Chapter III

Methodology

The present study was undertaken with a sight of developing the norms for senior Maharashtra state handball players. This is normative study; Percentile methods were followed to conduct this research project. The researcher found out physical fitness, skill status of handball players and determined the players grading on the basis of the morphological, physical fitness and handball skill tests and establishing standard norms. The detailed procedure has been presented in this chapter.

3.1 Subjects:

3.1.1 Population:

The population for the present study is the senior handball players participating in various tournaments conducted by different districts handball associations and Maharashtra state handball association in the state.

3.1.2 Sample:

Due to time constraint and for the convenience of research, the Purposive sampling method has been used for the selection of sample for the study.1,2 Sample for the study is the senior handball players those who have been participated in senior handball championships which were organized by Maharashtra state handball association in 2009 and 2010. The sample design and size of sample of the study has been framed as follows.

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Competition</th>
<th>Venue</th>
<th>Date</th>
<th>No. of subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>38th Sr. Handball State Championship</td>
<td>Ahamadpur, Dist. Latur</td>
<td>16th to 18th Dec 2009</td>
<td>472</td>
</tr>
<tr>
<td>2</td>
<td>39th Sr. Handball State Championship</td>
<td>Hadapsar, Pune Dist.</td>
<td>16th to 19th Dec 2010</td>
<td>510</td>
</tr>
</tbody>
</table>
3.2. Procedure:

The physical fitness and skill of senior handball players were measured on the basis of Kangane S.E, 3 (2005) team handball test battery which developed for the junior handball players of Maharashtra state. The investigator discussed with handball experts about the test included in the test battery and they suggested that all fitness and skill variables were covered in this test battery. The detailed procedure of study has been openly presented in table 3.2.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Dimensions</th>
<th>Test Item</th>
<th>To Measure</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2. Weight</td>
<td>2. Weight</td>
<td>2. Kolograms</td>
</tr>
<tr>
<td>2.</td>
<td>Physical fitness</td>
<td>1. 12Min Run/Walk</td>
<td>1. C.V. Endurance</td>
<td>1. Meters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. 50 Meter Dash</td>
<td>2. Speed</td>
<td>2. Seconds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7. Sit Ups</td>
<td>7. Muscular Endurance of Abdominal Muscle</td>
<td>7. Number of Repetition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Accuracy Throw</td>
<td>2. Throwing Accuracy</td>
<td>2. Points</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Foot Work</td>
<td>5. Defensive Foot</td>
<td>5. Points</td>
</tr>
</tbody>
</table>
3.3. Testing schedule:

It was decided to conduct the test on the selected sample when the subjects would come to take part in the senior handball championship which was organized by the Maharashtra state handball Association. The state championships were held for a period of four days. The format of the tournament was league cum knock out; the matches were conducted during the morning and early evening. The testing schedule prepared after discussion with coaches. The researcher conducted trie tests in four sessions and tried to provide the subjects with adequate rest. The researcher requested the association’s members, team managers and coaches for their cooperation for the testing on senior handball players. The association members, team managers and coaches were accept the request and gave permission to conduct the test on their players which were participating in state championship. The details of the tests conducted in the three days (four sessions) are presented below.

Table 3.3
The field schedule for Ahamadpur (Latur and Pune)

<table>
<thead>
<tr>
<th>Time</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.30am to 8.30am</td>
<td>Body Height, Body Weight, West, Hip, Vertical Jump</td>
</tr>
<tr>
<td>9.00am to 1.00am</td>
<td>12Min Run/Walk, Agility Dribbling, Footwork, Front Shoot</td>
</tr>
<tr>
<td>2.00pm to 4.00pm</td>
<td>Sit and Rich, Gripe Dynamiter, S.B.J., Speeds Pass</td>
</tr>
<tr>
<td>4.30pm to 6.30pm</td>
<td>Push Ups, 50m Dash, Sit Ups, Shuttle Run, Accuracy Throw</td>
</tr>
</tbody>
</table>

The schedule mentioned above was followed for all the championships. The table 3.3 shows the detailed testing schedule of the 34th senior state championship held at Ahamadpur (Latur) from 18th November to 21st November 2009 and 35th senior handball championship held at Hadapsar (Pune) from 17th November to 20th November 2011. The direction about the process of the test-administration, rules for participation in each skill and scoring principals were clearly determined.
3.4. Instrumentation:

Standard tests were administrated to measure the items of each dimension (See Table 3.4) for the data collection. Based on the nature of the variables (i.e. Morphological Physical Fitness and Handball Skill) the researcher collected proper equipments to conduct all the tests. The checklist of the equipments has been presented as follows:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Equipments</th>
<th>Quantity</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Electronic split stop watch</td>
<td>4</td>
<td>Functional</td>
</tr>
<tr>
<td>2.</td>
<td>Stedoe meter</td>
<td>1</td>
<td>Working</td>
</tr>
<tr>
<td>3.</td>
<td>Measuring tape</td>
<td>3</td>
<td>Usable</td>
</tr>
<tr>
<td>4.</td>
<td>Measuring tape (tailor)</td>
<td>5</td>
<td>Usable</td>
</tr>
<tr>
<td>5.</td>
<td>Handball</td>
<td>6</td>
<td>Usable</td>
</tr>
<tr>
<td>6.</td>
<td>Gripe Dynameter</td>
<td>2</td>
<td>Working</td>
</tr>
<tr>
<td>7.</td>
<td>Weighing Machine</td>
<td>1</td>
<td>Usable</td>
</tr>
<tr>
<td>8.</td>
<td>Pencil</td>
<td>10</td>
<td>Usable</td>
</tr>
<tr>
<td>9.</td>
<td>Pen</td>
<td>10</td>
<td>Usable</td>
</tr>
<tr>
<td>10.</td>
<td>Writing Pads</td>
<td>6</td>
<td>Usable</td>
</tr>
<tr>
<td>11.</td>
<td>Chalk Box</td>
<td>1</td>
<td>Usable</td>
</tr>
<tr>
<td>12.</td>
<td>String (Linedori)</td>
<td>1 (Bundle)</td>
<td>Usable</td>
</tr>
<tr>
<td>13.</td>
<td>Whistle</td>
<td>4</td>
<td>Working</td>
</tr>
<tr>
<td>14.</td>
<td>Handball Goalpost</td>
<td>1</td>
<td>Usable</td>
</tr>
<tr>
<td>15.</td>
<td>Wooden blocks</td>
<td>06</td>
<td>Usable</td>
</tr>
</tbody>
</table>
3.5. Description and measurement of test-items:

3.5.1. Morphological Test-Items:

The detailed descriptions of the morphological tests conducted on the subjects are as follows:

Test: Body Height

Objective: To measure the total body height of Handball players.

Equipment: Wall scale perpendicular to a flat surface, measuring tape, scale, score card, etc.

Procedure: The subjects are asked to stand erect, barefooted on a plane horizontal surface against a wall, with his heels, back of the shoulders and head touching the wall. He is requested to stretch the body upwards as much as possible without his heel leaving the ground. The head and face is checked. To get it easily, the subject is asked to see towards an object in front of him approximately at a height of his eyes, then the investigator adjusts the tracheon and infra-orbital points in a horizontal line. Keeping the sale at its position, the subject was instructed to come out of the wall and the scores of height of each subject were recorded.

Scoring: The score was recorded in cm. nearest to 0.1 cm.

Test: Body Weight

Objective: To measure the total body weight of Hockey players.

Equipment: Weighing Machine (Portable), Score card, etc.

Procedure: Each subject, one by one, stands on the flat surface of the weighing machine which was kept on a hard surface. Subjects were not allowed footwear while standing on the machine. They were instructed to wear minimum cloth and then stand erect by keeping equal weights on both legs and by looking towards front direction.

They were restricted to move body while standing on the machine. Keeping the machine at this position, the investigator Look the reading from the pointer associated with a scale, indicating body weight.

Score: The score was recorded in kilogram nearest to 0.5 kg.
Test: Waist to Hip Ratio (W.H.R.)

Objective: It is an objective means of measuring body fat distribution above and below waist.

Procedure: It is calculated simply by dividing an individual’s girth at the waist by their hip girth. For this individual's girth of waist and hip girth are to be measure and recorded. The formula is as follows: \( \text{WHR} = \frac{W}{H} \)

Scoring: After calculation, the score of WHR is expressed in the form of cm/kg

3.5.2 Physical Fitness Tests:

The detailed descriptions of the physical fitness tests conducted on the subjects are as follows:

Test: 12 Minute Run and Walk:

Objective: The purpose of the timed distance run is to measure maximal function and endurance of the cardio-respiratory system.

Equipment: A level floor or smooth surface ground, a stop watch, measuring tape, score cards or recording sheets, pencil and whistle.

Scoring: The distance covered during the allotted time (12 min.) is recorded (to the nearest 0.5 meter) as the score.

Instruction: Players are instructed to run as far as possible in 12 minutes. A signal, “ready, go,” or a whistle is used to begin the test. A loud signal such as a whistle or gun is used to stop the test. Participants continue to run or walk until they hear the signal to stop.

Organizational Hints: The distance of course should be measured so that the number of laps completed can be counted and easily multiplied by the course distance. Marking the course at 0.5 meter intervals enables the test participants or partners to easily calculate distances less than a full lap. On the signal to finish all runners stop and partners immediately run to the spot where their runner stopped and calculate laps run multiplied by the distance per lap, adding meters covered on the last lap. This distance recorded on the scorecard.
Test: 50 Meter Dash

Objective: The aim of this test is to determine acceleration and speed.

Equipment: Measuring tape or marked track, stopwatch, cone markers, flat and clear surface of at least 70 meters, score sheet, pencil.

Procedure: The test involves running a single maximum sprint over 50 meters, with the time recorded. A thorough warm up should be given, including some practice starts and accelerations. Start from a stationary standing position (hands cannot touch the ground), with one foot in front of the other. The front foot must be behind the starting line. Once the subject is ready and motionless, the starter gives the instructions "set" then "go". The tester should provide hints for maximizing speed (such as keeping low, driving hard with the arms and legs) and the participant should be encouraged to not slow down before crossing the finish line.

Scoring: Two trials are allowed and the best time is recorded to the nearest 2 decimal places. The timing starts from the first movement (if using a stopwatch) or when the timing system is triggered and finishes when the chest crosses the finish line and/or the finishing timing gate is triggered.

Suggestion: The timer should stand back away from the running track so they can clearly see the first movement and also see the runner pass the finish line.

Test: Agility Shuttle Run Test

Objective: The objective of the test to measure speed and agility, which is important in many sports.

Equipment: Wooden blocks, marker cones, measurement tape, stopwatch, non-slip surface, score sheet, pencil, marking tape.

Procedure: This test requires the person to run back and forth between two parallel lines as fast as possible. Set up two lines of cones 10 meter apart or use line markings, and place two blocks of wood or a similar object behind one of the lines. Starting at the line opposite the blocks, on the signal "Ready", "Go" the participant runs to the other
line, picks up a block and returns to place it behind the starting line, then returns to pick up the second block, then runs with it back across the line.

**Scoring:** Two or more trails may be allowed, and the quickest time is recorded.

Results are recorded to the nearest tenth of a second.

**Suggestion:** The blocks should be placed at the line, not thrown across them. Make sure the participants run through the finish line to maximize their score.

**Test: Vertical Jump Test**¹⁰

**Objective:** To measure the explosive power of the leg in vertical jump height jumped.

**Equipment:** Measuring tape or marked wall, chalk for marking wall, score sheet, pencil.

**Procedure:** The athlete stands side on to a wall and reaches up with the hand closest to the wall. Keeping the feet flat on the ground, the point of the fingertips is marked or recorded. This is called the standing reach height. The athlete then stands away from the wall and leaps vertically as high as possible using both arms and legs to assist in projecting the body upwards. The jumping technique can or cannot use a countermovement (see vertical jump technique). Attempt to touch the wall at the highest point of the jump. The difference in distance between the standing reach height and the jump height is the score. The best of three attempts is recorded,

**Suggestions:** The jump height can be affected by how much you bend your knees before you jump and the effective use of the arms. The test is also sometimes incorrectly spelled as the "Sergeant" or "Sargent" Test.

**Test: Standing Long Jump Test (Broad Jump)**¹¹

**Objective:** to measure the explosive power of the legs

**Equipment:** Tape measure to measure distance jumped, non-slip floor for takeoff, and soft landing area preferred. Commercial Long Jump Landing Mats are also available. The take off line should be clearly marked.
Procedure: The athlete stands behind a line marked on the ground with feet slightly apart. A two foot take-off and landing is used, with swinging of the arms and bending of the knees to provide forward drive. The subject attempts to jump as far as possible, landing on both feet without falling backwards. Three attempts are allowed. See some long jump video examples.

Scoring: The measurement is taken from take-off line to the nearest point of contact on the landing (back of the heels). Record the longest distance jumped in centimeters.

Suggestion: Falling or stepping backward after the landing will result in measurement to that point of contact rather than where the feet first touched. Some subjects will try to use a step at take-off, which is not allowed.

Test: Sit and Reach

Objective: To evaluate the flexibility of the low back and posterior thigh. Instruction: The player assumes a sitting position with legs extended, feet shoulder-width apart and shoes off. The arms are extended forward with one hand on top of the other and finger pads on top of fingernails. The player reaches directly forward, palms down, along the measuring scale four times, holding the position of maximum react the last time for one full second. Only one trial is given.

Equipment: A level floor or smooth surface ground, a special apparatus consisting of a box with measuring scale in which 39 cms.

Scoring: The score is the most distant point reached, measured to the nearest Centimeter.

Organizational Hints: Leg must remain straight throughout the entire stretch. The test administrator may need to hold the legs down at the knees. Players take the test with their shoes off. Players can be taught to administer the test to one another.

Players should warm up prior to the test. The test apparatus should be placed against the wall to prevent it from sliding on the floor.
Test: Push-Up test

Objective: This test measures upper body strength and endurance.

Equipment: Flat non slippery surface, stopwatch, score sheet, pencil.

Procedure: Start in the push up position with the hands-and toes-touching the floor, the body and legs are in a straight line, feet slightly apart and arms shoulder width apart, extended and at right angles to the body. Keeping the back and knees straight, the subject lowers the body until there is a 90-degree angle at the elbows, with the upper arms parallel to the floor. The subject being tested goes down until their shoulder touches the floor and then back up. The subject continues until he can do no more.

Scoring: Record the number of correctly completed push-ups that were performed.

Suggestions: See that the subject performs push-ups in a proper way or should not be recorded. The Push-ups to be unrecorded are: If 90° angles not kept at back and elbows. Bends at back and lowers hips rather than shoulders. Subject does not lower the shoulder until chest touches the floor. Touches fore head instead of chest and do not lower the hips or shoulder.

Test: Handgrip strength test

Objective: Handgrip strength is important for any sport in which the hands are used for catching, throwing or lifting. Also, as a general rule people with strong hands tend to be strong elsewhere.

Equipment: Handgrip Dynamometer, score sheet, pencil.

Procedure: The subject to be tested holds the dynamometer in one hand in line with the forearm and hanging by the thigh. Maximum grip strength is then determined without swinging the arm.

Scoring: The better of the two trials for each hand is recorded and is the score of the subject.

Suggestions: Check if the subject is swinging or folding the arm. See that the grip dynamometer is adjusted at zero at every grip. It can also be used to determine the dominant/strong hand of the subject.
Test: Bent knee sit – ups

Objective: To measure strength and endurance of the abdominal muscles.

Equipment: A level floor or smooth surface ground, mat, score cards or recording sheets, pencil and whistle.

Instruction: Players lie on back with legs fixed at the knees and feet approximately 12 inches apart. The partner holds the players ankles and keep the feet in contact with the floor while counting each sit-up. On the signal to being, the player sits up, turns the trunk touching one elbow to the opposite knee and returns to the starting position. The next sit up is performed touching the other elbow to the opposite knee. This alternating sequence is repeated as much time as possible. One complete sit up is counted each time the player returns to the starting position. Player should be informed that credit will not be given for sit ups completed when fingertips do not maintain contact behind the head, when the knee is not touched by the opposite elbow or when the performer pushes off the floor with the elbow.

Organizational Hints: The counters should be constantly remained to watch for release of interlaced fingers. Further, counters should be alerted to stringently enforce the instruction that states that no sit up will be counted unless it is properly executed.

Test: Handgrip Strength Test

Objective: Title purpose of this test is to measure the maximum isometric strength of the hand and forearm muscles. Handgrip strength is important for any sport in which the hands are used for catching, throwing or lifting. Also, as a general rule people with strong hands tend to be strong elsewhere, so this test is often used as a general test of strength.

Equipment: Handgrip Dynamometer, Pencil, Score sheet.

Procedure: The subject holds the dynamometer in the hand to be tested, with the arm at right angles and die elbow by the side of the body. The handle of the dynamometer is adjusted if required - the base should rest on first metacarpal (heel of palm), while the handle should rest on middle of four fingers. When ready the subject squeezes the
dynamometer with maximum isometric effort, which is maintained for about 5 seconds. No other body movement is allowed. The subject should be strongly encouraged to give a maximum effort.

**Scoring:** The best result from several trials for each hand is recorded, with at least 15 seconds recovery between each effort. The values listed below (in kilograms) give a guide to expected scores for adults.

### 3.5.3 Handball Skill Test 17:

The detailed descriptions of the skill tests conducted on the subjects are as follows:

**Test: Front Shoot**

**Objective:** To measure the shooting ability in team handball

**Equipment:** A marked level floor or ground with a smooth surface, a stop watch, a standard inflated Handball, rope or string, measuring tape, marking tape, score card or recording sheet and pencil. The front surface area of a team handball goal post is divided with rope or string into eight pails. Each part is assigned a certain number of points reflecting the difficult of shooting the ball into that area.

**Description:** The player gets ten shoot, five when executing a jump throw and five when executing a set shoot. The player can take three steps before releasing a ball but the last step must be executing outside the free throw line (9 meter Line). If the ball hits the court surface before it reaches the goal, no points are scored.

**Diagram in appendix E** (figure 1).

**Rules:** All shoots must be made from behind the free throw line (9 meter line). If ball hits the court surface before it reaches the goal no points are scored. Outside shoots are counted as attempts.

**Scoring:** The score for ten shoots is the sum of points awarded on each shoot or attempt. A maximum of forty points is possible.
Test: Accuracy Throw

Objective: To measure the accuracy with which team handball player can make throw at the target in team handball.

Equipment: A stop watch, a standard inflated handball, measuring tape, marking tape, a score cards or record sheet, pencil. A level floor or ground and hard smooth surface wall with painted or marked target. The target should be properly measured and marked as in the accompanying.

Description: The player, with handball, stand behind a line on the floor parallel to and fifteen meter from soiled smooth wall. Ten throw made and all must be executed from behind the restraining line. A tow practice throw is allowed. The target is circular with three concentric circles separated by two cm wide white or black lines. The inner circle is 50cm in diameter, the second circle is 100cm in diameter, and outer circle is 150cm in diameter. The bottom of the outer circle is 100cm above the floor.

Diagram in appendix E (figure 2).

Rules: The ball may be caught and throw bay one armed overhand throw. To be scored all throws must be made from behind the line.

Scoring: Three points are scored for each throw hitting the center circle, two points for hitting the next circle and one point for hitting the outer circle. Ball hitting on a line was counted as hitting in the area of the higher score. The points scored on each throw are recorded and then added to arrive at a score of that trial. The score is the total for ten throws. A maximum of thirty points.

Test: Speed Pass

Objective: To measure the speed with which a player can continue to pass and catch a ball in team handball.

Equipment: A level floor or ground and a wall a solid smooth surface, a stop watch, a standard inflated handball, measuring tape, marking tape, score card or recording sheets and pencil.
Description: The player stands behind the line on the floor parallel to and four meter from solid smooth wall. On the signal "go", the player throws the ball against the wall about the head high. Catches the rebound and continues passing against the wall as rapidly as possible for thirty seconds and is told to stop. Any method of passing may be used, but overhand pass is recommended. Some warm-up practice is allowed.

Diagram in appendix E (figure 3).

Rules: All passes must be made from behind the line. The ball cannot be batted. It must be caught and pass. If the ball is dropped, the player must be recover it and continue from behind the line. The ball may hit the wall at any height. Two complete trails are recommended with approximately a thirty second rest between them.

Scoring: Each throw to the wall that is caught or retrieved is counted as one. The score on each trial is the accumulation of those completed from the time timer says 'go' until he say "stop" after thirty seconds have elapsed. The score is the total of the two trials.

Test: Agility Dribble

Objective: To measure the speed with which a player can dribble a handball around obstacles in team handball.

Equipments: A level floor or smooth surface ground, a stop watch, a standard inflated handball. Two chairs measuring tape, marking tape score card or recording, sheet and pencil.

Description: The player stands behind a starting line with a ball in hand and on the signal "go" starts with a dribble on the right side of the first chair [No.1] and continues to dribble to the left of the second chair [No.2] and around it. Back to the right side of chair No.1 around it and back to the left side of chair No.2, around it and back across the line from which started. The chairs are one in front of the other with their outer most edges being 6.1 meter apart. The starting line is perpendicular to an imaginary line directly between chair No. 1 and chair No. 2.

Diagram in appendix E (figure 4)
**Rules:** The ball may be dribbled with their hand, the legal dribbles only are allowed. Each player is given two trials, one to follow the other after about thirty seconds rest.

**Scoring:** The score is the time in seconds and tenths that it takes to dribble around between the chairs and back. The time is started on the signal of "go" and stopped the instant the player crosses the finish line at the end of the circuit. Two trials are the players score on the test.

**Test: Foot Work**

**Objective:** To measure defensive foot work and maneuverability in team handball.

**Equipment:** A level floor or ground on which there are marks. 5 by 30 cm in size, three meters apart arranged as in the accompanying, a stop watch, measuring tape, marking tape, score cards or recording sheets and pencil.

**Description:** The player begins by starting with both feet touching the centre mark A, and facing mark C. on the signal Go the player moves laterally to the right to touch mark B, then back to A, then forward to C, back to A to the left to D, back to A to the left to D, back to A and then repeats the squares until he is told to stop. He is instructed to touch as many marks as possible in thirty seconds while following the prescribed sequence.

**Diagram in appendix E** (figure 5)

**Rules:** All steps to either side must be of the shuffle or a side steps nature. To be counted, each mark must be clearly touched with at least one foot. The described sequence must be followed. Two twenty second trials are recommended with thirty second rest interval between them.

**Scoring:** The score is the total number of marks touched during one twenty second trial. The subject’s best score will be used to represent his footwork.
3.6. Statistical Tools:

Descriptive statistics will be used for obtaining Mean, Median, Mode, S.D. the percentile method\textsuperscript{18} was used to prepare the norms. The detailed analysis, interpretation and grading scale is given in Chapter IV.