Chapter III

METHODOLOGY

In this chapter, selection of subjects, selection of variables, orientation of subjects, experimental design, training schedule, test administration and statistical analysis have been explained.

Selection of Subjects

For the purpose of the present investigation 58 boys were selected randomly from Pondicherry. The age ranged between 13 and 19 years and they were categorized into trained and novice players. Trained players randomly divided into two groups namely experimental group I and control group I of 15 each, similarly novice players divided into two groups namely experimental group II and Control group II with 15 players and 13 players respectively. They accepted to participate in the research voluntarily and cheerfully without any compulsion.

Criteria for Selection of the Subjects

For this study the hockey coaches/experts were selected 64 players (4 teams) for coaching camp and they were trained systematically and scientifically. It was easy for them to organize matches during training period. It helps to scout the player’s performance during training and practice matches. The selected players were given particular position with their performance. Considering these facts and feasibility of the study the investigator selected 58 out-of 64 players which include 30 trained players and 28 novice players. In this category of 30 players were segregated into two equal groups of 15 each at random allotment of control and experimental group.

While selecting the experienced and novice players, the sub junior level player was not taken into consideration. The players eligible to participate in the junior and senior teams were considered for the present study and their age ranged between 13 to 19 years.
Criteria for Selecting the Location

The most important aspect of research is to assess the influence of training on selected criterion measures. The implementation of training players needs enough space for training so that all fifty eight players can undertake the training schedule. Further there should be enough facilities for bathrooms, toilets, drinking water and rooms for giving instruction. All the players have been regularly played both in the morning and evening. Further Astro turf play field is also available for hockey player to undergo comfortable training.

Selection of Variables

For this study the researcher had gone through enough literature and guidance from various experts, the following variables which had been selected.

Motor Fitness Variables

1. Speed
2. Agility
3. Explosive Power
4. Muscular Strength
5. Reaction time
6. Flexibility
7. Static Balance
8. Dynamic Balance

Skill related variables

The game hockey involved many skills but few skills were related to the sensory perception, so the researcher selected the forthcoming skill related variables.

1. Hitting for Accuracy.
2. Ball with Speed.
3. Receiving, Ball Control and Driving the ball.
58 Subjects

30 Trained players

- Experimental Group- 15 No
- Control Group 15 No

28 Novice players

- Experimental Group-13 No
- Control Group 15 No

Pre Test

Proprioceptive Training

Post Test

Statistical Technique
Paired ‘t Test
Experimental Design

The study was formulated as random group design. Fifty eight (58) boys were randomly selected from Pondicherry. They were categorized into trained players and novice players. The trained players were randomly divided into two groups namely experimental group I and control group I of 15 each, similarly novice players divided into two groups namely experimental group II and Control group II of 15 and 13 players respectively. The experimental group I and II underwent 12 weeks training programme. The selected parameters are tested before and after the training programme. The descriptive statistics, paired sample ‘t’ test and independent ‘t’ test were applied to test the significance difference between the pre and post test mean scores.

Training Programme

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tr>
<td>Total Duration</td>
<td>12 Weeks</td>
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<tr>
<td>Sessions</td>
<td>3 Sessions per week</td>
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<tr>
<td>Volume</td>
<td>60 minutes</td>
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Tester Competencies and Reliability of Tests

Before conducting the tests, it was ensured that the investigator was well versed in the techniques of handling the equipment. A number of practice sessions were conducted with the testing procedures. All the measurements were taken by the investigator with the assurance of experts who were all acquainted with the testing procedures.

Tester competency was evaluated along with reliability of the tests. Reliability of the tests was established by test-retest method. Hockey performance variables and motor fitness variables was evaluated by used standard test.
Table 3.1
Reliability of Selected Motor Fitness and Skill Performance Test

<table>
<thead>
<tr>
<th>Variables</th>
<th>Co-efficient of Correlation</th>
</tr>
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<tbody>
<tr>
<td>Speed</td>
<td>0.86*</td>
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<tr>
<td>Agility</td>
<td>0.89*</td>
</tr>
<tr>
<td>Explosive Power</td>
<td>0.81*</td>
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<tr>
<td>Muscular Strength</td>
<td>0.82*</td>
</tr>
<tr>
<td>Reaction Time</td>
<td>0.87*</td>
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<tr>
<td>Flexibility</td>
<td>0.85*</td>
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<tr>
<td>Dynamic Balance</td>
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</tr>
<tr>
<td>Static Balance</td>
<td>0.83*</td>
</tr>
<tr>
<td>Ball with Speed</td>
<td>0.91*</td>
</tr>
<tr>
<td>Friedal field Hockey Test</td>
<td>0.86*</td>
</tr>
<tr>
<td>Hitting for Accuracy</td>
<td>0.92*</td>
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*significant at 0.05 level of confidence with df 8 =0.765
## TRAINING SCHEDULE

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<th>Week</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<th>9</th>
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<td>Square Board (B)</td>
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<td>60 mins</td>
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<td>30'-35'</td>
<td>35-40'</td>
<td>40'-50'</td>
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<td>Both legs</td>
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<td>Half, full squad Position</td>
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<td>+</td>
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<td>Object manipulation</td>
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<td>+</td>
<td>+</td>
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</tr>
<tr>
<td>Strength exercises</td>
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<td>+</td>
<td>+</td>
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<td>+</td>
<td>+</td>
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<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Jump on, Jump off Both</td>
<td>+</td>
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<td>+</td>
<td>+</td>
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</tbody>
</table>
Test Administration:

Motor Fitness Variables

1. Reaction time - Nelson Hand Ruler test
2. Static Balance - Stork Stand test
3. Dynamic Balance - Johnson Modified balance test
4. Agility - 3x10 shuttle run
5. Speed - 30 metres dash
6. Muscular Strength - Leg Dynamometer
7. Explosive Power - Standing broad jump
8. Flexibility - Stand and reach test

Skills Performance Variables

a. Hitting Accuracy - Schmithals and French Field Hockey test
b. Ball with Speed - SAI Skill test
c. Receiving, Ball Control
and Drive While Moving - Freidal Field Hockey test

Motor Fitness Variables

Reaction time

Purpose

This test is used to measure the reaction time of hand movement in response to a visual stimulus. This test of hand movement is response to a visual stimulus. This test is suitable for both boys and girls aged five years and above.

Equipment

Nelson reaction timer scale, table and chair or desk chair. The Nelson Reaction Timer is based on the law of constant acceleration of free falling bodies and consists of a
stick that is scaled to read in time (accurate up to 0.005 seconds) as computed from the formula:

\[
\text{Reaction Time (sec)} = \sqrt{\frac{2 \times \text{Distance the stick (timer) falls (in feet)}}{32}} \text{ (Acceleration due to gravity)}
\]

**Test Administration**

After giving a practical demonstration to a group of 10 to 15 subjects, the tester asked the subjects to sit in the chair with his/her forearm and hand resting on the table in such a way that the tips of thumb and index finger are held in a ready to pinch position, about 3 or 4 inches beyond the edge of the table. The tester assures that the upper edge of the thumb and index finger are in a horizontal position. Now the tester holds the stick of the timer from its tip edge in such a way that the lower edge of the stick timer hangs between the subject’s thumb and index finger so that the marked base line of the stick timer is in a same horizontal position in which is the upper surface of the subjects thumb and fore-finger. The tester has to assure that the subject does not touch the hanging sick timer. Now he/she ask the subject to look at the concentration zone that is the black shaded area between the 0.120 and 0.130 seconds lines. The subject is instructed to catch the stick by pinching together his/her index finger as soon as the stick timer is released by the tester. The subject is also to be instructed strictly neither to look at the tester’s hand nor to move his/her hand up or down while attempting the stick, the tester gives a preparatory command of ‘ready’. Each subject is given twenty trials.

**Scoring**

Time is read from the stick just above the upper of the thumb when the subject catches the falling stick timer. Out of 20 trials, results of five fastest and five slowest trials, the discarded and the average of the middle 10 trials’ give the score of this test (Nelson, 1985.)
Precautions

a. The tester should use different timings between the command ‘Ready’ and release of the stick timer. However, it should neither be very small, nor very large and should vary within 0.5 to 2.0 seconds.

b. The testing environment should be calm so that the subject can concentrate properly.

c. The index finger and thumb should not be more than one inch apart.

Static Balance

Bass stick Test (crosswise)

Purpose

Bass stick test is used to measure the static balance of the subject by making the body stable on a narrow surface while standing on the ball of the foot. The test is suitable for both sexes aged 10 years and above.

Equipment

A stopwatch one inch wide, one inch high and 12 inches long stick and an adhesive tape.

Test Administration

The tester gives a practical demonstration either himself/herself or through a trained helper of a group of 10 to 15 subjects by showing how to stand crosswise on the stick upon a given signal. After the demonstration the subject is asked to place the back of the right foot crosswise on the stick which is tightly secured to the floor to the help of adhesive tape. The tester then announces Ready, Steady, and ‘start’

On the signal ‘start’ the performer lifts the left foot from the floor and raises the heel of the right foot from the ground so as to balance his/her body on the ball of the foot placed crosswise on the stick for as long as possible upto a maximum of 60 seconds, on the signal ‘start’ the timer starts the stopwatch which is stopped when one of the following event happens:-
a) The subject touches the floor either with his/her right heel or toes.

b) The subject looses balance and happens to touch the floor with the free foot.

c) 60 seconds are over when the test is officially announced as completed.

Each subject is required to perform the above test for six times, three times on right foot and three times on left foot alternating each trial with left after right foot.

**Scoring**

The score is given by the sum of the times in seconds recorded during all the six trials.

**Comments**

This is quiet a reliable, valid, objective, simple and practical test of static balance. The test is not only easy to administer but can also be administered simultaneously to a group of subjects depending upon the number of helper, stopwatches and sticks as an exception, the tester may opt to perform the test on a group of subjects simultaneously even with the help of a single stop watch in this case, the tester is required to count loudly one to sixty at an interval of one second between each count so that each helper could record his/her subjects’ time on the basis of listening of the seconds counted by the tester with the help of a stopwatch.

**Dynamic Balance Test**

There are several tests of measuring dynamic balance of the body. However there was only two most commonly used and simple to perform tests.

**Modified bass Test of Dynamic Balance**

This test is used to measure one’s ability to jump accurately and to maintain balance during repeated jumping. The test was originally designed by Ruth I. bass in 1939 which was later modified by Johnson and leach in 1968. This test is suitable for both boys and girls aged 12years and above.
Equipment

A stopwatch, ¼ inch wide colored marking tape and a yardstick.

Test Administration

First of all eleven pieces of colored marking tape, measuring ¼ × 1” size are cut and pasted on the floor at level S and 1 to 10. These marking spots are obtained by the proper measurement of 30” and 15” distances. After marking the required floor pattern, demonstration of the test is given with the help of a trained helper having a good dynamic balance then the tester repeats the instructions. The subject is asked to stand with the right foot on the starting tape mark and to leap to the first tape mark with the left foot. He is required to maintain a steady balance on the ball of the left foot for as long as possible up to a maximum of five seconds after which he is to leap to the second tape mark with right foot, and is told to repeat the process completed at first mark and to proceed to next tape spots serially with alternate foot upto the 10th tape mark. The subject is to clearly stated that he will get one point for each second of balance maintained at a spot upto a maximum of five seconds and that his foot must cover the tape marked at each spot completely so that the tape can not be seen by the tester when the subject is maintaining the balance of the body on a particular tape mark. The subject must also know that hopping or moving the supporting foot ball will invite penalty.

Scoring

The maximum points which may be scored at each landing as opt are ten thus making a theoretically maximal score of the test as 10×10=100. At each landing point, five points are given to proper landing and five for each second of steady balance on the ball of the concerned foot it the perform lands improperly and does not cover the tape marked at spot or fails to stop on the landing spot or touches his heel or any other part of the body the floor, he gets zero point out of five points of landing. However, on wrong landing, the subject is allowed to reposition by hopping for the 5-second balance points and it continue to test in case, the performer commits balancing error either by touching any part of the body other than ball of the foot to the floor or by moving the foot, the performer is asked to
step back on the spot just previous to balancing error and then leap afresh for the net spot and so on. It is recommended that the tester counts loudly the seconds of five second balance time so that the performer knows his performance and is encouraged to perform better.

**Comments**

The test is quite reliable, objective and fairly valid to test the dynamic balance. The test is easy to administer both the sexes and subjects of various age groups. It is recommended that the future researches may work for establishing the validity of the test by correlating it with a battery of other tests purported to measure dynamic balance.

**Agility**

**Shuttle Run Test**

**Equipment**

Two blocks of wood, a stopwatch and marking powder. The subject should wear spikes or run bare foot.

**Test Administration**

Two parallel lines are marked on the floor 10yards apart or the width of the regular volleyball court may be used for the test. The two wooden blocks are placed behind the other line. On the signal ready? Go! The timer starts the watch and the subject runs toward the blocks, picks-upon block, runs back to the starting line, places the block behind the starting line, runs back and picks-up the second block to be carried back across the starting line. As soon as the second block is placed on the ground the timer stops the watch and records the time.

**Scoring**

Two trials are allowed to each subject with some rest in between. The time of the better of the two trials is recorded to the nearest 10th of a second as the score of the test item.
**Speed (30 meters Dash)**

**Equipment**

Stopwatches or a single stopwatch with a split second time.

**Test Administration**

Two lines are marked on the floor 30 meters apart. One line is used as a starting line and the other as the finish line. On the signal ready? go! The subjects start running at their best to reach the finish line at their earliest. The signal ‘go’ is accompanied with the downward sweep of the starter’s arm to give the visual signal to the timer who stands at the finish line.

**Scoring**

The interval between the starting signal and the instant subject crosses the finish line is the score of the test. The time is recorded to tenth of second.

**Explosive Power: (Standing Broad Jump)**

**Purpose**

This test measures the power of legs in jumping horizontal distance and may be applied to children of both sexes aged seven years and above.

**Equipment**

Floor, mat or long jump pit may be used, measuring tape, marking tape or a peg.

**Test Administration**

A demonstration of the standing broad jump is given to a group of subjects to be tested. The subject is then asked to stand behind the starting line with the feet parallel to each other. He is instructed to jump as farthest as possible by bending knees and swinging arm is to take off for the broad jumping towards the forward direction. The subject was given three trials. The best of three trails would be taken into consideration.
Scoring

The distance between the starting line and the nearest point of landing provides the score of the test. The best trial is used as the final score of the test.

Flexibility (Stand and Reach)

Purpose

This test measures the back hip range of the subjects in standing position.

Equipment

Stand and reach instrument, scale,

Test Administration

The subjects asked to remove their shoes and stand on the instrument and bend forward as far as possible. The researcher whether subjects bend his knee or not. And advised don’t bend their knees instructor the subject while going down, two trials were given.

Muscular Strength (Hand Dynamometer)

Purpose

This test measures the strength of the subjects back and leg strength.

Equipment

Hand dynamometer,

Test Administration

The subject was asked to stand on the dynamometer instrument. After the researchers command Ready, Go! the subjects pull the chain as much as possible. Two trials were given to each subject. The tester advised the subject would be bend their knee according to their height and convenience.

Scoring

While pulling the instrument, scores will be shown on the basement for recording.
Schmithals and French Field Hockey test

Hitting Accuracy

Purpose

The test is designed to measure the ability of the player to adjust footwork, to judge while moving, and to drive with accuracy and force while running (Gladys Scott, M., and Esther French, 2009, p.144-145).

Equipment

Target, 9 inches wide, 12 feet long, and at least half inch thick, made of hard wood. The board is painted according to the following specifications, the length of the board is divided into eleven equal spaces, alternate space starting from either end being painted black or the other remaining the natural colour of the wood. Numbers are painted in the spaces in contrasting colors (black on light background and white on black background) in the following order starting from either end: 1-2-3-4-5-6-5-4-3-2-1. A base made of board at least 3 inches wide, exactly 12 feet long, and at least half inch thick is nailed on the bottom of the target so that 2 ½ inches extend beyond the back of the target. The board, in order to stand upright securely, may be anchored with an ice pick or other similar device. Hockey sticks for each participant four to ten balls; stop watch.

Field Markings

a. A line 6 ½ feet long to be used as a starting line. Draw a use caps midpoint of the side opposite the starting line.

b. A line 12 feet long, called the center target line, parallel to and 60 feet from the starting line.

c. A line 12 feet long, called the right inner target line.

d. A line 12 feet long, called the left inner target line.

e. The target is placed directly on the specified line with the numbers facing the starting line and the board anchored with ice picks. For the straight drive, it is
placed on the center target line, for the drive from the right and lift inners’
positions, the right and left inners target lines, respectively

Test

a. Drive from center’s position. The player being tested stands being the starting line
with the hockey ball placed on the starting line. At the signal, ready go! The ball is
dribbled to the rectangle from within which area it must be driven toward the board
(placed on the center target line). The procedure is repeated until ten trials have
been given.

b. Drive from right inner’s position. The same procedure is repeated, the only
difference being the position of the target, which is placed on the right inner target
line.

c. Drive form left inner’s position the same procedure is repeated the only difference
being the change in position of the target to the left inner target line.

Scoring

The score for one trial constitutes the time lapse from the timer’s signal, go! until
the ball strides the target the score for the entire test. The sum of the two best odd-
numbered trials and the sum of the two best even numbered trials made on the center drive,
the right inner drive, and the left inner drive. The score counts if the ball bounces over the
top of the target. In this case, the time is taken until the instant the ball clears the target.
The score is zero if the ball is not driven from within the rectangle or it to hall fails to
target or misses it at either end. The attempt is not counted as a trial if “sticks” are made, or
if the player raises the ball so that it fails to touch the grounded before passing above the
target.
Figure 3.a

Field Marking for field Hockey Goal Shooting Test

A = Center of front line of rectangle, from which target lines are measured

R = Right inner target line  C = Center target line, L = Left inner target line
SAI skill test

Ball with Speed

Purpose

This test item is aimed to measure the ball controlling ability of the hockey player when moving with the ball.

Equipment

A stopwatch, hockey stick, cork balls, tape and marking powder.

Dimensions

Two horizontal lines, one called starting line and the other end line, are marked at a distance of 20 meters.

Administration

The subject must stand behind the starting line by holding the hockey stick in both the hands. The hockey ball must be placed on start line. On the signal Ready? Go! The subject must start moving forward rolling the ball with the stick without breaking the contact of the blade of stick on the ball and try to cross the finish line with the ball as early as possible. The forward movement of the ball with the blade of the stick should be rolling movement. A stopwatch is started simultaneously to the signal ‘go’ and is stopped as soon as the ball and the subject cross the finish line. Each subject is given two trials and better of the two is considered for evaluation.

Evaluation

The minimum time taken to reach the end line with the ball is evaluated with the help of SAI prescribed standards.
Friedel Field Hockey Skill Test

Purpose

The single test helps to examine the ability of pass receiving, fielding and drive while moving.

Equipment

Measuring tape, stopwatch, hockey sticks, balls and open field.

Test Dimensions

A 10-yard wide starting line is marked on the ground. The two ends of the lines are extended perpendicularly by 25 yards long lines whose ends are connected to provide a 10 yards end line parallel and opposite to the starting line. Another line known as restraining line is drawn parallel to the starting line at a distance of 15 yards from the starting line and 10 yards from the end line. A target two yards in length and one yard in breadth is drawn in the middle of the restraining line towards the starting line.

Test Administration

The subject stands near one corner behind the starting line with a hockey stick in his hand. On the signal ready? Go, the subject moves forward, the stopwatch is started by the timer and ball is rolled form the corner towards the target. The subject receives the pass on his right in the target area to carry the ball by dribbling to the end line where here verses direction and drives the ball back to the starting line. If the ball is not driven hard enough to reach the starting line, the subject must follow up the device. The timer stops the watch as soon as the ball crosses the starting line. Ten passes each were to be received from right and left sides. Time taken to execute each complete trail, is recorded.

Scoring and Evaluation

Total time taken for twenty trials, 10 from right side and 10 from left side, is the score of the skill test and may be evaluated appropriately (Devindar Kansal, 1996, p.327-328).
Figure 3.b

Diagram of Field Marking for Fielding, Control and Driving while Moving Hockey Test
Statistical Techniques

The data were collected from the two categories namely trained and novice players on selected motor fitness and skill related variables. They were statistically examined to find out the significant difference by using descriptive statistics and paired sample ‘t’ test. To compare the experimental and control groups, independent ‘t’ test was applied at 0.05 level of confidence.