This chapter details the methodology adopted for this study. The chapter is organized in sections covering:

i. Selection of Subjects

ii. Selection of Variables

iii. Administration of Test

iv. Collection of Data

v. Design of the Study

vi. Statistical Techniques Employed
SELECTION OF SUBJECTS

For the purpose of the present study, One Hundred Two (N=102), Female University Level Handball Players between the age group of 18-25 years (Mean ± SD: age 23.15±1.98 years, height 176.35±5.17cm, body mass 67.87±7.15kg) were selected. A purposive sampling technique was used to select the subject for the study. The players in the teams who participated in the Inter-University handball women championship of Punjab University Chandigarh, Punjabi university Patiala, Guru Nanak Dev University Amritsar, Kurkshetra University Kurkshetra, M.D University Rohtak, Delhi University Delhi, Himachal Pardesh University Shimla and P.A.U University Ludhiana were considered. These universities had participated in the Inter-University tournament from 18-09-2010 to 22-09-2010 held at Noida College of Physical Education Dhoon Manikpur Dadri Ghaziabad Chadhury Charan Singh Meerut. There were one hundred twenty eight players in eight teams. In additions to these players’ other players from other teams selected for Indian University coaching camp at G.N.D. University, Amritsar camps were also considered as subjects. Because of injuries to certain players during Inter-College competitions as well as medical problems and other players who could not appear in the test for data collection purpose were dropped. Under the circumstances total 102 players were considered fit to act as subjects for collection of data. The subjects were purposively assigned into following groups:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Subjects</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Punjabi University, Patiala</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>Panjab University, Chandigarh</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>Guru Nanak Dev University, Amritsar</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>Kurkshetra University, Kurkshetra</td>
<td>14</td>
</tr>
<tr>
<td>5</td>
<td>M.D University, Rohtak</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>Delhi University, Delhi</td>
<td>12</td>
</tr>
<tr>
<td>7</td>
<td>Himachal Pardesh University, Shimla</td>
<td>10</td>
</tr>
<tr>
<td>8</td>
<td>P.A.U University, Ludhiana</td>
<td>10</td>
</tr>
</tbody>
</table>
SELECTION OF VARIABLES

A feasibility analysis as to which of the variables/skills could be taken up for the investigation, keeping in view the availability of tools, adequacy to the subjects and the legitimate time that could be devoted for tests and to keep the entire study unitary and integrated was made in consultation with experts. With the above criteria’s in mind, the following Anthropometric Variables, Physical Fitness Variables and Skill Variables were selected for the present study:

- **ANTHROPOMETRIC VARIABLES**
  i. Age
  ii. Height
  iii. Weight
  iv. Shoulder width
  v. Biacromion width
  vi. Arm length
  vii. Upper arm length
  viii. Fore-arm length
  ix. Leg length
  x. Calf circumference
  xi. Sitting height
  xii. Supra-iliac skin fold
  xiii. Thigh skin fold
  xiv. Sub scapular skin fold
  xv. Calf skin fold
  xvi. Bicep skin fold
  xvii. Tricep skin fold

- **PHYSICAL FITNESS VARIABLES**
  i. Speed
  ii. Agility
  iii. Power of arms
  iv. Power of legs
  v. Cardio vascular endurance
  vi. Grip strength
• **SKILL VARIABLES**
  i. Dribbling
  ii. Passing
  iii. Handball throw for distance
  iv. Throwing ability:
      a. Dominant hand
      b. Non-dominant hand
  v. Throwing accuracy
  vi. Defensive movements

• **DEPENDENT VARIABLES**

  Overall playing ability performance was worked out by applying three judges rating scale.

**SELECTION OF MOTOR SKILL VARIABLES**

Out of six motor skill variables the expert considered only three handball motor skill tests on handball players. These tests are:

1. Handball throw for distance: Handball throw
2. Throwing accuracy: Service placement test
3. Throwing ability: Wall-volley test

The remaining three tests listed below were picked up from the game of basketball to measure the motor skills of handball players.

1. Dribbling: - AAHPERD control dribble test item.
2. Passing: - AAHPERD passing test item.

Since the movements of handball and basketball players are identical in these motor skills, therefore the standardized tests to measure these motor skills in basketball game could be easily adopted to measure the motor skill of handball players. The recommended procedure adopted to measure the motor skills of dribbling, passing and defense of handball players which is used for basketball players.

These tests were applied on 12 basketball and 12 handball players. The relationship between two sets of scores was obtained.
The results are given below:

**Table 3.1**: Relationship between motor skill test of basketball (n=12) and handball players:

<table>
<thead>
<tr>
<th>Motor skill tests</th>
<th>r-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Dribbling</td>
<td>.822</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>2 Passing</td>
<td>.725</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>3 Defensive movements</td>
<td>.758</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

The results shown in table 3.1 indicated significant positive relationships, which meant that these tests could be successfully applied on basketball as well as handball players. To analyze the performance of these variables the following measurements were taken as mentioned against each one of them were conducted:

**A: Anthropometric Measurement**

1. Age: Chronological age
2. Height: Centimetre
3. Weight: Kilogram
4. Shoulder Width: Millimetre
5. Biocromion Width: Centimetre
6. Arm Length: Centimetre
7. Upper Length: Centimetre
8. Fore Arm Length: Centimetre
9. Leg Length: Centimetre
10. Calf Circumference: Centimetre
11. Sitting Height: Centimetre
12. Supra-iliac Skin Fold: Millimetre
13. Thigh Skin Fold: Millimetre
14. Sub-scapular skin fold: Millimetre
15. Calf skin fold: Millimetre
16. Bicep Skin Fold: Millimetre
17. Tricep Skin Fold: Millimetre

**B. Motor Fitness Tests**

1. Speed:
   i) 50 mts. Sprint
   ii) 30 mts. Sprint
2. Agility:
   i) Shuttle Run
   ii) Zigzag Run

3. Power of Arms:
   i) Hand ball Throw
   ii) Pull Ups

4. Power of Legs:
   i) Standing Broad Jump
   ii) Sargent Jump

5. Cardio-Vascular Endurance
   i) 12 Minute running/walk

6. Grip Strength:
   i) Measured in kilogram with Dynamometer

C. Motor Skill Tests
   1. Dribbling: AAHPERD Control Dribbling Test Item
   2. Passing: AAHPERD Passing Test Item
   3. Defense: AAHPERD Defensive Movements Test Item
   4. Throwing Accuracy: Service Placement Test
   5. Throwing Ability: Wall Volley Test
   6. Handball Throw for Distance: Handball Throw

Reliability of Instruments

The instruments have been obtained from the standard firm, duly certified by the firm that the instruments were reliable; however the instruments were calibrated before their use.

Reliability of Tester and Data

Test and retest method was used to established the reliability of the tester and data together by repeated test measures by the same individual. The reliability of coefficient of test retest score is given below:
Table 3.2: The reliability coefficients of test re-test score of anthropometric variables

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Anthropometric Variables</th>
<th>Reliability Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Age</td>
<td>.927</td>
</tr>
<tr>
<td>2.</td>
<td>Height</td>
<td>.897</td>
</tr>
<tr>
<td>3.</td>
<td>Weight</td>
<td>.978</td>
</tr>
<tr>
<td>4.</td>
<td>Shoulder width</td>
<td>.850</td>
</tr>
<tr>
<td>5.</td>
<td>Biacromion width</td>
<td>.755</td>
</tr>
<tr>
<td>6.</td>
<td>Arm length</td>
<td>.945</td>
</tr>
<tr>
<td>7.</td>
<td>Upper arm length</td>
<td>.974</td>
</tr>
<tr>
<td>8.</td>
<td>Fore arm length</td>
<td>.959</td>
</tr>
<tr>
<td>9.</td>
<td>Leg length</td>
<td>.755</td>
</tr>
<tr>
<td>10.</td>
<td>Calf-Circumference</td>
<td>.986</td>
</tr>
<tr>
<td>11.</td>
<td>Sitting height</td>
<td>.953</td>
</tr>
<tr>
<td>12.</td>
<td>Supra-iliac skin fold</td>
<td>.927</td>
</tr>
<tr>
<td>13.</td>
<td>Thigh skin fold</td>
<td>.835</td>
</tr>
<tr>
<td>14.</td>
<td>Sub-Scapular skin fold</td>
<td>.941</td>
</tr>
<tr>
<td>15.</td>
<td>Calf skin fold</td>
<td>.864</td>
</tr>
<tr>
<td>16.</td>
<td>Bicep skin fold</td>
<td>.851</td>
</tr>
<tr>
<td>17.</td>
<td>Tricep skin fold</td>
<td>.923</td>
</tr>
</tbody>
</table>

Table 3.3: The reliability coefficient of test re-test scores of motor fitness variables:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Motor Fitness Variables</th>
<th>Reliability Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Speed:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) 50-Metre sprint</td>
<td>.798</td>
</tr>
<tr>
<td></td>
<td>ii) 30-Metre sprint</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Agility:</td>
<td>.980</td>
</tr>
<tr>
<td></td>
<td>i) Shuttle run</td>
<td>.945</td>
</tr>
<tr>
<td></td>
<td>ii) Zigzag run</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Power of arms:</td>
<td>.998</td>
</tr>
<tr>
<td></td>
<td>i) Hand ball throw</td>
<td>.925</td>
</tr>
<tr>
<td></td>
<td>ii) Pull ups</td>
<td></td>
</tr>
</tbody>
</table>
4. **Power of legs:**
   - i) Standing broad jump
   - ii) Sargent jump
   - reliability coefficient: .913 .836

5. **Cardio-Vascular Endurance**
   - i) 12 minute run/walk
   - reliability coefficient: .910

6. **Grip strength:**
   - i) Dominant hand grip strength
   - ii) Non-dominant hand grip strength
   - reliability coefficient: .891 .936

Table 3.4: Reliability coefficient of test re-test scores of motor skill variables:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Motor Skill Variables</th>
<th>Reliability Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Dribbling</td>
<td>.927</td>
</tr>
<tr>
<td></td>
<td>Passing</td>
<td>.919</td>
</tr>
<tr>
<td>2.</td>
<td>Handball throw</td>
<td>.896</td>
</tr>
</tbody>
</table>
| 3.    | Wall volley test:
|       | i) Dominant hand grip strength     | .760                    |
|       | ii) Non-dominant hand grip strength| .827                    |
| 4.    | Throwing accuracy                  | .995                    |
| 5.    | Defense                            | .944                    |

It is clear from the tables that the r-values are highly significant. This shows that the instruments as well variables selected were highly dependable.

**ADMINISTRATION OF TEST**

The data were collected through administration of tests as well as measurements of selected variables. Before the administration of the tests the scholar gave the subjects brief introduction about all the test items. Doubts, if any, were cleared. The tester further explained about the use of various apparatuses in collection of data, by giving proper demonstration about each and every test item.
Age

Age was taken in calendar year and month. Each subject was asked about his data of birth. Later it was also verified from the college record.

Height

The researcher marked height in centimeter on a smooth wall. The subject was asked to stand erect bare-footed with his back towards the wall keeping heels together and toes apart, eyes and ears in a horizontal plane. The tester then kept a metallic rod over the head of the subject horizontally and read the height, which was recorded in centimeters.

Weight

The weight was taken of all subjects by removing all the clothes from the body except the shorts. The pointer of the weight machine was set up at zero. The subject was asked to stand bare-footed on the weighing machine. The weight of each subject was recorded in kilograms.

Sitting height

The subject was asked to assume long sitting position with trunk erect against the wall. The measuring points were already marked on the wall for measuring total height of the subject and accordingly the sitting height was also recorded in centimeters.

Upper arm length

The subject was asked to stand at ease with equal weight on both the feet and with hands hanging freely. The straight distance between acromion and radiale was measured.

Fore arm length

The subject was asked to stand as in the case of measurements of upper arm length. The straight distance between redialed (r) and sternum (st) was measured.
Arm length

The arm length was also measured with the flexible steel tape, while the subject was in standing position with his elbow, wrist and fingers fully extended. The measurements were taken from the acromion process to the tip of the third finger and recorded to the nearest of a centimeter. (Straight distance between a acromion and dactyllion).

Leg length

The leg length of the subject was calculated by subtracting sitting height from standing height of the subject.

Calf circumference

The subject should stand, with his legs slightly apart. The steel tape was wrapped horizontally around the naked lower leg where calf muscles were most developed and recorded nearest to centimeter.

Shoulder width

The subject was made to stand erect with arms hanging freely. Breadth of the acromion was measured.

Bicromion width

The measurement of the biacromion width was taken with the help of anthropometric rod. The subject was asked to stand in erect position with arms close to the body. It was straight distance between the two acromia. The tips of the tow crossbars of the anthropometric compass was made to touch the acromiale points on both the shoulders along with the tips of the fore-fingers of the investigator so as to ensure firm grip of compass on the outer border of the acromion process with a mild pressure.

Supra-iliac skin fold

The skin fold of the subject was picked up approximately one centimeter and about two centimeters medial to the anterior superior iliac spine. The measurement was recorded with skin fold caliper in millimeters.
Thigh skin fold

The subject was asked to sit on a table with naked thigh with legs hanging freely. The skin fold was picked at a level about 1 cm superior to previously marked of the thigh on the anterior side. The measurement was taken in millimeters.

Sub-scapular skin fold

The subject was asked to stand in relaxed position and skin fold was picked up just above top of inferior angle of scapula and measurement was taken with the help of skin fold caliper and record in millimeters.

Calf skin fold

The subject was asked to sit on the corner of a table top in such a way that his one leg was in front of the longer side of table and the other leg was in front of the breadth side of the table. The tester sat on his heel in between the two legs of the subject and picked up the skin fold on the medial side of the left leg of the subject and applied the jaws of the caliper exactly in line with the marked level where the calf circumference was measured. The reading was recorded in millimeters.

Bicep skin fold

The scholar used the skin fold caliper to take the measurement of adipose tissues present at the front part of the bicep muscle. The skin fold of the bicep muscle of the subject was picked up with the fore fingers and thumb, in front of the upper arm directly above the centre of the capital fossa, the jaws of the caliper were applied and measurement was recorded after two seconds of the pressure of the jaws of the caliper. The longer be inaccurate. The measurement was recorded in millimeters.

Tricep skin fold

The skin fold of the tricep muscle of the subject was taken at the back of the upper arm at about one centimeter above the marked level as done in the case of measurement of the bicep region. The measurement was taken directly in line with the point of the olecranon process. The measurement was recorded in millimeters.
Motor Fitness Variables

50-metre sprint

The purpose of this test was to measure the accelerating ability of the subject. A calibrated stopwatch was used to record the timing.

The subject was asked to assume any position behind the starting line to avoid stretching of the muscles. On the sound of the clapper, the subject started running as fast as possible towards the finishing line and the stopwatch was started by the helper on seeing the clapper and he stopped the watch while subject crossed the finish line. The starter and helper were given training for the said purpose.

Scoring

The elapsed time was recorded to nearest one hundredth of a second, as the score of each subject.

30 metre sprint

The purpose of this test was to measure the accelerating ability of the subject over short distance.

This test was similar to 50-metre sprint. The subject were to run 30 metres in place of 50 metres and the time was recorded as their score.

Shuttle Run

This item was selected with the purpose to measure the agility of the subject. Two wooden blocks (2"x2"x4") and a stopwatch was used to conduct this study.

The researcher marked two parallel lines, five centimeters thick and 30 feet apart on a smooth play field. The subject was asked to take any position behind the starting line and two wooden blocks were placed behind the other line. The researcher gave command "ready" and then clapper sounded. At this, the subject started running and at the same time the time keeper started the watch, as the runner crossed the line, he picked up one wooden block and came back to the starting line and picked up the second block and this time he was permitted to carry it across the
starting line. The timekeeper stopped the watch when he crossed the starting line second time. Each subject was given two trials.

**Scoring**

The time was recorded to nearest one hundredth of a second with the help of electronic stopwatch. The best time out of two trials was the score of the subjects.

**Zigzag Run**

This test was selected with the purpose to measure the agility of the subjects. Five obstacles, a stopwatch and measuring tape was used to conduct this test. The researcher placed four obstacles ten feet apart in a square shape and fifth obstacle placed in center. The subject was given demonstration about the course of Zigzag running. Obstacles were marked with numbers as lower left side was number 1, centre obstacle marked number 2, lower right side marked number 3, upper number 5. The subject ran from obstacle one to obstacle two and over turned the obstacle and ran towards obstacle three and over turned it and run towards obstacle and over turned it and ran towards obstacle second and over turned it and ran towards obstacle five and over turned it, ran towards obstacle number one which was also the starting line and that three laps were to be run. The fast run was continued up to the finish line.

The subjects were specifically informed that the obstacles were neither to be grasped while going around them and nor to be misplaced in any way. If anybody fouled, the whole run was repeated.

After the signal "ready, go", the subject began the Zigzag run, the helper started the stopwatch. As soon as the runner crossed the finish point after the third round, the helper stopped the watch.

**Scoring**

The final score was the time taken to run the three rounds of the figure of eight.
Handball Throw

This test was selected with the purpose to measure the power of arms. Handball and measuring tape was used to conduct this test. One line was marked as throwing line. The subjects were asked to throw the handball before touching or crossing the throwing line. The subjects could throw the ball with or without running but could not touch or cross the throwing line. Two chances were given.

Scoring

The distance was measured and best distance was his score.

Pull Ups

This test was selected with an objective to measure the strength of arms. This test was conducted on a horizontal bar. A horizontal bar was adjusted to such a height as the subjects could hang freely with their arms and legs fully extended and feet remained off the ground throughout the test. The subjects were permitted to take only over hung grasp (palms facing away from the body) on the bar. After the performer assumed proper hung position, he was asked by the tester to start performing the test to raise the body by flexing the elbows so that his chin was raised above the level of the bar and then lower the body gradually so as to come back to the starting position of free hung. The subjects were permitted to repeat it as many time as possible. Neither swinging nor kicking the legs nor knee raising was allowed. An exercise was not counted into his score if he failed to cross his chin above the level of the bar.

Scoring

The successfully completed pull-ups were recorded as his score.

Standing Broad Jump

This test was selected with an objective to measure the power of legs. Five centimeter thick, one meter long line and parallel to the jumping pit was marked. Measuring steel tape was used to measure the distance. The subject took standing stance behind the marked line, with both feet comfortably apart. Before he could leap from the ground into the pit, he was permitted to swing arms forward and
backward and allowed to flex his knees and lean back with his trunk to get advantage to attain maximum distance.

**Scoring**

The score, best of the three trails to nearest of a centimeter was recorded as the score of the subject.

**Sargent jump**

This test was selected with the objective to measure vertical explosive power of the legs. The researcher had to mark the vertical distance on a smooth wall. The measuring steel tape and chalk were used in this test.

The subject was asked to stand close to the wall with his side towards a wall, heels together, and hold a 1 inch piece of chalk in the hand nearest to the wall. Keeping the heels on the floor, he reached upward as high as possible and made a mark on the wall. The performer than jumped as high as possible and made another mark at height of his jump.

**Scoring**

The three successive trials were given to each subject and best one was considered the distance between the reach and the jump marks measured to nearest of a centimeter and recorded as score of the subject.

**Twelve minutes run/walk**

The objective of the test was to measure the cardiovascular endurance of the subject. Stop-watch and wooden clapper were used in this test. Track spotters were assigned in this test. The subjects started behind a line and upon clapper sound, ran/walked as many laps as possible around the course within 12 minutes. The spotters maintained a count of each lap, and when the signal to stop was given they immediately ran to the spot at which these runners were at the instant the command to stop was given.
Scoring

The total distance covered in twelve minutes was recorded as the score of the subject.

**Right and left hand grip strength**

The test was chosen to measure the grip strength of the hands. In this test dynamometer and magnesium chalk were used. The hands of the subject and instrument should be dry. The subject put some magnesium chalk on the hand. The researcher set the pointer to zero and placed the dynamometer in the subject's hand, with the dial against the palm. The subject squeezed as sharply and steadily as possible, making certain that no part of the arm touched the body. Three trials were allowed with a one-minute rest between squeezes. For right hand and for left hand grip strength the subject squeezed with right hand and left hand respectively.

**Scoring**

The highest reading of the three squeezes in kilograms was taken as the score of the subject.

**Motor Skill Tests**

**Dribbling test (AAHPERD Control Dribble Test)**

The objective of this test was to measure skill in handling the ball while the body was moving. Six obstacle cones, handball and stopwatch were used while conducting the test.

During the marking AAHPERD control dribble test, four obstacle cones are placed in a rectangle 19' apart in length and 12' apart in width. One obstacle was placed in the centre of these four obstacles and last obstacle was placed in the centre of length side. These obstacle cones were marked as A,B,C,D,E and F so that the subjects could understand the run way easily. 'A' was the starting line and 'F' was the finishing line.

Three trails were given. The first was a practical trial, and the last two were recorded. With the ball, the subject started on his non-dominant hand side of cone A.
On the signal, "Ready, Go!" the performer dribbled with the non-dominant hand to the non-dominant hand side of cone B. The subject then proceeded to follow the course using the preferred hand, changing hands as deemed appropriate, until the finishing line was crossed by both feet. If there was a ball handling infraction (double dribble), the subject or the ball remained outside the cone, or the subject failed to begin at the point in the course where control was lost, the trial was stopped, the subject returned to the start, and the trial timing began again.

**Scoring**

The was recorded in seconds. Minimum time from the two trails was his score.

**Passing Test (AAHPERD Passing Test)**

The objective of the test was to measure skill in passing and recovering the ball accurately while moving. A smooth wall, chalk, handball and stopwatch were used while conducting this test.

Six squares of two feet each were marked on the wall so that the base of the square was either 3 or 5 feet from the floor. A restraining line was marked on the floor at a distance of 8 feet from the wall and parallel to it. A total of three trails of 30 second each were conducted. The first was a practice trial and the last two were recorded. The subject with a ball stood behind the restraining line and faced the target on the far left. On the signal "Ready, Go", the subject chest passes at first target, recovering the rebound while moving to a location behind the second target and behind the restraining line and chest pass at target-B. This pattern continued until target-F was reached, where two chest passes were executed, following which the subject then passed to target-E, repeating the sequence by moving to the left.

**Scoring**

Each pass that hits the target or the boundary line of the target counted two points. Each pass hitting the intervening spaces on the wall counted one point. If a pass was made from a point in front of the restraining line, no point was awarded for the pass. If passes were made at target B, C, D, or E twice in succession, no points
were scored for the second pass. If the pass was not a chest pass, no points were awarded for the pass. The final score was the highest score of the two trials.

**Handball Throw**

This test was selected with the purpose to measure the maximum throwing ability for distance of the subject. Handball and measuring steel tape was used to conduct this test. One line was marked as throwing line. The subjects were asked to throw the ball from that line. The subjects could throw the ball with or without running, without touching or crossing the line. Three chances were given.

**Scoring**

The distance was measured and the best distance was his score.

**Wall Volley Test**

This test was chosen to measure the throwing ability of subject's dominant hand and non-dominant hand. A smooth wall, handball and stopwatch were used. A restraining line was marked on the floor at the distance of 8 feet from the wall and parallel to the wall. Three trails of 30 Seconds were given for dominant hand and three trials for non-dominant hand. The first each was a practice trial and last two were recorded. The subject with a ball stood behind the restraining line, struck the ball against the front wall repeatedly for 30 seconds with dominant hand. The subject was permitted to step ahead of the line for one return, but the next must be played behind the line. If subjects violated this rule or lost control, they recovered the ball and began a new series in the same way.

The test was administered in the same manner with non-dominant hand, but the subject might not strike at with the dominant hand.

**Scoring**

The sum of the number of times the ball was struck against the front wall in 30 seconds with the dominant hand was the score of the dominant hand and the sum of the number of times the ball stroked against the front wall in 30 seconds with the non-dominant hand was the score of the non-dominant hand.
Service Placement Test

The test was taken with the objective to measure the throwing accuracy of the subjects. A court assigned numerical values and handball was used in this test.

Court 38x18 feet divided into two parts. One part was divided into areas that were assigned numerical values. This was a service area of 18x2 feet towards the end line on the other part. The one part of the court which was divided in difference size areas from centre line were 4x2 feet with numerical value 3, 4x2 feet with numerical value 2, 4x2 feet with numerical value 3 and 5x2 feet had numerical value of 4 with the both side lines and 2x2 feet with numerical value of 5 on both corners and 7x2 feet with numerical value of 4 were at the end line.

The subject stood in the service area and threw the ball into areas that were assigned numerical values. Ten chances were given. The ball in which area if dropped was recorded its value.

Scoring

The sum of 10 trials was recorded as the score of the subjects.

AAHPERD Defensive Movement Test

This test was taken with the objective to measure performance of basic defensive movement of the subject. A marked court and stopwatch was used while conducting the test.

A court 19x12 feet was marked A, B, C, D, E and F. Point C was marked 9' apart from point A on the side A-E and point F was marked 8' apart from point B on side B-D.

There were three trials. The first was the practice trial and the last two were scored for the record. The performer stood at point A facing towards the court. On the signal, "Ready, Go", The subject slided to the right side without crossing feet and continued to marker B, touched the floor over the side lane with the left hand, executed a drop step, slided to point C, and touched the floor outside the lane with the right hand. The subject continued the course as diagrammed. Completion of the course occurred when both feet had crossed the finish line.
If the subject crossed his feet during the slide or turned and ran or failed to touch the floor outside the lane with the hand or execute the drop step before the hand touched the floor, the trial was stopped. The subject returned to the starting point and the trial timing began again.

**Scoring**

The score for each trial was the elapsed time required to legally completing the course and the score of the subject was the best score of the two trials.

**STATISTICAL TECHNIQUE EMPLOYED**

Besides simple statistical tools such as mean, standard deviation, advance statistical tools such as stepwise regression analysis was done to identify the anthropometric, motor fitness and motor skill variables which determine the playing ability of handball players. The results of the regression analysis were used to draw out the equations of the identified anthropometric, motor fitness and motor skill variables. Person's Product Moment Coefficients of Correlation (r) were computed to see the relationship of playing ability with anthropometric, motor fitness and motor skill variables. Coefficient of Variation (C.V.) was also calculated as standard deviation as percent of the arithmetic mean.