[
SW^2 = \sum X^2 - \frac{\sum x_t^2}{K}
\]

c) \( ST^2 = \) Total set variance
\[
ST^2 = \sum X^2 - \frac{\sum x_t^2}{K \times N}
\]

d) Check if, \( ST^2 = SB^2 + SW^2 \)

Step – 7 Place the value in the summary table as shown below

<table>
<thead>
<tr>
<th>Variance source</th>
<th>SS</th>
<th>Df</th>
<th>MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between subjects</td>
<td>( SB^2 )</td>
<td>( K-1 )</td>
<td>( SB^2 / (K-1) = MS_B )</td>
</tr>
<tr>
<td>With in subjects</td>
<td>( SW^2 )</td>
<td>( K(N-1) )</td>
<td>( \frac{SW^2}{K(N-1)} = MS_W )</td>
</tr>
</tbody>
</table>

\( N = \) total of 3 trial samples,

\( K = \) No. of treatment of experiment

Step – 7 Calculation \( Rxx' \) (Correlation Coefficient of Reliability)

\[
\frac{MS_B}{MS_W} = \text{MODIFIED TEST}
\]

\( Rxx' \) or \( R = \) Newly Constructed

\( MS_B \)
3.11.2. VALIDITY FOR THE MODIFIED TESTS

The validity was calculated by using the following formula:

\[
\frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{[ N \sum X^2 - (\sum X)^2 ][ N \sum Y^2 - (\sum Y)^2 ]}}
\]

Where X and Y are the raw scores for the two tests.

3.11.3. OBJECTIVITY FOR THE MODIFIED TEST

In order to establish the objectivity of the modified test two testers have conducted the test on modified test by using same subjects on different occasions on consecutive days under the same condition. The collected data were correlated by Pearson product moment correlation method.

\[
XY = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{[ N \sum X^2 - (\sum X)^2 ][ N \sum Y^2 - (\sum Y)^2 ]}}
\]

3.11.4. NORMS

The investigator has used two types of scales for the construction on norms for college level men volleyball players in Tamilnadu namely, (1) Hull Scale (2) Percentile Scale.
STEP-I

Ebel states that "The norms are often used to analyzed different homogeneous groups such as students in a grade or given age".

For the construction of norm to this study the investigator after the collection of raw scores followed the statistical procedure of computing mean and standard deviation by using the formula suggested by Mathews.

1. Mean \((M) = AM + \frac{\sum fd}{N \times i}\)

Where \(M\) = mean

\(AM\) = Assumed mean

\(\sum\) = the sum of

\(f\) = frequency

\(d\) = deviation

\(fd\) = frequency deviation

\(N\) = total number of frequencies or scores

\(i\) = Size of the step interval.

2. Standard Deviation = \(i \sqrt{\left(\frac{\sum fd^2}{N}\right) - \left(\frac{\sum fd}{N}\right)^2}\)

Where

\(s\) = Standard deviation

\(i\) = Size of step interval

\(fd\) = Frequency deviation
\[ \sum = \text{the sum of} \]

\[ N = \text{Number of scores} \]

After calculating the mean and standard deviation, the scores were converted into Hull Scale, because the Hull scale is the most stringent scale. The Hull scale was computed by the following as suggested by Mathews”.

Hull scale is made up of 3.5 standard deviation on either side of the mean. The scale value of 0 to 100 can be obtained by adding the hull scale value with the mean for determining the points from 51 to 100 and subtracting the Hull Scale value from the mean for determining the points from 49 to 0 point.

**STEP-II**

Percentiles are standard scores. A standard score is derived from raw data. It has a basis for comparison. In percentiles, the centre is 50% and the range is from 0% to 100%.

The following formula is used for computing percentiles from a grouped data frequency distribution.

\[ P_p = L + \left( \frac{\frac{P \cdot N}{100} - CF}{f_p} \right) i \]
Where

\( P = \text{Percentile} \)

\( P = \text{Percentage of the distribution wanted} \)

\( L = \text{Lower limit of the step interval on which the percentile falls.} \)

\( N = \text{Total number of frequencies} \)

\( CF = \text{The total frequency (in cumulative frequency column below the step interval on which the percentile score falls.} \)

\( F_p = \text{the frequency in the step interval on which the percentile score falls.} \)

\( I = \text{the size of the step interval} \)