CHAPTER III

METHODOLOGY & PROCEDURE
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METHODOLOGY AND PROCEDURE

Research methods are of utmost importance in a research process. They describe the various steps of the plan of attack to be adopted in solving a research problem, such as the manner in which the problems are formulated, the definition of terms, the choice of subjects for investigation, the validation of data gathering tools, the collection, analysis and interpretation of data and the processes of inferences and generalizations.

Procedure is to a research worker as tools are to a carpenter. Taking a specific, pin-pointed problem and trying to find a solution in a scientific manner to it, is a procedure of research.

The present chapter deals with the methods employed in the study and the procedures followed in order to accomplish the test battery construction. The study had two important phases. In the first phase a pilot study was conducted on the findings of which the data was collected for the main study in the second phase. The methods and procedure followed in both the phases have been presented as under.

3.1 FIRST PHASE OF STUDY – THE PILOT STUDY

3.1.1 DESIGN

The present study was descriptive in design. It focuses on the development of a handball skill test to assess handball playing ability of university level handball players.
3.1.2 SAMPLE

Sampling is an indispensable technique of research studies. It is a process by which a relatively small number of individuals, objects or events are selected and analyzed in order to find out something about the entire population from which it is selected. The research work cannot be undertaken without the use of sampling. The chosen sample should always be representative of the entire population from which it is selected.

Mouly (1994) said, “In the strict sense of the term, a representative sample should be a miniature replication of the population, at least with respect to the characteristics under investigation, if not in all respects.”

The present study was completed in two phases. For the pilot study phase, twenty Subjects were the probable players of Panjab University Campus Handball Team. These subjects were selected by using purposive sampling technique. Purposive sampling is used for validation of a test or instrument with a known population. As the purpose of the investigator was to construct a skill test battery for University level handball players, the Population under study was highly unique and representative of the population for which the skill test battery was to construct.

According to Shaw (1998) “If there are evidences to indicate that a particular section or stardom faithfully represents the entire population in respect of the property under study, random sampling method may be applied to only that section or stardom of the population for drawing the sample.
In the second phase of study, one hundred and twelve subjects were purposely selected from seven universities of Punjab, Himachal Pradesh, Haryana and Delhi namely Panjab University Chandigarh, Punjabi University Patiala, Guru Nanak Dev University Amritsar, Punjab Agriculture University Ludhiana, Himachal Pradesh University Shimla, Chaudhari Devi Lal University Sirsa Haryana and Delhi University Delhi for the standardization of handball skill test battery.

All these University teams participated in North East Zone and all India Inter-University Handball Championship in the session 2004-2005 at sports ground of Panjab University, Chandigarh. These seven teams comprised of sixteen members each thereby totaling the number of subjects to one hundred and twelve. But during the data collection two subjects did not take part in the evaluation process thereby leaving the investigator with the sample of one hundred and ten subjects for study.

3.1.3 TEST SELECTION

In order to select test items, the every possible care was employed. The investigator studied, extensively, the books related to handball, the journals, thesis and surfed different websites through internet but could not find any such type of readymade test item that was worth including in the process of measuring the skill ability of the potential handball player. Thus in scarcity of such test items, need was felt to design and develop the new skill test items to objectively measure the skill ability of handball player. The main idea, to develop these test items, was to make the tests as extensive as possible so that these could meet the criteria of the problem under study. For this purpose the investigator observed a
number of national and international level handball matches so that the most basic and frequently exhibited skill patterns could be identified. The services of one qualified handball coach and two senior handball players of national standard were taken for selecting the test items. The researcher himself being an Indian combined university level player involved himself in the process of devising skill test items.

After devoting a fair amount of time period in identifying skill pattern and having lengthy and healthy discussions with experts, it was found that the four skills namely basic defensive movement, passing, shooting, and dribbling were the fundamental skills constituting the game of handball. Therefore fourteen test items, for objectively measuring efficient and swift defensive movements to prevent the attacker from making moves; accurate speed passing; making accurate and forceful shots into the goal post, and dribbling the ball with speed; were devised to serve as tools to measure handball playing ability of the potential University level handball players and were named according to their attributes. These test items, to a greater extent, assess the proficiency in handball skills keeping in view the progression in the game.

Eckert (1974) examined the structure of test items used in sports skills and found that several basic formats appear frequently. These involve sports skill characteristics associated with the application of maximal force to and/or accuracy of projection of objects; control in receiving objects directed towards the individuals; and speed of body movement while controlling an object. Out of these fourteen test items devised for pilot study, two test items were to measure defensive movement of the players and
four test items each to measure passing, dribbling and shooting skills in order to serve as the basis for construction of handball skill test battery. The test items selected, on the basis of skill they measure, for pilot study have been presented in table 3.1

Table 3.1

TEST ITEMS DEvised FOR PILOT STUDY

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Factor measured</th>
<th>Test Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Defensive Movement</td>
<td>Diagonal Defensive Movement</td>
</tr>
<tr>
<td>2.</td>
<td>Defensive Movement</td>
<td>Rectangular Defensive Movement</td>
</tr>
<tr>
<td>3.</td>
<td>Speed Passing</td>
<td>20 Second Wall Pass</td>
</tr>
<tr>
<td>4.</td>
<td>Parallel Passing</td>
<td>10 meter Wall Pass</td>
</tr>
<tr>
<td>5.</td>
<td>Passing for Accuracy</td>
<td>15 meter Wall Pass</td>
</tr>
<tr>
<td>6.</td>
<td>Long Passing</td>
<td>22 Meter Floor Pass</td>
</tr>
<tr>
<td>7.</td>
<td>Low Dribbling</td>
<td>Right-Hand Low Dribble</td>
</tr>
<tr>
<td>8.</td>
<td>Low Dribbling</td>
<td>Left-Hand Low Dribble</td>
</tr>
<tr>
<td>9.</td>
<td>Control on Dribbling</td>
<td>Zigzag Dribble</td>
</tr>
<tr>
<td>10.</td>
<td>High Dribbling</td>
<td>15 Meter High Dribble</td>
</tr>
<tr>
<td>11.</td>
<td>Long Shooting</td>
<td>Front Shooting</td>
</tr>
<tr>
<td>12.</td>
<td>Shooting Accuracy</td>
<td>Penalty Shoot</td>
</tr>
<tr>
<td>13.</td>
<td>Shooting Accuracy</td>
<td>Turn-off and Shoot</td>
</tr>
<tr>
<td>14.</td>
<td>Jump Shoot High</td>
<td>Jump and Shoot</td>
</tr>
</tbody>
</table>

While administering the test items for pilot study, proper care was given to the feasibility of administering the tests. The written directions for test dimensions; markings, time allotments and the
scoring system were prepared in advance after finding the fourteen
test items satisfactory.

The scoring system of test items was prepared after going
through the methods employed by the different researchers. It was
found that in badminton and tennis, parts of the court are marked
off so that shots placed closer to a corner result in more points
awarded than shots landing slightly farther away from the corner
are lesser number of points. In some sports like basketball the goal
is fixed but the position is varied. In those situations the number of
successful shots is scored. Time may also be a factor such that the
most number of successful attempts in a certain number of
seconds. Therefore the test items pertaining to the dribbling and
defensive movement were measured in seconds as their unit while
the tests designed to determine the passing and shooting skills of
the subject were measured in number of successful attempts.

3.1.4 INSTRUMENT RELIABILITY

The instruments and tools used were of ISI mark. Measuring
tapes, stopwatches, handballs etc. were obtained from reputed
suppliers and were calibrated at the Department of Physical
Education, Panjab University, Chandigarh before the collection of
data. The instruments were considered reliable for the purpose of
this study.

3.1.5 TESTER'S COMPETENCY

The investigator, himself being an Indian Combined
University level handball player and junior Indian team probable,
was quite well acquainted with technique of conducting tests. However, before finally administering and measuring the test items, the investigator had a number of practice sessions in the testing procedure under the supervision of his supervisor to acquire proficiency in testing. But still it was felt that the tester's competency be established objectively. For establishing the tester's competency, ten inter collegiate players of Campus handball team of Punjab University Chandigarh were purposely selected. The investigator took the measurement on one test each from all four factors measured and correlated it with the raw scores of the same test items taken by the supervisor. (Appendix-A)

The coefficient of correlation of four test items establishing tester’s competency are presented in table 3.2.

**TABLE 3.2**

**THE COEFFICIENT OF CORRELATION OF TEST ITEMS ESTABLISHING TESTER'S COMPETENCY**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Test Item</th>
<th>Factor Measured</th>
<th>‘r’</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Diagonal Defensive</td>
<td>Defensive Movement</td>
<td>.65</td>
</tr>
<tr>
<td></td>
<td>Movement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>20 Second Wall Pass</td>
<td>Passing</td>
<td>.69</td>
</tr>
<tr>
<td>3.</td>
<td>Zigzag Dribble</td>
<td>Dribbling</td>
<td>.66</td>
</tr>
<tr>
<td>4.</td>
<td>Jump and Shoot</td>
<td>Shooting</td>
<td>.78</td>
</tr>
</tbody>
</table>
It is evident from table 3.2 that the tester was competent enough for administering and measuring the test items of different attributes. The coefficient of correlations between the measurements taken by tester and the supervisor on the same tests ranged from .65 to .78 thereby establishing the tester’s competency.

During the administration of test items on pilot study subjects, all the measurements were taken by the investigator himself with the assistance of qualified coaches, who were well trained and made familiar with the tests and testing procedures.

3.1.6 SUBJECT RELIABILITY

The same tester used the same subjects on all test items under similar conditions. No motivational techniques were used nor were the subjects given any training.

3.1.7 PROCEDURE FOR THE COLLECTION OF DATA

For collecting the data for pilot study, the investigator personally contacted the authorities of Panjab University Chandigarh before conducting the test items at sports ground of Panjab University and permission was sought. The manager and coach of the subjects under study were requested to help in the matter by acquainting their players with the purpose of the research study. The timings for the collection of data from the players were also fixed with them in advance taking into consideration their convenience. The morning session i.e. from 6
am to 8 am and evening session from 4.30 pm to 6.30 pm were preferred to conduct the tests. To facilitate data collection and to avoid any confusion, the data cards were prepared and were given to every subject during the administration of the tests. The data collection card used in pilot study is given at Appendix-B.

The collection of data in pilot study phase for fourteen skill test items was done in the month of September 2004. The data collected was treated statistically for establishing the reliability, validity and objectivity of the test items, the reliability of the subjects and the tester's reliability.

3.1.8 ADMINISTRATION AND DESCRIPTION OF TEST ITEMS

The help of qualified teachers and coaches was taken to mark the testing areas one day before the conduct of tests. The research Scholar sought the assistance and help of professional handball coaches to administer these tests. As the number of selected test items was large and to avoid the fatigue, boredom, injuries and to maintain the interest of subjects, investigator spent two days with the subjects and seven test items per day were administered during morning and evening sessions. Retests of all the test items were conducted after the gape of two days. The investigator assembled the subjects in a central place within the handball field and explained to them the various test items so that the subjects would form for themselves a mental picture of the various tests they are going to take. Questions on the part of student were allowed and the doubts were cleared.
The investigator demonstrated each test item to the subjects before the administration of each test. All the subjects were asked to go through proper warm-up at the beginning of each session. Adequate recovery time was provided to all subjects during testing. The subjects were asked to report in proper playing kit for the conduct of the test items. The researcher himself took all kinds of measurements carefully to maintain authenticity and accuracy of the measurements. The procedure applied for administering the test items has been presented in detail in the following paragraphs.

1) **DIAGONAL DEFENSIVE MOVEMENT**

The intention of this test was to establish diagonal defensive movement ability of the subject while defending the opponent. This type of movement pattern generally occurs while defending the left back, center back and right back.

**Requirements**

Smooth surface or handball playing field; five cones of 20" height, measuring tape, marking powder, two stop watches, three helpers; one at start line and one at finish lines and one to check the faults.

**Ground and target markings**

A course is marked with the help of lime powder by the six-meter line as shown in figure 3.1.
Figure 3.1 Path of Diagonal Defensive Movement Test
**Test Administration**

The subject was asked to make sideward sliding movements towards his left along the marked lines of the course (fig. 3.1). He was required to keep his left arm straight, vertical to his shoulder and right arm parallel to the floor in line with his shoulder up to the centre of the course and vice versa for the remaining part while completing the course. The subject was allowed to touch the cones anyway. The cross movement of the feet was not allowed while making sliding movements. On Signal ‘Go’ the subject starts the sliding movements to complete the course. The subject moves towards the cone ‘B’ crosses it from outside in order to move towards the cone ‘C’ placed at seven-meter line. The subject moves from in between the 6 meter restraining line and the cone ‘C’. Just as the subject crosses the cone ‘C’ he changes the position of his arms i.e. the right arm above the shoulder and vertical and left arm at shoulder height and parallel to the ground. The subject is required to continue his sliding movements until he crosses the cone ‘D’ from outside and then finishes his movements after crossing the finish line at cone ‘E’ from in between the nine meter free throw line and the cone ‘E’. The timekeepers took timings lapsed between ‘Go’ signal and the subject’s both feet crossing the finish line.

**Scoring**

The time taken to complete the course was recorded to provide the score of the test item. Two trials were given and the better was taken for analysis.
2) RECTANGULAR DEFENSIVE MOVEMENT

The purpose of this test was to determine rectangular defensive movement ability of the subject while defending the opponent.

Requirements

Smooth surface or handball playing field; four cones of 20" height, measuring tape, marking powder, two stop watches, two helpers; one at start and finish lines and other to check the faults.

Ground and target markings

A 4x3 meter rectangular course as shown in figure 3.2 was marked. Four cones were placed on four corners of the rectangle.

![Diagram of Rectangular Defensive Movement Test](image)

**Figure – 3.2 Path of Rectangular Defensive Movement Test**

Test Administration

The subject standing on the right side of the cone ‘A’ and facing towards cone ‘B’ was asked to make forward sliding movements towards cone ‘B’. Then he was required to cross the
cone 'B' from behind and move sideward towards the cone 'C' and then backward to cone 'D' by sliding towards his left and then turn around the cone 'D', where the finish line was marked, to complete the course. While making sliding movements the subject was required to keep his left arm straight, vertical to his shoulder and right arm parallel to the floor in line with his shoulder up to the centre of the course and vice versa for the remaining part while completing the course. The cross movement of the feet was not allowed while making sliding movements. The timekeepers took the timings lapsed between 'Go' signal and the subject's both feet crossing the finish line.

**Scoring**

The time taken to complete the course was recorded to provide the score of the test item. The each subject was given two trials after few rehearsals. The better of two attempts was recorded for evaluation process.

3) **20 SECOND WALL PASS**

This test item was designed with the purpose of measuring accuracy in handball speed passing of the subject.

**Requirements**

Equipments required for this item include four standard inflated men handballs, coloured adhesive tape for marking target area, marking powder for marking floor area, measuring tape, and a plain vertical wall of at least 3x2 meters.
Ground and target markings

A restraining line at a distance of 3.5 meter from a smooth-surfaced plain vertical wall was marked on the floor. A square target area of 45x45 centimeters was marked with the help of coloured adhesive tape on the wall at a height of 1.5 meters from the wall base.

Test Administration

The subject was asked to make maximum number of passes standing at any point/points in front of the target area from behind the restraining line in thirty seconds. He was specially instructed that only legal passes i.e. ball hitting within the boundaries of target area, will be counted. If the ball gets out of control, the
subject could retrieve the same ball or could get the spare ball placed with a helper.

On the signal “Ready - go”, the subject started passing the ball on to the target area and the stopwatches were started simultaneously and were stopped after the twenty second time period finished. The ball released before the end of the twenty seconds was also counted as score if it was a legal pass.

**Scoring**

The ball released before the call ‘Stop’ after the completion of twenty seconds, counts if the pass is legal. The number of the legal passes in twenty seconds gave the score of the test. Two trials were given and better one was considered the final score of the subject.

4) **10 METER WALL PASS**

This test was designed to determine the accuracy of the subject in middle distance passes.

**Requirements**

A plain vertical wall of at least 7x5 meters, standard inflated handballs, coloured adhesive tape for marking target area, two stopwatches, three helpers; one for counting the legal number of passes hitting the target, one for collecting the balls, and one for checking the violations made at the restraining line.

**Markings**

A 2x1 meter target was marked on the wall at a height of 1.5 meters from the wall base as shown in figure 3.4. Another seven-
meter wide Restraining line, having its center in line with the center of the target, is marked on the floor at a distance of ten meters from the base of wall.

![Diagram of 10 Meter Wall Pass Test](image)

**Figure - 3.4  10 Meter Wall Pass Test**

**Test Administration**

The subject, with a handball in his hand, standing behind the restraining line, started passing the ball against the wall on the signal “Go”, with an idea to pass every ball within the target area as rapidly as possible for twenty seconds. The subject was not allowed to cross or cut the restraining line. He was, however allowed to retrieve the ball if it did not rebound back properly. But he could
again pass it on the wall only behind the restraining line. The subject was also allowed to take spare balls placed with the helper. After 20 seconds tester gave the “stop” signal and stop watches were stopped simultaneously.

**Scoring**

The ball released before the call ‘Stop’ after the completion of twenty seconds, counts if the pass is legal. Each time the ball strikes the target area on the wall, within twenty seconds time period, scores one point. Each subject was given two trials of which better one was taken for evaluation.

5) **22 METER FLOOR PASS**

The test was constructed to gauge the ability of passing the ball accurately to a distant target. This sort of passes is generally used in counter-attacks (fast breaks) in a handball game.

**Requirements**

Smooth surface of at least 40x10 meters, Lime powder of good quality, six standard inflated handballs, Measuring tape, adhesive tapes of three colours for marking target area, two stopwatches, three helpers; two for retrieving balls, one and one for checking the violations made at the restraining line.

**Markings**

The test was conducted in a regulation handball court. The nine-meter free throw line of one half of the court served as the restraining line. A circular target having three circles of 1.5
meters, 1.25 meters and 1 meter (as shown in the figure 3.5) were marked at a distance of twenty two meters from the center of the nine-meter free throw line (restraining line) in the other half of the court between six-meter and nine-meter lines.

Figure - 3.5  22 Meter Floor Pass Test
The subject, standing behind the nine-meter restraining line was asked to make five passes to the hit target area. For passing he was allowed to use only overhand pass method. The touching or overstepping the restraining line was not allowed before the subject releases the ball for pass. But he was permitted to do so after releasing the ball in follow through.

**Scoring**

For each pass hitting inside the innermost circle, five points were awarded; hitting on its boundaries scored four points; for each ball hitting the middle circle three points, ball hitting on its boundaries, two points were awarded; and for each pass hitting inside outermost circle and on its border, one point was awarded. The total of the points earned in five throws were collected as the score of subject. Three trials were given and the best out of three was taken for scoring purpose.

6) **15 METER WALL PASS**

This test item measures the consistent and accurate distant passing ability of the subject.

**Requirements**

A plain vertical wall of about 6x4 meters size, adhesive tapes of different colours, measuring tape, three helpers; one for judging correct and legal throws, one for counting the number of throws and one for checking the violations at restraining line. (Fig. 3.6)

**Markings**
**Markings**

A rectangular target having three rectangles was marked on the wall as shown in Fig. 3.6 at a height of 1.5 meters from the floor. A restraining line was marked on the floor at a distance of fifteen meters from the wall base. Points are marked on the wall and are encircled so that the tester could identify the area with points clearly.

![Figure - 3.6 15 Meter Wall Pass Test](image-url)
Test administration

The subject was asked to make ten passes for hitting the target area from behind the restraining line. For throwing, the subject was allowed to use any type of passing skill. The cutting or overstepping the restraining line before releasing the ball was not allowed. However the subject was permitted to do so in follow through after releasing the ball.

Scoring

For each pass hitting inside the innermost circle, five points were awarded; hitting on its boundaries scored four points; for each ball hitting the middle circle, three points; ball hitting on its boundaries, two points were awarded; and for each pass hitting inside the outermost circle and on its border, one point was awarded. The total of ten trials was used for evaluation. Two trials were given to each subject and the better of the two was taken for evaluation of this test item.

7) LEFT-HAND Dribble

This test was designed to measure low-dribbling ability of the subject while using left hand. The low dribbling ability is very helpful to evade opponent during when the man-to-man marking strategy is employed by the opponent.

Requirements

Two well inflated standard men handballs, lime powder for marking floor area, two 20" cones, two stop watches, two helpers for checking violations; one at start/finish line, one at farther end near the cone, and a smooth floor area of at least 12x6 meters.
Markings

Two cones were placed on the floor at a distance of 7.5 meters from each other. Two lines; one at starting/finish point and other at the farther end, in line with the cones, were marked which were parallel to each other at a distance of 7.5 meters. The two cones were placed outside these lines. Lines were extended on both sides of the cones for about one meter on each side. (Figure 3.7).

Figure – 3.7 Left Hand Dribble Test
Test Administration

The subject, standing on the left side of the cone ‘A’ and behind the start line with a ball in his hand, was required to start on dribbling the ball by using left hand by keeping its bounce below the waist level. He was asked to dribble from one end of the starting line and was required to come back to the other end of the start/finish line after turning completely around the cone ‘B’ placed at farther end. He was allowed to use right hand for dribbling the ball only at the about-turn at the ‘cone ‘B’. The timekeepers took their timings lapsed between ‘Go’ signal and the subject’s both feet crossing the finish line.

Violations

(i) The traveling with the ball without dribbling and the holding of the ball during dribbling was considered as the faults and the subject was asked to restart the trial afresh.

Scoring

The time taken to complete the designated course was taken for evaluation. Two trails were given and the better timing out of two was taken as the score of subject.
8) **RIGHT-HAND DRIBBLE**

The purpose of this test was to rate low-dribbling ability, while using the right hand, of the subject in terms of time taken by them to perform the skill. The low dribbling ability is very useful when the aim is to dodge opponent during man to man marking being done by the opponent.

**Requirements**

Two inflated standard men handballs, two stop watches, lime powder for marking floor area, two 20” cones, two helpers for checking violations; one at start/finish line, one at farther end near the cone, and a smooth floor area of at least 12x6 meters.

**Markings**

Two cones were placed on the floor at a distance of 7.5 meters. Two lines; one at starting/finish point and other at the farther end, in line with the cones, were marked and were parallel to each other at a distance of 7.5 meters. The two cones were placed outside these lines. Lines were extended on both sides of the cones for two meters on each side. (Figure 3.8).
Figure - 3.8 Right-Hand Dribble Test
Test Administration

The subject standing on right side of the cone 'A' and behind the start line, with a ball in his hand, was asked to begin dribbling the ball with right hand by keeping its bounce below the waist level, from one end of the starting line and was required to come back to the other end of the start/finish line after turning completely around the cone 'B' placed at farther end. He was allowed to use left hand for dribbling the ball only at the about turn at the cone 'B'. The timekeepers took their timings lapsed between ‘Go’ signal and the subject’s both feet crossing the finish line.

Violations

(i) The traveling with the ball without dribbling and the holding of the ball during dribbling was considered as the faults and the subject was asked to restart the trial afresh.

Scoring

The time taken to complete the designated course was taken for evaluation. Two trails were given and the better timing out of two was taken as the score of subject.

9) 15 METER HIGH DRIBBLE

The purpose of this test item was to determine the high dribbling ability of the subject. This kind of dribbling is generally used in counter-attacks (fast breaks) in a handball game.
**Requirements**

Smooth surface of at least 15 meters long and 5 meters wide or handball playing field, two handballs, two cones, measuring tape, marking powder, two stop watches, two helpers; one at starting line and other at the farther end to check the faults.

**Markings**

Two straight lines, parallel to each other at a distance of 20 meters, are marked on the handball playfield or any other smooth surface. While conducting the test on a handball field, the straight part of six-meter line can be used as one of the restraining line. Both the lines should be of three-meter width. Two cones are placed at the center of each line. (Figure 3.9)

**Test Administration**

The subject was asked to dribble the ball to complete the course as soon as possible. He was allowed to use any hand or both hands. On the signal ‘Go’ the subject started dribbling the ball from cone ‘A’ towards cone ‘B’. At cone ‘B’ the subject turned around the cone and returned to start/finish line. He was allowed to start from any side of the cone placed at start/finish line. The timekeepers took their timings lapsed between ‘Go’ signal and the subject’s both feet crossing the finish line.
Figure – 3.9  15 Meter High Dribble Test
Violations:

(i) The traveling with the ball without dribbling and the holding of the ball during dribbling were considered as the faults and the subject was asked to restart the trial afresh.

Scoring:

The each subject was given two trials. The better timing of two attempts was recorded for evaluation process.

10) ZIGZAG DRIBBLE

This test item was designed with the purpose of measuring ball handling ability level of the subject while dribbling in a zigzag manner.

Requirements:

Smooth surface of at least 15 meters long and 5 meters wide or handball playing field, two handballs, six cones, measuring tape, marking powder, two stop watches, two helpers; one at starting line and other to check the faults.

Markings:

First cone was placed on the center of a four-meter line. Second cone was positioned in a straight line and in line with the first cone at a distance of 2 meters. The remaining cones were kept in line with the cones with a distance of 1.5 meter in between them.

Test Administration

The subject was required to complete the course by dribbling in a zig-zag manner by passing each cone alternatively on the right and left sides, approaching the first cone on the opposite side of the starting point and by turning around at the fifth cone as shown in
Figure - 3.10 Zigzag Dribble Test
Fig. 10. The course was reversed for the left handed subjects. On the signal ready, 'Go'; the subject started dribbling to complete the course. The subject was allowed to use any hand for dribbling & was also allowed to employ any skill of dribbling. The timekeepers took their timings lapsed between 'Go' signal and the subject’s both feet crossing the finish line.

**Violations**

(i) The traveling with the ball without dribbling and the holding of the ball during dribbling were considered as the faults and the subject was asked to restart the trial afresh.

**Scoring**

The time taken to complete correct dribbling along the designated course was recorded as the score of the subject. Two trials were given and the better one was taken for scoring purpose.

**11. FRONT SHOOTING**

This test team was aimed to assess the shooting efficiency of potential handball player from left back and right back positions.

**Requirements**

A vertical and smooth wall of 6x4 meters, adhesive tapes of different colours to mark the goal post area and to mark the different scoring zones, ten standard men handballs, two stop watches, and three helpers; one for passing the ball to the subject,
one for operating stop watch and one for counting scores. The other stopwatch was operated by the investigator himself.

**Markings**

A standard goal post area was marked at the wall with the adhesive tape. It was further divided in different scoring zones with the help of coloured tape of different colours. The points for respective zones were marked on the designated areas. Two arched restraining line, each one of them two meters wide, were marked on the floor at a distance of one meter from the 6 meter line. Two more Restraining lines (arched) were marked at a distance of 4 meter and parallel to the former restraining lines at the left back and right back positions. (Figure 3.11)

**Test administration**

The subject was asked to shoot at the goal post area with an idea to get maximum points. The balls were kept on the palm of the helper at a height that was convenient for the subject for picking ball. The each player was given ten attempts; five attempts from the left back and five from the right back positions were to be made. The subject received the ball from the common helper, jumped and shoot from in between the restraining lines. He was allowed only to land between these restraining lines.
Figure - 3.11 Front Shooting Test
**Scoring**

For hitting inside the four corners; five points were awarded for the balls hitting the farther corners of the target area whereas the balls hitting the nearest corners were awarded three points. The shots hitting on the boundaries of the scoring zones were awarded the points corresponding to that zone. The balls hitting on the goal post lines were awarded no points. The total of the points of all valid attempts were taken as the score of the subject. Two trials were allowed and the best was taken as the score of the subject on this test.

12) **PENALTY THROW**

This test was designed with a purpose of measuring shooting accuracy of the subject.

**Requirements**

A smooth surfaced vertical wall of at least 6x4 meters of size, 6 well inflated men handballs, adhesive tapes of different colours, two helpers; one to collect the ball and other to check violations at seven-meter line.

**Markings**

The goal post was divided into nine scoring zones as shown in the figure 3.12. Maximum five points were awarded to the balls hitting in between the zones at all the four corners of the post.
The subject was given ten attempts from seven-meter penalty throw line. He was allowed to use any technique of penalty throw provided he didn’t cut the penalty throw line or drag the shooting foot or lift the shooting foot before releasing the ball. He was required to shoot the balls in a manner that the first two attempts
into the right part followed by two into the left part and one as the subject wishes. The same pattern was asked to repeat for remaining five throws. The purpose of the subject was to make maximum number of correct throws in the designated areas for earning maximum points on test. On signal 'Ready', the subject picked the ball kept on nine-meter free throw line and stood behind the seven-meter penalty throw line. A whistle was blown by the investigator and the subject started throwing the ball at the target in a manner mentioned above.

**Scoring**

Points, as per markings on the target area were awarded on all legal throws. The balls hitting on the boundaries of the scoring zones were awarded the points corresponding to that zone. The balls hitting on the goal post lines were awarded no points. The total of the points on all valid attempts were taken as the score of the subject. Two trials were given and the best one was selected for evaluating purpose.

**13) TURN-OFF AND SHOOT**

This test was designed to determine the skill ability of the subject in turning-off and shoot accurately at the target.

**Requirements**

Standard goal post area marked at a plain vertical wall of 6x4 meters, adhesive tapes of different colours, and ten well-inflated men handballs.
**Ground and target markings**

The standard goal post area was marked on the wall with the help of adhesive tape. The goal post area was further divided into nine zones into which points were written boldly with the help of chawk. A seven-meter penalty throw line was marked. A six-meter line was also marked and was considered as the restraining line. (Figure 3.13)
Test Administration

The subject was asked to stand at seven-meter line with his back towards the goal post area. On the signal 'Go' the ball was passed to him by the expert at chest level but towards the left or right side of the subject. The subject received the ball and turned-off from the opposite direction in order to shoot at the target. The subject after receiving the ball on his left side turned off from his right on first pass and then vice-versa on the second pass. This practice continued for ten trials i.e. the subject making the shots from alternate sides. Therefore five attempts from left side and five from right side were made by the subject. He was required to fall on the ground in follow-through after every attempt.

Violations

Touching or over-stepping the six-meter line was considered as violation and the attempt was awarded no score for such shot made.

Scoring

The subject was awarded point as shown in figure 3.14. The balls hitting on the boundaries of the scoring zones were awarded the points corresponding to that zone. The balls hitting on the goal post lines were awarded no points. The total of the points of all valid attempts were taken as the score of the subject. The points earned on all legal shots were totaled and were taken as the score of the subject. Two trials were given and the better out for two was taken for evaluation purpose.
14) JUMP AND SHOOT

The purpose of this test was to evaluate the accuracy in shooting the ball in pre-decided area.

**Requirements**

A smooth surfaced vertical wall of at least 6x4 meters of size, 6 well inflated men handballs, coloured adhesive tapes, two hurdles of one foot height, two helpers; one to collect the ball and other to check violations at restraining line.

**Ground and target markings**

The standard goal post area was marked on the wall with the help of coloured adhesive tapes as shown in figure 3.14. The goal post area was divided into nine scoring zones into which points were written boldly with the help of marker.

**Test Administration**

The subject standing behind the hurdle with his face towards the goal post was asked to make jump shots by jumping on any leg from one side of the hurdle and landing on the other side. He was required to come back as rapidly as possible behind the hurdle to make the next attempt. The aim was to make maximum number of accurate and valid shots in twenty-second period. On the signal ‘Go’ the first ball was passed to the subject by a common helper at chest height and the stopwatch was started simultaneously. It was
ascertained that the speed of the ball passed to the subjects remain same for all the subjects. The right-handed subjects made their attempts from the left back position while the subject with left hand being their dominant hand made the attempts from right back position.
Scoring

For the balls hitting inside the four corners; 5 points were awarded for the balls hitting the farther corners of the target area whereas the balls hitting the nearest corners were awarded 3 points. The valid shots hitting in the scoring zone or on its boundaries were awarded points as mentioned in figure 13. The shots hitting on the boundaries of the scoring zones were awarded the points corresponding to that zone. The balls hitting on the goal post lines were awarded no points. The total of the points of all valid attempts were taken as the score of the subject. The total points earned in all legal shots in 20 seconds were totaled and served as the score of the subjects. Two trials were given and the better one was counted for evaluation.

3.1.9 RELIABILITY OF THE PILOT STUDY TEST ITEMS

Guttmann split-half reliability method was applied to establish reliability of the test items. The obtained test scores of twenty subjects on all test items were split into two halves (Appendix- C) by applying even-odd method and were correlated.

3.1.10 OBJECTIVITY OF PILOT STUDY TEST ITEMS

The test-retest procedure takes into account errors of measurement resulting from differences in conditions associated with the two occasions on which the test is administered. The same students served as subjects during tests and retests to find out correlation between the two test-samples to establish the objectivity of test items. The objectivity of the test items was established as a
qualified handball coach conducted the retests after a gap of two days as the differences between the conditions of the administration were likely to be greater after a long time interval than short one.

The raw scores collected thus were treated with Cronbach’s alpha reliability analysis. Cronbach’s alpha is a test for a model internal consistency called a scale reliability coefficient sometimes.

### 3.1.11 VALIDITY OF THE PILOT STUDY TEST ITEMS

The data collected for pilot study was subjected to Spearman’s rank correlation method for establishing the validity of the pilot study test items. The twenty subjects of pilot study were rated by an expert. These evaluations were done by an expert through observing the performance of the subjects in the real game situations.

According to Johnson and Nelson (1986) “the experts must be selected with care, but at the same time the services of nationally known figures are not needed for this purpose. To illustrate, if the test item pertains to performance in basketball, coaches could certainly be considered qualified to rate skills provided ample opportunity is allowed of observation of each student.” The subjects were assigned ranks from one to twenty on the basis of their general handball playing ability. The expert was technically authority in handball and was also serving as selector of state and university teams for considerable time period.
Eckert (1974) suggested that, “judges’ ratings are among the most widely used criteria for evaluating validity skill tests for team Sports”.

The scores obtained by the subjects on all the fourteen test items were also given ranks to simplify the process of calculating coefficient of correlation to establish validity of the test items.

3.1.12 IDENTIFICATION OF TEST ITEMS FOR HANDBALLSKILL TEST BATTERY

All studies reviewed adopted different types of Statistical techniques to construct sports skill tests. The data collected in the pilot study was analyzed through factor analysis. The principal component method of factor analysis was employed to identify the test items to be included in test battery for university level handball players. The results of factor analysis suggested four skill test items namely 20 second wall pass, 15 Meter High Dribble, Front Shooting and 22 Meter Floor Pass, for inclusion in Handball Skill Test Battery.

3.2 SECOND PHASE OF STUDY – THE MAIN STUDY

In the second phase of study, the developed test battery was administered to 110 subjects purposely selected from seven universities of Punjab, Himachal Pradesh, Haryana and Delhi namely Panjab University Chandigarh, Punjabi University Patiala, Guru Nanak Dev University Amritsar, Punjab Agriculture University Ludhiana, Himachal Pradesh University Shimla, Chaudhari Devi Lal University Sirsa Haryana and Delhi University Delhi.
According to Scott and French (1959), “The subjects used in the development of a new test or battery of tests should be a representative of the population for which the instrument is designed. There is no magical number, which can be given as the one, which will give satisfactory results in all studies.”

All these University teams participated in North East Zone and All India Inter-University Handball Championships in the session 2004-2005 at the sports ground of Panjab University, Chandigarh. These seven teams comprised of 16 members each thereby totaling the number of subjects to 112. However, during the data collection two players did not take part in the evaluation process thereby leaving the investigator with 110 subjects for study.

3.2.1 COLLECTION OF DATA

During the second phase of study, the researcher had widened his area for collecting data from universities of Punjab, Haryana, Delhi and Himachal Pradesh. The research scholars himself approached the coaches and the managers of various teams under study and seek cooperation in collecting data by sparing the subjects for taking tests. They assured maximum help in this regard. The timings were again fixed with discussions with the coaches and the managers of the teams as well as with the players. The investigator conducted the tests on two teams at a given time and retests after two days. The investigator tried to stick to the same timings for test-retest administration and administered the tests at same place where no distraction could be caused. For
keeping record of the data collected, data collection cards were prepared afresh for main study. (Appendix-D)

Before the commencement of each test item, the researcher himself gave demonstration of the test item in order to make the players well informed about what was to be done. To yield better results the researcher asked all the subjects to compete between them for better performance and asked them to back-up for the subjects taking test. Thus, game-like anxiety was tried to be created in order to justify this essential requirement of sports skill testing. The order of taking tests was reversed during retests to avoid monotony. The procedure for administering the selected test battery items and the scoring system remained same as was in pilot study. The raw data collected in second phase (Appendix - E (i) and E (ii)) was statistically treated to obtain reliability of the test items and to construct T-scales in order to prepare norms for the construction of handball skill test battery.

3.3 STATISTICAL PROCEDURE

Raw scores have no meaning by themselves unless some statistical techniques are employed to interpret the data collected as a result of the investigation. Therefore data collected, during pilot study and during main study, were statistically analyzed.

3.3.1 STATISTICAL TECHNIQUES USED IN THE DEVELOPMENT OF SKILL TEST BATTERY

The statistical techniques applied, for analyzing and interpreting the data collected in pilot study, were as follows: -

i) **Descriptive statistics**
Descriptive statistics such as mean, standard deviations were used to ascertain the nature of distribution of scores.

**ii) Coefficient of correlation**

To ascertain the tester's competency and to establish objectivity of the test items Cronbach's alpha reliability analysis was employed. Reliability of the test items was established by Guttman's Split-half method. Spearman's Rank Correlation method was used to establish validity of the test items. To study the relationship between 14 test items, intercorrelation matrix was obtained by applying Pearson's Product Movement Method.

**iii) Factor analysis**

To select the test items out of fourteen variables, best suited to measure the handball playing ability, factor analysis technique was used.

Among 14 variables a matrix of intercorrelation was obtained by applying Pearson's Product Movement method.

The scree test devised by Catell (1966) was applied to select the principal component for further rotation.

For rotated factors, **Kaiser's Varimax Criterion** (1958) was used.

The rotation matrix was used for interpretations as recommended by Comrey (1973) to extract test items for handball skill test battery.
3.3.2 STATISTICAL TECHNIQUES USED IN STANDARDIZATION OF SKILL TEST BATTERY

The statistical techniques used to standardize the test battery were as follows:

i) Mean and Standard deviation

In order to prepare norms for University level handball players, descriptive statistics such as mean and standard deviations were computed.

ii) Coefficient of correlation

The reliability of the test battery items was established by applying two methods of obtaining coefficient of correlation. Firstly, the scores of test and retests were correlated utilizing Cronbach’s alpha reliability analysis. Reliability of the test items was also established by Guttman’s Split-half method.

All statistical analysis were got done on VAX-8350 Computer system of Department of Computer Science and application, Panjab University. Chandigarh.