CHAPTER III

METHODOLOGY

In this chapter, the selection of subjects, research design of the study, selection of subjects, orientation of subjects, selection of skills, standardisation of tests, reliability of instruments, competency of tester, reliability of data, test retest administration, subjective assessment of playing ability, inter-rater assessment of tests standardized, and the statistical procedure used have been explained.

3.1 SELECTION OF SUBJECTS

The purpose of this study was to standardise a battery of physical fitness tests and skill tests for selected games, namely, basketball, football and hockey for Tamil Nadu Physical Education and Sports University. To achieve these purpose 300 students, were randomly selected from five physical education colleges, at the age group of 18 to 25 years. The newly standardised batteries of physical fitness and skill tests were administered on the subjects, which actually to measure the capability of each individual candidate.

3.2 RESEARCH DESIGN OF THE STUDY

The study was designed to standardise physical fitness and skill tests for physical education entrance in Tamil Nadu physical education colleges. To achieve the purpose, the investigator formed the research method in three phases, namely, pilot study phase, testing phase for validity and reliability and testing
phase for objectivity. During pilot study phase twenty subjects were involved for standardisation of physical fitness and skills of selected three games, refinement process of the battery of physical fitness and skill tests and finalisation of the tests to be standardised. During the testing phase for reliability and validity of tests standardised, the researcher found the reliability of the tests through test – retest (intra class) methods. Reliability of the constructed tests were also done by inter-rater (outside expert) with the 60 subjects, 30 in the age group of 18 to 21 and 30 in the age group of 22 to 25 were selected for this purpose. To ascertain the validity (criterion related and construct related) the athletic ability and playing ability were determined by three experts when the selected subjects were in actual competitions. The obtained athletic and playing abilities were related with the skill scores of the subjects to determine criterion related validity. To determine the construct related validity the athletic ability and playing ability and physical fitness and skill scores of the subjects in the age group of 18 to 21 and in the age group of 21.1 to 25 were found and related so that to find the validity of the tests for both the age groups. To find out the objectivity of the tests, the investigator administered the tests for 300 subjects (randomly selected 5 physical education colleges in Tamil Nadu State). Based on the scores, hull scales were computed and the subjects were classified and thereby the objectivity of the skill tests could be proved. The research design of this study under different phases are detailed in Figure I through a flow chart.
Fig 1. Flow Chart Showing the Methodology adapted in the Study

MRN STUDENTS
N = 300

PILOT STUDY PHASE
(n=20)

STANDARDIZATION OF PHYSICAL FITNESS AND OF SKILL TESTS

Physical Fitness Tests
- Speed
- Leg Explosive Power
- Abdominal Power
- Muscular endurance

Skill Tests of Selected Games
- Basketball: Dribbling, Passing, Shooting
- Football: Dribbling, Passing, Shooting
- Hockey: Dribbling, Passing, Shooting

TEST & RETEST
(n=60)
For Inter Class and Inter-rater Assessments

18 – 21 Age Group (n=30)
21.1 – 25 Age Group (n=30)

SUBJECTIVE ASSESSMENT OF ATHLETIC ABILITY AND PLAYING ABILITY BY THREE EXPERTS
For criterion related and construct related Assessments

For Reliability
Pearson Correlation

For Validity
Multiple Correlations

For Objectivity
Hull Scale – Norms - Classifications

RESULTS, DISCUSSION & CONCLUSIONS

CONSTRUCTION OF NORMS
(n=300)
3.3 STANDARDISATION OF PHYSICAL FITNESS AND SKILL TESTS

The standardization of physical fitness and skill tests were done in the pre pilot study and pilot study is explained in pre pilot study and pilot study. For this purpose, the investigator selected twenty men candidates selected to undergo physical education courses at Selvam College of Physical Education Pappanaickenpatti, Namakkal. They were voluntarily involved in this process. Since the selected subjects were just underwent the selection tests prescribed in by the institution and playing the game, they have adequate exposure on different physical fitness tests and skills of the game.

3.4 PRE-PILOT STUDY

In this phase, the preliminary works in connection with the standardisation of tests were conducted. The stages in the preliminary work are identification of physical fitness components, identification of skills, identification of selected games, and selection of most appropriate physical fitness components and skills. They are as follows:

3.4.1 IDENTIFICATION OF PHYSICAL FITNESS COMPONENTS

In general there are different physical fitness components as advocated by eminent in the field of physical education as follows:

1. Speed
2. Agility
3. Power – Leg Power
4. Power – Arm Power
5. Abdominal Strength
6. Muscular endurance
7. Balance
8. Coordination
9. Reaction time

There are different tests available to test the above physical fitness components. Speed is tested through 50 M sprint and 100 M sprint. Agility is tested through Shuttle Run (10 M distance x 4 times), Shuttle Run (10 M x 6 times). Leg power is tested through standing broad jump, long jump, squats, half squats. Arm power is tested through cricket ball throw, push ups, pull ups. Abdominal strength is tested through sit ups. Muscular endurance is tested through shot put, pull ups or push ups. Balance is tested through static balance, dynamic balance. Coordination is tested through Scott Motor Coordination test. Reaction time is tested through electronic devices and manually. Thus, there are number of physical fitness tests to measure different physical fitness components. For the purpose of this study, the investigator selected the following physical fitness components and tests for standardization of physical fitness tests for physical education entrance in Tamil Nadu Physical Education colleges.
1. Speed 100 M Sprint
2. Leg Explosive Power Standing Broad Jump
3. Abdominal Strength Sit ups
4. Muscular endurance Pull ups

3.4.2 IDENTIFICATION OF GAMES

The aim of this study is to standardize physical fitness tests and skill tests for physical education entrance in Tamil Nadu physical education colleges. The investigator during pre pilot study phase collected the number of students opted for different games from five physical education colleges in the state. It was found that about 80% of the students were opted either football, or basketball or hockey and the remaining 20% were also involved in any one of the three games apart from their opted games, like Cricket, Handball, Ball Badminton, etc. Hence, the investigator selected three games for selection of skill tests, namely, football, basketball and hockey.

3.4.3 IDENTIFICATION OF SKILLS OF THE GAMES

The selected games, football, basketball and hockey have different skills pertaining to the particular game. However, the investigator found common skills like dribbling, passing and shooting are basically involved in all the three games and experts have found significant relationship between mastering these skills improved proficiency of the game of the individuals. Hence, the investigator
selected dribbling, passing and shooting skills of basketball, football and hockey for the purpose of this study.

The researcher in standardization of the skill tests at pre pilot study analysed the advantages and disadvantages of each skill related to the respective positions, administered the available skills in order to get suitable experiences for the formulation of new skill tests. Great care was taken in the observation of the execution of the skills and the related existing skill tests.

The reasons for selection of the above three skills for construction of skill tests are discussed below:

3.4.3.1. PASSING

A pass is a method of moving the ball between players. Most passes are accompanied by a step forward to increase power and are followed through with the hands to ensure accuracy. There are different types of passes in different games. The crucial aspect of any good pass is being impossible to intercept. Good passers can pass the ball with great accuracy, touch and know exactly where each of their teammates likes to receive the ball. A special way of doing this is passing the ball without looking at the receiving teammate etcetera. Taking into consideration the above importance of passing, the investigator selected passing as a variable.
3.4.3.2. Dribbling

Dribbling is the act of keeping the control of the ball continuously, and is a requirement for a player to take steps with the ball. To dribble, a player exhibits his skills in keeping the possession of the ball depending on the game. Ball handlers tend to dribble the ball low to the ground, reducing the travel out side and lose control. Additionally, good ball handlers frequently dribble behind their backs, between their legs, and change directions of the dribble frequently, making a less predictable dribbling pattern that is more difficult to defend. A skilled player can dribble without watching the ball, using the dribbling motion or peripheral vision to keep track of the ball’s location. So the investigator selected dribbling as a variable.

3.4.3.3. Shooting

Shooting is the act of attempting to score points by scoring the ball through the target. While methods can vary with players and situations among the games selected for the study. In basketball, the player should be positioned facing the basket with feet about shoulder-width apart, knees slightly bent, and back straight. The player holds the ball to rest in the dominant hand’s fingertips (the shooting arm) slightly above the head, with the other hand on the side of the ball. To aim the ball, the player’s elbow should be aligned vertically, with the forearm facing in the direction of the basket. The ball is shot by bending and extending the
knees and extending the shooting arm to become straight; the ball rolls off the finger tips while the wrist completes a full downward flex motion. When the shooting arm is stationary for a moment after the ball released, it is known as a follow-through; it is incorporated to maintain accuracy. Generally, the non-shooting arm is used only to guide the shot, not to power it. Players often try to put a steady backspin on the ball to deaden its impact with the rim. The ideal trajectory of the shot is somewhat arguable, but generally coaches will profess arch. Most players shoot directly into the basket, but shooters may use the backboard to redirect the ball into the basket. In football and hockey, after having taken possession of the ball through dribbling and passing the player aims to shoot the ball for scoring goals. Thus, shooting becomes one of the most important skills for all the three games selected for this study.

3.5 PILOT STUDY AND FINALISATION OF TESTS

In the pre pilot study process the investigator gained rough idea on the tests to be standardised and after the selection of the physical fitness components and skills and tests. Before planning further the investigator consulted and discussed with experts and the guide and the first draft of tests and testing procedures were prepared. A pilot study was made on twenty candidates selected for physical education courses in Selvam College of Physical Education, Namakkal, to understand the difficulties in administering the tests and to see the
accuracy in measuring the physical fitness and skills. After understanding difficulties and drawbacks, modification and changes were made in the testing procedures and measurements after discussing with the experts and guide. After the modification the tests were tried again and finalised. On each stage of testing the battery of tests the results were analysed through statistical application. Thus the test battery consisting of physical fitness tests and skill tests were formed with the able guidance of the guide and the experts in the field.

3.6. CRITERION MEASURES

In general, the following are listed as criteria to be reviewed in the selection of a test to be used in measuring achievement; (1) validity, (2) reliability, (3) objectivity, and (4) norms. Barrow and McGee (1971) have made the statement, "If a test is accompanied by norms, its usefulness is enhanced."

Thus, the criterion measures for this study was to test tests, namely, (1) Speed (2) leg explosive power (3) abdominal strength (4) muscular endurance and skills test in basketball, football and hockey, namely (1). Passing, (2) Dribbling and (3) Shooting.

The following steps were followed to prove the reliability, objectivity and validity, of these tests criterion. An effort was also made to formulate norms with the available data collected from this study.
3.6.1 RELIABILITY

The test battery was administered on all the 60 subjects by the investigator and the scores were recorded. They were again tested by the investigator and the scores were recorded. Subjects from each physical education college were tested on a day time and it continued to conduct the test and retest for all the students. (The data collected were shown in the appendices). The test scores of best test score and second best score were correlated to test the reliability. This was called the intra class method of assessing reliability.

The reliability of the test was used by another expert in the area twice in different times and the scores were correlated to assess the inter-rater reliability of the tests.

3.6.2 VALIDITY

To determine the validity of the tests, the sixty subjects selected were divided into two groups based on their age. The players whose age was between 18 and 21 formed one group and the players whose age was between 21.1 and 25 were formed into second group. This assessment would be helpful to find out whether the tests were valid for both the groups.

The overall athletic ability and playing ability of the subjects were objectively measured through three experts in the fields and the scores of the
objective measurement and the scores of the same subjects in the subject measurements were analysed for criterion related validity. The scores between the two different groups were compared to assess the construct related validity.

3.6.3. OBJECTIVITY

To determine the objectivity, the tests were administered to 300 candidates admitted to five physical education colleges in the Tamil Nadu State. The tests were conducted on a day time and it continued to conduct for all the students. Based on the scores, the norms were constructed for the tests, and the subjects were classified according to their scores. This enabled the subject to classify their physical fitness and skills of the games, thereby established the objectivity of the each tests constructed.

3.7. RELIABILITY OF DATA

The reliability of the data was ensured through (1) reliability of instruments used (2) reliability of subjects and (3) reliability of testers.

3.7.1 RELIABILITY OF INSTRUMENTS:

The stop watches, basketballs, footballs, hockey balls, measuring tapes, cones, courts of basketball, football and hockey, back board, chalk, writing bad, paper, pencil, pen, and whistle used for tests were considered reliable as they were
procured from reputed firms and were on use for research purpose. Further these instruments had been calibrated in standard units.

To determine the reliability of instruments the measurements on each of the variable were recorded two times under similar conditions using the same instrument and scores obtained were the same and also the scores were compared with other scores taken from the instruments procured from other reputed firms. Thus they were considered reliable and precise for the purpose of this study.

3.7.2. TESTER’S RELIABILITY

The Assistant Professors and Coaches in the physical education colleges were assisting the investigator in this study. They were experts in the field as well as thorough in conducting the tests. They were given proper instructions and practice a day before conducting the actual tests.

The testers were in the field for more than 3 years and have ample exposure on the skills, skill tests, playing circumstances and assessment of the subjects both in micro and macro levels. Thus, these experts who were utilised for the purposes of this study were considered reliable.

3.7.3 SUBJECT RELIABILITY

The subjects selected for this study were candidates selected for physical education colleges. The subjects had adequate exposure on physical fitness tests
and experience in playing the game. They involved in this study impartially and they were considered reliable for the purposes of this study.

3.8. ORIENTATION OF SUBJECT

The subjects were assembled prior to the test. The purpose of the test and testing procedures were explained in detail to the subjects to ensure proper understanding and effective co-operation to obtain accurate and reliable data. The researcher himself demonstrated the test.

3.9. COLLECTION OF DATA

The data for the variables (speed, leg explosive power, abdominal strength and muscular endurance, dribbling, passing and shooting in basketball, football and hockey) to construct norms were collected by administering the appropriate standard tests. The procedure for administering the test is explained below. Before administering the test the purpose and procedure were explained to the subjects in details.

3.10 SUBJECTIVE RATING BY EXPERTS

3.10.1 ATHLETIC ABILITY

The standardized physical fitness tests were correlated with subjectively assessed athletic ability of the subjects. To determine the athletic ability of the
runners, the 600 meters running performance of the subjects were subjectively rated by three experts, that was, by two qualified coaches and the Director of Physical Education. The experts assessed the athletic ability of the runners subjectively and awarded marks for the subjects while running based on selected criteria and observation for total marks of fifty. The average of the marks of the three experts was taken as the criterion score. The score sheet for evaluating the athletic ability subjectively by the experts is given in Table I

Table I

**Showing the Subjective Evaluation of Athletic Ability of the Runners**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Criteria for Evaluation</th>
<th>Marks Awarded</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Starting technique</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>Crouch</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>Stride Length</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>Stride Frequency</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>Arm Swing</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>

Total Marks Awarded:
Date: 
Signature of the Expert

**Testing Arrangements**
To determine the subject’s athletic ability in actual running situation, the subjects were required to run in a well marked track for 600 meters run.

**Test Administration**

The experts ranked the individual skills of the subjects in a competitive 600 meters run situations. Each time only five subjects were asked to run so that the experts could judge each subject while running. In this way all the subjects were measured of their athletic ability subjectively by the experts based on the five skills.

**Scoring**

Three experts gave marks according to the athletic ability of the subjects. The average of the marks awarded by the experts was the athletic ability of the subjects.

**3.10.2 SUBJECTIVE RATING OF PLAYING ABILITY OF RESPECTIVE GAMES SELECTED**

To determine the playing ability of respective games selected, namely, basketball, football and hockey players, the performance of the subjects were subjectively rated by three experts for each game, that is by three qualified coaches cum officials. The individual and team performance related basketball, football and hockey skills were selected as criteria for subjective ranking of
playing ability by the experts. The criterion score were classified into two parts, viz., five individual skills (50 marks) and five situations where the individual player contributes to the team (50 marks) for a total of 100 marks (Table I). The average of the marks of the three experts was taken as the criterion score.

3.10.2.1 INDIVIDUAL SKILLS

The following individual skills were selected, namely passing, dribbling, field goals, defensive and offensive moves and rebound collection (in case of basketball and interceptions in the case of football and hockey). Ten marks were awarded for each skill for a total of 50 marks.

Testing Arrangements

To determine the subjects playing ability in actual playing situation, the subjects were required to play in a regulation basketball / football / hockey courts.

Test Administration

The experts ranked the individual skills of the subjects in a game situation. In this way subjects were subjectively rated on the individuals as well as team skills.
Scoring

Three experts gave marks according to the playing ability of the subjects as detailed in table I.

3.10.2.2 INDIVIDUAL’S CONTRIBUTION TO THE TEAM

The following individual contribution to the team were selected, namely, positional play, adapting the principles of play, fitness, awareness of the rules/violation/ fouls of the game and situational awareness. Ten marks were awarded for each skill for a total of 50 marks (Table II).

Testing Arrangements

To determine the subjects playing ability in actual playing situation, the subjects were tested during actual game situation in matches organised by the investigator.

Test Administration

The experts ranked the individual contribution to the team in a playing situation. In this way subjects were subjectively rated on the individual contribution to the team during match situations.
Scoring

Three experts gave marks according to the playing ability of the subjects for a total of 50 marks as shown in Table II

**Table II**

Criteria for Subjective Ranking of Basketball / Football / Hockey Playing Ability

<table>
<thead>
<tr>
<th>Name of Subject:</th>
<th>Game Selected:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Variables</th>
<th>MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>Individual Skills</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Dribbling</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>2. Passing</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>3. Field Shooting</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>4. Defensive and Offensive Moves</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>5. Rebound Collection (for Basketball) Interceptions (for Football/ Hockey)</td>
<td>10</td>
</tr>
<tr>
<td>II</td>
<td><strong>Individual Contribution to Team</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Positional Play</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>2. Adapting Principles of Play</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>3. Awareness of the Rules</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>4. Fitness</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>5. Situational Awareness</td>
<td>10</td>
</tr>
</tbody>
</table>
3.11 PHYSICAL FITNESS TESTS

3.11.1 SPEED (100 METERS RUN)

Purpose

To measure the speed

Facilities and Equipments

An area on a running track, a 100 meter and a finish line. Two stop watches.

Procedure

After a short warm up period the subject took a position behind the starting line. To get best results two were asked to run at the same time for competition. The starter used the command, “Are you Ready?” and “Go”. The latter was accompanied by a downward sweep of the arm as a signal to the timer. The subject ran across the finish line. One trial was permitted.

Score

The score is the elapsed time to the nearest one ten of a second recorded from starting signal to the time the subject crossed the finish line. (Yobu, 1988).

3.11.2 ABDOMINAL STRENGTH (SIT UPS)
Purpose:

The purpose of the test was to measure the abdominal strength of the subjects.

Equipments

Gymnastic mat

Test Administration:

The starting position of the test was a back lying position with knees flexed, feet on floor and one foot from the buttocks. The hands are positioned behind the neck and fingers were clasped. A partner held the subject’s feet to keep the subject in contact with the testing surface. The subject curled to a sitting position, touching the elbows to the opposite knee. The subject curled back down to the floor until the mid-back contacted the testing surface another sit-up was then attempted.

Scoring

One point was scored for each correct sit-up. The score was the maximum of sit-ups completed in 60 seconds.
3.11.3 LEG EXPLOSIVE POWER (STANDING BROAD JUMP)

**Purpose**

To assess the leg explosive power.

**Equipments Used**

Jumping pit and measuring tape.

**Procedure**

The subject was asked to stand with the feet parallel to each other and behind the starting mark and then the subject bent the knees and swings the arms and jumps far forward as possible. Three trials were given with adequate rest.

**Scoring**

The distance between the starting mark and the nearest landing point was measured as score. The best of three trials was the final score (Johnson and Nelson, 1982)

3.11.4 MUSCULAR ENDURANCE (PULL UPS)

**Purpose**

The muscular endurance was measured through pull-ups for male subjects.
Test Administration

The subjects performed the pull-ups in the horizontal bar. The subjects grasped the bar with their palms facing away from their body. The subjects then raised their body until their chin was over the bar and lower it again to the starting position with their arms fully extended.

Scoring

One point was scored each time when the subject completed one pull-up. Only one trial was permitted. The number of pull-ups were counted and recorded.

3.12 SKILL TESTS GAMES STANDARDISED

3.12.1 BASKETBALL SKILL TESTS

3.12.1.1. PASSING

Purpose:

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

Equipment

Standard inflated basketball, stop watch, smooth wall surface and measuring tape for marking targets and restraining line.
Field Marking:

There will be six squares of 60 cm. by 60 cm; the squares are each marked on the wall so that the base of the squares is either one point five five meters or 90 cm from the floor. All adjacent squares will be marked on the floor at a distance of two point five zero meters form the wall as shown in diagram as shown in Figure II.

Fig. II: FIELD MARKING FOR PASSING TEST
Warm-up

Pre test warm up and test trials was given to the subjects.

Administration

There will be a total of three trials of 30 seconds each. The first trial is considered as a practice and the last two are recorded. Number of passes counted for 30 seconds. The subject (with a ball) stands behind the restraining line and face the target on the far left ‘A’. On the signal ‘Go’ the performer chest passes to first target, recovers the rebound while moving to a location behind the second target and behind the restraining line and chest pass at target ‘B’. this pattern continues until target ‘F’ is reached, where two chest passes are executed, following which the performer then passes to ‘E’, repeating the sequence by moving towards the left. The stop watch will also be started on the signal ‘Go’ and on completion of 30 seconds the watch will be stopped. Number of hits made on the target will be counted.

Rest

30 seconds to one minute was given for rest.

Scoring

In each passing the ball hits the target or the boundary line of the target counts two points, and ball hits the intervening spaces on the wall counts one
point. The highest numbers of points scored in 30 seconds out of two trials were taken as test score.

**Violations / Penalties:**

1. Passing from a point in front of the restraining line (foot fault) no points awarded for the pass.

2. Passing at targets B, C, D and E twice in succession. No points awarded for second pass.

3. Failing to use chest pass-no points awarded for the pass.

**3.12.1.2. DRIBBLING**

**Purpose**

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

**Equipment**

Standard inflated basketball, six cones and a stop watch.

**Field Marking:**

An obstacle course marked by six cones will be set up in restricted area (key area / three seconds area) of a regulation basketball court as shown in Figure III and IV.
Fig. III  FIELD MARKING FOR CONTROL DRIBBLE TEST (LEFT HAND)

Fig. IV  FIELD MARKING FOR CONTROL DRIBBLE TEST (RIGHT HAND)
Warm-up:

Pre test warm up and test trials was given to the subjects.

Administrations:

Three trials will be given, the first is a practice trial and the last two are scored for the record. At the starting point the performer should stand behind the cone ‘A’ with the ball. Soon after he receive ‘Go’ signal he has to move on the middle cone ‘B’ by dribbling the ball with his non dominated hand to the non dominate hand side then he has to reach cone ‘C’ which is in the end line at the restricted area by dribbling, after this point the performer dribble through side of the restricted area to reach the free throw line corner cone ‘D’ later the performer has to come back the cone ‘E’ which is in the middle point of the restricted area, then he has to move on to the free throw line corner cone ‘F’ on the restricted area, after he can use the side of the restricted area to reach cone ‘G’ at last the performer has to reach their finish point cone ‘H’ cross by both feet with non dominated hand dribble.

The same procurer has to follow by the performer in a reverse way with his dominated hand and dominated hand side.

Rest

30 seconds to one minute was given for rest.
Scoring

The score for each trial will be elapsed with the time required to complete the course fully. Scores should be recorded to the nearest hundredth of a second for each trial. The least time out of the two trials will be the final test score.

Violations / Penalties:

If the performer does ball handling infractions (traveling, double dribble) the trials will be stopped and the performer has to return to starting point and begin the trial again.

1. The performer and the ball have to remain outside the cone (this includes dribbling the ball either inside or over the cone). If there was failure of this, the trial will be stopped and the performer has to return to starting point and begin again.

2. If the performer fails to begin at the point in the course where control was last the trial will be stopped and the performer has to return to start and begin again.

3.12.1.3. SHOOTING

Purpose

To measure skill in rapidly shooting from specified positions and to a certain extent, agility (co-ordinative ability) and ball handling.
Equipment

Standard inflated basketball, standard goal, stop watch, measuring tape for marking floors.

Fielding Marking

Five shooting spots (markings) should be marked on the floor of the regulation basketball court in front of a basket at five different angles to the target (basket) namely at zero degree angle to the right and zero degree to the left, at 45 degree angle to the right and 45 degree angle to the left and at 90 degree angle (in front) to the centre of basket at three different distances three meters, four meters and five meters from the centre of the ring, which is the spot at one point five seven five meters from the mid-point of the base line as shown in Figure V.

**Fig. V FIELD MARKING FOR SPEED SPOT SHOOTING TEST**
Warm-up

Pre test warm up and test trials was given to the subjects.

Administration

The subject will be tested for the skill in shooting for each distance repeatedly. There will be three trials of 60 seconds each form distance namely three meters, four meters and five meters the first is practice trial and the next two are recorded. Performer may stand behind any marking ‘A’ or ‘E’. on the signal ‘GO’ performer will shoot in the fashion by following the spots ABCDE or EDCBA reverse from same distance spots.

One foot must be behind the marker during each attempt. On the signal, the subject will shoot, retrieve the ball, dribble to the next designated spot and shoot.

A maximum of four lay up spots may be attempted during each trial but no two successive lay up shot attempts are to be made. The performer must attempt at least one shot from each designated spot.

Rest

30 seconds to one minute was given for rest.
Scoring

Including lay-ups, each shot are awarded with two points, and for each unsuccessful shot the ball hits the rim were awarded with one point. Score for shooting recorded as speed spot shooting from spot one, two, three at the distance of three meters, four meters, and five meters respectively.

Violations / Penalties

1. Ball handling infractions (traveling, double dribble etc.) shots attempted following violations will be scored as zero points.

2. Two lay-ups in succession (second lay up scored as zero point)

3. More than four attempts at lay ups (all excessive lay-ups scored as zero points)

4. Failure to shoot from each of the five designated spots (repeat trial).

3.12.2 FOOTBALL SKILLS

3.12.2.1 PASSING (Football)

Purpose

To assess the passing ability.

Equipments Used

Footballs and cones.
Marking

Marking is given in the Figure VI.

FIGURE VI
FLOOR MARKING FOR PASSING

Procedure

The subject received an incoming ball along the ground by foot, passed by a server. Then the subject passed the ball to a passage in between the cones. The subject passed the ball immediately after receiving with a turn and not crossed the line before passing the ball. When the ball was not served properly, the attempt was repeated. Three attempts were given continuously.

Scoring

The tester judged the perfection of receiving. Two points were awarded when the subject received and passed the ball perfectly. One point was awarded when the subject performed any one perfectly.
3.12.2.2 DRIBBLING (Football)

Purpose

To assess the dribbling ability with speed and perfection.

Equipments Used

Football, cones, stopwatch and whistle.

Marking

Marking is given in Figure VII.

FIGURE VII

FLOOR MARKING FOR DRIBBLING

Procedure

The subject dribbled the ball from the starting point in forward direction and continued the zig-zag dribbling still the last cone and returned back to starting point in the same way. Three attempts were given with adequate rest in between.
Scoring

The time taken to complete the course was recorded to the nearest seconds. The best of three attempts was the final score.

3.12.2.3 SHOOTING (Football)

Purpose

To assess the shooting accuracy over a long distance.

Equipment Used

Football

Marking

Marking is given in Figure VIII.

FIGURE VIII
FLOOR MARKING FOR SHOOTING

Procedure

The subject kicked the ball from its dead position on the line into a circle of 2 meters radius marked on the floor in the middle of a square target area of 10 x 10 meters. The distance between the line and the centre of the circle was 35 meters. The subject had a trial attempt first. Three kicks were given continuously.
Scoring

When the ball landed inside the circle or on its circumference 3 points were awarded. When the ball landed elsewhere inside the square one point was awarded. The total of three kicks was the final scored.

3.12.3 HOCKEY SKILLS

3.12.3.1 PASSING (Hockey)

Purpose

To test the passing ability of an individual

Equipment

Hockey stick for each participant
5 match balls
Stop watch
12 Flags, Score sheets, Whistle

Field Marking

A straight line of 10 feet length was marked as a straight line. Perpendicular line of 30 feet is marked from the center point of starting line. Two flags are placed on the perpendicular line of the distance of 15 feet and 20 feet. A line of 10 feet length is marked parallel to the starting line at the 30th feet, from the starting line. This is called passing end line.

A semi circle is marked from the center of passing end line with radius of 5 feet, facing starting lines. This semi circle called as caution area for passing.
Five target zones are marked 30 feet away for the center of passing and line at 45°, 90°, 135° and 180° respectively.

**Fouls**

It was treated as foul if:

1. the subject dogged before crossing 1st flag

2. the subject collects the ball before crossing II Flag and without crossing field line.

3. the subject pass before entering the passing areas or while crossing the passing area.

4. ball does go in between marking zones along the ground.

**Figure IX**

**Showing Hockey Passing Test**

3.12.3.2 DRIBBLING TEST IN HOCKEY

**Purpose of the test**

To measure the dribbling speed of an individual. To determine how fast an individual can dribble the ball in between the flags with a good control over the ball.
**Equipment**

A hockey stick to each participant, whistle, match ball, stop watch, nine flags, score sheets and pen.

**Field Markings**

A line of 10’ (feet) long is marked as the starting line.

Another line of 72’ (feet) perpendicular to the starting line from the centre of the starting line is marked.

Three parallel lines of 8’ long to the starting line are marked from the 8’, 40’ and 56’ towards the left side from the centre line.

One parallel line of 8’ long towards the right side of the centre line at the 16’ is also marked.

Flags are placed, at the end of each 8’ long line, 2nd, 16th, and 24th flags are placed at the end of 8’ long line on the left side of the centre line. The third flag is placed at the end of 8’ long line on the right side of the centre line and the 1st, 4th, 5th, 7th and 9th flags are placed at the centre line as shown in Figure. X
Administration of the Test

The subject was asked to stand behind the starting line on the right side and the ball is kept on the right side of the starting line. On the signal ‘go’ the subject was asked to dribble the ball in between the flags as fast as possible to cover the maximum number of flags within the given time of 30 seconds. Three trials were given to each individuals and the best was considered as the dribbling ability of an individual. The scores are presented in Appendices.

Scoring

The number of flags covered by an individual within 30 seconds was the score of an individual.

After crossing the last flag, that is the 9th flag, the subject was asked to come back on the same route as shown in the figure. When the subject crossed over the last flag, the 9th flag twice (up and down), it has to be counted / treated as 9 and 10. The same procedure was adopted when he crossed and went around the first flag again after one full circuit by following the same route again and it was counted as 18 and 19.
3.12.3.3 SHOOTING (Hockey)

**Purpose**
To test the shooting accuracy of an individual

**Field Markings**
Two flag posts of four feet high were placed on the goal line at a distance of one yard away from both the vertical goal post towards the centre of the goal. Shooting circle was marked as per the rules. The diagram of the field markings is shown in Figure XI.
Figure XI: Markings of Shooting Accuracy Test

Procedure

The subject was asked to keep the ball at the center of the starting line and to stand behind the starting line. On signal “Go”, the subject was asked to shoot at the target in between the flags. Two trials were permitted and there after the subject were asked to shoot five attempts.

Scoring

The points were given in the following manner for each trial.

1. If the ball hits / went through at the center of the goal two points are given.

2. If the ball hits/ went through at the left or right corner on either side of the center line, three points are given.
Two trials are given. Then the subject was asked to perform shooting accuracy test for five attempts. The final score was the total score of the five attempts which was considered as the shooting accuracy of an individual.

3.13 STATISTICAL TECHNIQUES

The primary purpose of this study was to standardize a battery of objective physical fitness tests and skill test to measure the physical fitness and skill proficiency for physical education course of Tamil Nadu Physical Education and Sports University. The standardized physical fitness and skill tests were tested for its reliability, validity and objectivity under different phases and the data were collected for statistical treatment. To arrive at meaningful statistics the following statistics were computed.

3.13.1 DESCRIPTIVE STATISTICS

The mean and standard deviation for the physical fitness tests and playing abilities of basketball, football and hockey were assessed subjectively, and the scores of standardized tests were calculated separately.

3.13.2 CORRELATIONAL ANALYSIS

Simple correlation was computed to analyze the following aspects.
a. To examine the relationship between the test – retest scores of each test and thereby establish the intra class reliability of the tests standardized.

b. To examine the relationship between the investigator’s scores and expert’s scores of each test and thereby establish the inter rater reliability of the skill test constructed. (Aggerwal, 1990)

3.13.3 MULTIPLE REGRESSION ANALYSIS

Multiple regression analysis was made for the following purposes:

a. To examine the relationship between the subjectively assessed athletic ability of the subjects with scores of the physical fitness tests standardized and thereby establish criterion related validity of the skill tests constructed.

b. To examine the relationship between the subjectively assessed playing abilities of the subjects with scores of the skill tests standardized and thereby establish criterion related validity of the skill tests constructed.

c. To examine the relationship between the scores of different age groups and thereby establish construct related validity for the physical efficiency and skill tests standardized.
3.13.4 COMPUTATION OF NORMS

Norms were computed based on each physical fitness and skill tests standardized and the subjects were classified according to their ability, thereby establishing the objectivity of the skill tests constructed. (Philips and Hoenak, 1979).