CHAPTER - III

METHODOLOGY
METHODOLOGY

All the methodological issues governing the procedure and method adopted in selection of subjects, justification of selected variables, selection of tests, reliability of data, instrument reliability, tester’s competency, orientation to subjects, experimental design and statistical techniques applied for the analysis of data are discussed in this chapter.

SELECTION OF SUBJECTS

The primary purpose of this study is to predict hockey playing ability from physical, anthropometric measurements and fundamental skills of inter-university men hockey players. To meet the purpose of this study one hundred (N = 100) men hockey players those who have participated in inter-university hockey tournament were selected from various universities like Sri Venkateswara University, Tirupati, Sri Krishnadevaraya University, Anantapur, Osmania University, Hyderabad, Kakatiya University, Warangal, Acharya Nagarjuna University, Guntur and Jawaharlal Nehru Technological University, Hyderabad in Andhra Pradesh were chosen as subjects and their age ranges from 18-25 years and were tested on playing ability through subjective evaluation, physical variables through speed and endurance, anthropometric measurements through standing height and arm length, fundamental skills through Henry-Friedel field hockey test and shooting ability test.

The investigator explained the purpose and the significance of the study to all the selected players before conducting the tests to ensure maximum co-operation from the subjects. All the subjects agreed voluntarily to co-operate in the testing procedures explained to them and to put in their test efforts in the interest of the scientific investigation and in order to enhance their own performance and achievement standards. Though no special techniques were used to motivate the subjects to put in their best effort, the subjects were very enthusiastic and co-operative throughout the project. They were free to withdraw as respondents in case they feel any difficulty or discomfort during the test. The researcher has taken
sufficient care and caution in counseling the sample respondents about the utility of physical fitness for a healthy body and also the purpose of study. Because of this, no dropouts as respondents and all the selected subjects voluntarily co-operated well throughout the period of test.

SELECTION OF VARIABLES

The investigator has gone through the available literature and had a lengthy discussion with the subject experts and the guide before selection of the variables for the study. The available of techniques for the purpose of analysis, feasibility, reliability of the data and outcome were extensively taken care before finalization of the variables. After examining various factors associated with the present study, the following most ideal variables were chosen for testing. Though many studies were carried out on speed, endurance, standing height, arm length, dribbling, dribble and shooting and other games like football, Basketball, Handball etc.. But there is no single study which has included all the variables such as physical, anthropometric measurements and fundamental skills on hockey playing ability.

Hence, a need arose and the researcher has been made an attempt to predict the hockey playing ability from selected physical, anthropometric measurements and fundamental skills of university men hockey players of various Universities in Andhra Pradesh.

JUSTIFICATION OF VARIABLES

In the game of Hockey, since 1928, India gained supremacy in world hockey nearly for 40 years. India which once was considered to be magician with hockey stick is now pushed back in world competitions. Though there are number of reasons for one defeats such as playing surface, lack of facilities, lack of proper selections, people are critical about the present standard of Indian hockey by comparing with the good olden days. In case India to regain last reputation the researches are required. Hence the following variables were selected under the head of physical variables, anthropometric measurements and fundamental skills.
PHYSICAL VARIABLES

Physical variables have been defined as the present acquired and innate ability to perform motor skills of a general or fundamental nature exclusive of highly specialized sports techniques. Taking into consideration of the view, the following physical abilities were selected for this study.

1. Speed
2. Endurance

Speed

Ability to move the entire body rapidly from one place to another is referred to as speed. Even though speed and reaction time are related, they are distinct characteristics. It is possible for people to look like as one trait but still have distinctive to each other. There are different forms of speed viz. Speed of every movement of body segments, running speed for a very short distance (acceleration rate) and maximum running speed.

Speed movement is highly specific to the areas of body. An individual with fast arm movement may have slow leg movements. In fact, this specificity extends even to the type of task and the direction of movement. Running speed comprises of two factors namely (a) acceleration rate and (b) maximal velocity. This is the most important consideration in speed for distance about 20 yards and is very essential in the court and field games and short races, as well. The second factor is related to a distance greater than 20 yards where in maximal speed is more important. Therefore, an individual may be slow starter but achieve a maximal speed after 20 yard distance. Indeed, a person may be proficient in hand ball, foot ball, basket ball, or tennis where involves quick acceleration but is poor in 20 yard sprinter and vice versa. Under this state of condition, the speed is significantly considered as a variable.

Endurance

The capacity to continue to work under the strain for a long period of time without undue fatigue is called endurance. It means the ability to persist in strenuous activity. This concept applies to the body as a whole or to a particular body system.
or to a local area of the muscular system. As one of the basic components of general athletic ability, endurance is usually considered to be the most important component of physiological fitness. Activities in which endurance is of prime importance are running (except short distance), swimming, cycling, wrestling, basket ball, hand ball, foot ball and rugby. In all these activities, it occupies an important place.

Muscular endurance means the ability to continue successive movements with a heavy load at maximal speed in a short period of time. Such endurance can be improved by increasing strength through the over load principle. As muscles are taxed beyond the point of comfort, any aerobic activity or the longer time durational activity is involved with the endurance.

ANTHROPOMETRIC MEASUREMENTS

The study of human physical measurement is meant by anthropometry. The physical structure especially the height and arm length has definite decisive advantage in many games. Anthropometric measurements have revealed correlation between body structure, physical characteristics and sports capabilities. Taking into consideration of the above facts, the following measurements were selected for this study.

a) Standing Height
b) Arm Length

Standing Height

Stature is taken as the maximum distance from the point vertex on the head to the ground. Height or stature of an individual is another important anthropometric measurement which sums up the linearity of the body. Height of a person is composed of legs, pelvis, trunk (spine) and the head and face. These components of the stature are of importance in any study pertaining to the assessment of growth in different body proportions and for other general and specific purposes. But in the field of nutritional anthropometry usually the total height (or length in case of infants) is measured.
Arm Length

Arm Length is measured from the acromion process above the shoulder joint to the tip of the middle finger in the side view. It is obtained as a distance between olecranon and tip of the middle finger (dactylion) when the forearm, resting on the ulna, was placed on the table with fingers extended.

Acromion-Fist Length

Subject stands erect with his arms hanging and fists closed with the thumb outside. Distance from acromion to the head of the third metacarpal is taken using beam compass.

Anterior Arm Length

Subject stands erect in standard standing position, with the right arm raised laterally to about 30 degrees without elevating the shoulders. Subject keeps the fingers extended with the palms facing the thighs. Using the tape, measure the distance between the underarm mid-point on the arm (determined as the crossing point of the natural folds of the arm pit and the total width of the shoulder), and the mid-anterior wrist point (which lies on the anterior projection of the distal end of ulna).

FUNDAMENTAL SKILLS

Main basic patterns of movement were embodied in the fundamental skills. These fundamental patterns of movements were expressed as running, passing and hitting. They were basis for survival activities originally and they later developed into more purposive work. Taking into consideration of the above view, the following skills were selected for this study.

1. Dribbling

2. Dribble and Shooting

Dribbling

To proceed further having full control over the ball in a required speed and towards some directions preferably towards the opponent’s goal line. It is mostly used by forwards to carry the ball into the opponent area.
The player with the ball can progress towards his goal through dribbling. As he is not permitted to carry the ball the only option for him to progress with the ball is dribbling. At the same time he should also see that the opponents do not interfere his progress and about that entire one must be certain about the rules which govern the skill of dribbling. Hence dribbling is very important in hockey.

**Dribble and Shooting**

An attempt to score a goal in the main object of the hockey game is to push or shoot the ball into opponent's goal and to score a goal. The aim of hockey game is to score as many goals as possible. Because it is the highest number of goals scored that would decide the result of the game. However the defenders will always to their best to prevent the opponent to score a goal. Hence a good hockey player should master the skill of shooting.

**SELECTION OF TESTS**

A test is an instrument or tool used to measure the efficacy of data influencing data under the scientific investigation. Though many tests are available, the investigator has selected the standardized tests which are ideal for the selected variables for the purpose of the study. The selected tests for the variable are presented in Table-I.
TABLE - 1

DEPENDENT AND INDEPENDENT VARIABLES – THEIR TESTS

<table>
<thead>
<tr>
<th>Variables</th>
<th>Tests/Equipments</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hockey playing ability</td>
<td>Subjective Evaluation</td>
<td>Points</td>
</tr>
<tr>
<td>Speed</td>
<td>AAHPER 50-Yard Dash</td>
<td>Seconds</td>
</tr>
<tr>
<td>Endurance</td>
<td>Cooper's 12 min walk / Run test</td>
<td>Metres</td>
</tr>
<tr>
<td>Standing Height</td>
<td>Stadiometer</td>
<td>Centimetres</td>
</tr>
<tr>
<td>Arm length</td>
<td>Anthropometric rod</td>
<td>Centimetres</td>
</tr>
<tr>
<td>Dribbling</td>
<td>Henry-friedel field hockey test</td>
<td>Seconds</td>
</tr>
<tr>
<td>Dribble and Shooting</td>
<td>Shooting ability test</td>
<td>Points</td>
</tr>
</tbody>
</table>

INSTRUMENT RELIABILITY

The stop watches, steel tapes and anthropometric for measurement used in carrying research are considered reliable as they are procured from the reputed firms and they are calibrated in standard units also. The measurement on each of the variable was recorded five times under the similar conditions using the instruments; the obtained scores were not only the same but also tallied on comparison with other scores taken from the instruments procured from other reputed firms. Thus, they were accepted as reliable and precise for the purpose of study.

TESTER'S COMPETENCY

The record of all the measurements in the study was carried out by the investigator under the supervision of the research guide; scholars registered for Doctor of Philosophy and experienced lecturers in physical education and coaches. This ensured the investigator to get him well versed with the technique of conducting tests. Further, he had a number of practical sessions to correct the testing procedure. Thus the tester’s reliability was established by the method of test and re-test.
RELIABILITY OF DATA

Test and re-test method was followed in order to establish the reliability of data. For this purpose ten university hockey players were selected at random out of the selected samples. All the variables used in the study were tested twice on the subjects under the similar conditions. Pearson product moment correlation was employed to know the reliability of data. The pearson's product co-efficient of correlation is presented in table -II.

TABLE - II
RELIABILITY OF PREDICTOR VARIABLES

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Predictor Variables</th>
<th>Pearson’s ‘r’</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Speed</td>
<td>0.925*</td>
</tr>
<tr>
<td>2.</td>
<td>Endurance</td>
<td>0.965*</td>
</tr>
<tr>
<td>3.</td>
<td>Standing Height</td>
<td>0.822*</td>
</tr>
<tr>
<td>4.</td>
<td>Arm Length</td>
<td>0.968*</td>
</tr>
<tr>
<td>5.</td>
<td>Dribbling</td>
<td>0.832*</td>
</tr>
<tr>
<td>6.</td>
<td>Dribble &amp; Shooting</td>
<td>0.855*</td>
</tr>
</tbody>
</table>

*Significant at 0.05 with df 8 = 0.632.

Hence, the obtained ‘r’ value is more than the table value at 0.05 level of confidence; the data is accepted as reliable in terms of instrument, tester and the subjects.

ORIENTATION OF SUBJECTS

In order to get co-operation fully from the subjects, the investigator has explained the purpose of study, prior to administering the test. This explanation has helped very much in the desired approach ensuring an effective co-operation from the subjects in getting data reliable and also helped them to perform the tests perfectly without injuries. Model performance of subjects was done in order to make the subjects understand clearly about the tests related to the test of variables.
PILOT STUDY

The investigator has conducted a diligent study on twenty university men hockey players from different universities who were selected at random from sample size (N = 100) as pilot study. In order to know the practical experiences in administering the test and gain additional ideas, knowledge and approach, the pilot study was conducted. The individual score sheet system was adopted to record all the test results as well as particulars of individual subjects. This procedure has minimized recording time and expenditure too. A sense of competition was also created in the minds of sample respondents.

COLLECTION OF DATA

Data on hockey playing ability, physical variables namely speed and endurance, anthropometric measurements namely standing height and arm length and fundamental skills namely dribbling and dribble and shooting were collected through 50-yard dash for speed, 12 minute walk / run for endurance, stadiometer for height, anthropometer for arm length, Henry –Friedel field hockey test for dribbling and shooting test for dribble and shooting, rating scale for hockey playing ability.

TEST ADMINISTRATION

CRITERION VARIABLE

The criterion variable is hockey playing ability of the Inter-university hockey players. The hockey playing ability of the players was determined individually by rating during the competition in the following given areas namely, dribbling, flicking, passing, stopping, scooping, hitting, shooting, tactics, intelligence and general play.

This was done on ten point (10) rating scale by three Hockey coaches (appendix II) giving points for each fundamental skill. The average score of the ten fundamental skills was his playing ability score for one judge. Like this other two coaches will measure the player’s ability finally, the average score of three coaches was the measure of criterion variable for each subject.
EVALUATION WHILE PLAYING GAME IN INTER-UNIVERSITY MEN HOCKEY TOURNAMENT
The purpose of deriving the criterion variable into 10 categories was to make the coaches rating of Hockey playing ability more reliable and accurate.

PHYSICAL VARIABLES

SPEED

Purpose:

To measure speed

Facilities and Equipments:

An area on a track, football field, or playground with a starting line, a 50-yard course, and a finish line. Two stop watches or a split-second times.

Procedure:

After a short warm-up period the subjects take a position behind the starting line. Best results are obtained when two subjects run at a time for competition. The starter uses the command, “Are you ready”? And “Go”! The latter is accompanied by a downward sweep of the arm as a signal to the timer. The subjects run across the finish line. One trial is permitted Harold (1979).

Instructions:

You may take any position behind the starting line you wish. On the command, “Go!” you are to run as fast as you can across the finish line. Do not slow up until you are across the finish line. Then you may slow down gradually.

Scoring:

The score is the elapsed time to the nearest tenth of a second between the starting signal and the instant the subject crosses the finish line.
SPEED-50 YARD DASH

Field experiment of speed on exponent
ENDURANCE

Twelve minute walk / run.

Purpose

To measure cardiovascular fitness.

Facilities/Equipments

It is suggested that a specific course be measured in distance so that the number of laps completed can be counted and multiplied by the course distance. It is also helpful to divide the course into quarters or eights by placing markers. This enables the tester to quickly determine the exact distance covered in 12 minutes. A stop watch, whistle and distance markers are needed for group testing.

Directions

It is usually most efficient to assign each runner to a spotter. The runners start behind a line and, upon the starting signal, run and or walk as many laps as possible around the course within the 12 minutes. The spotters maintain a count of each lap and when the signal to stop is given, they immediately run to the spots at which their runners were at the instant the whistle or command to stop was given Barry L Johnson (1988).

Scoring

The score in yards is determined by multiplying the number of complete laps time the distance of each lap (e.g., 440 yards), plus the number of segments (quarters, eights, 10 yards intervals, etc) of an incomplete lap plus the number of yards stepped off between a particular segment.

For example, the 12 minute run is given on a 440 yards track sectioned off into eights. A student completes 5 laps plus eights segments plus 11 yards. The students score is 5x440 = 2200; plus 3x55 (each one eighth segment is 55 yards) = 165; plus 11 yards; i.e., 2200 + 165 + 11 = 2376 yards covered in 12 minutes.
ENDURANCE - COOPER'S 12 MIN WALK/RUN TEST

Field experiment of endurance on exponent
ANTHROPOMETRIC MEASUREMENTS

STANDING HEIGHT

Purpose

To measure the height of the subject.

Facilities/Equipments

Stadiometer.

STANDING HEIGHT

Measuring Standing Height on Exponent

Procedure

The height of the subject was measured in centimeters when he was in a standing position. A height scale in centimeter was fastened to a back board. The subject stood exact with his heel, buttocks and upper back contacting the scale as in figure. Height was taken by placing flat object with one and against the scale and long side resting on highest point of the head Barry L Johnson (1982).
ARM LENGTH

Purpose

To measure the arm length.

Facilities/Equipments

First two segments of the anthropometric rod.

Procedure

It measures the straight distance between acromion (a) and dactylion (da), when the arm is hanging downwards. This measurement should be taken directly

Indra (1989).

ARM LENGTH

Measuring Arm Length on Exponent
Land Mark

Acromion: It is the most lateral point on the lateral margin of the acromial process when the subject stands in normal position with his arms hanging by the sides. This point can be located by palpating the scapular spine with the middle and first finger from the sternal end to lateral wards. It is easier to locate this point on lightly built individuals.

Dactylion (da)

It is the lowest point on the anterior margin of the middle finger with the arm hanging on the side of the subject.

SKILL TEST

DRIBBLING

HENRY – FRIEDEL FIELD HOCKEY TEST

Purpose

To measure Dribbling ability

Facilities/Equipments

Hockey sticks, balls, obstacles and stop watches. Area needed was 25 yard by 10 yard with starting 10 yard line so that the goal area was in the middle of the line.

Procedure

The player should stand behind the starting line inside the goal cage with hockey stick in hand and ready to run. At the signal, ‘Ready Go’ the clock was started as the player run forward towards the target area. As the player crossed the 7 yard mark, the ball was rolled in from the 10 yard mark, either from the left or right side line, so that the ball crossed diagonally through the target. The player fielded the ball on the run and within the 2 yard square target area, he dribbled towards the person standing in the dodge square and did a right dodge around him. As soon as the stationary person was dodged, he moved out of the testing area so that he was not obstructing the player on his return.
FIGURE - 1

PROCEDURE FOR HENRY - FRIEDEL
FIELD HOCKEY TEST

- Subject running without ball
- Subject dribbling

Accuraccy Key
1 = 9 Points
2 = 7 Points
3 = 3 Points
4 = 5 Points
5 = 7 Points
DRIBBLING – HENRY-FRIEDEL FIELD HOCKEY TEST

Field experiment of Dribbling on exponent
The player continued dribbling up to the line went around the obstacle as if doing a circular tackle and dribbled back down field moving within the 1½ yards lane. Before getting to the restraining line but within the lane, the player drove the ball aiming for the goal area. The clock was stopped as soon as the ball crossed the starting line of side line or when the ball came to stop. Each player had 10 scored trials five of them with the ball rolled in from the left side and other five with the ball rolled in from the right side. One practice trial from each side was given Harold and Mc Gee (1979).

**Scoring**

The time for a trial was elapsed time in one tenth of second from the word ‘Go’ until the driven ball crossed the starting line or the side line or came to stop within the testing area plus.

1. One second for an incorrect dodge or for omitting the dodge.
2. One second for using the reverse stick during the circular tackles.
3. One second for the driven ball going over the side line or not reaching the starting line.
4. One second for not fielding an accurately rolled ball within the target area is reduced.

**Speed Score**

The lower score was the better score. The speed average score for the test was the total time for all the 10 trials.

**DRIBBLE AND SHOOTING ABILITY**

**Purpose**

To determine shooting ability.
FIGURE - II

THE NEWLY CONSTRUCTED TEST Dribble AND SHOOTING ABILITY TEST IN HOCKEY
Field experiment of Dribble and shooting on exponent
Facilities/Equiments

Hockey sticks, balls, score sheets, goal back boards with marking and goal posts with net affixed. On the shooting circle three squares known as goal shooting areas, with dimensions of two yards square shall be marked as 45 on right and left and one at go in the center of the shooting circle. Parallel to the inside field in line with the square shall be drawn three starting lines two yards away. The length of the starting line shall be two yards.

Procedure

A player being tested shall be on the starting line with the ball, he shall dribble the ball two yards and shall shoot for the goal from the marked squares, he shall got two chances for shooting at each square Harban’s Singh (1961).

Scoring

Point of target hit on the goal board on each trial, by a player shall count his score. He shall be given six trials. Add score of six trials shall be shooting ability of the player.

EXPERIMENTAL DESIGN AND STATISTICAL TECHNIQUE

Correlation random design was employed in the present investigation to see whether there is any significant relationship between dependent variables and independent variables.

The relationship between dependent variable (playing ability) and independent variables (speed, endurance - standing height, Arm length- dribbling, dribble and shooting were established through simple, partial and multiple correlation. Level of significance was set at 0.05 level.

The formula used for simple correlation was

\[ r = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sqrt{\sum(x - x)^2} \sqrt{\sum(y - y)^2}} \]
The formula used for partial correlation was

$$r_{12.34...n} = \frac{r_{12.34...n-(n-1)} - r_{ln.34...n-(n-1)} \cdot r_{ln.34...n-(n-1)}}{\sqrt{1-r^2_{ln.34...n-(n-1)}} \cdot \sqrt{1-r^2_{ln.34...n-(n-1)}}}$$

The formula used for multiple correlations was

$$R = \sqrt{1 - (1 - r^2_{12}) (1 - r^2_{13:2}) (1 - r^2_{14:23})......(1 - r^2_{ln:234...(n-1)})}$$