CHAPTER III

METHODS AND MATERIALS

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CHAPTER – III
METHODS AND MATERIALS

3.1 Introduction

Procedure and technique make the most dominant contribution towards the success or failure of any research work or investigation. They also depict scientific attitude and validity of the work. So the procedural method with specific operation directed towards logical conclusion has been planned and performed in this chapter on methods and materials.

After establishing the hypothesis in relation to the objectives, the next step is to develop the procedural method in the instructional model. This indicates that specific operation based on the hypothesis that will accomplish the desired objectives, must be planned and performed. Hypothesis based on the best information available should be used to direct the procedure. Methodology is one by which programmes are initiated and carried out.

In this chapter, subject of study, criteria measured, procedure for data collection, design of the research work, list of equipment used during the test, procedure for administering tests, environmental condition and statistical treatment have been described.

3.2 Subject of the Present Study

The subjects of the present study were selected from two groups; one from football player and the other from kabaddi players of district level. They were undergoing the training schedule programme of Sports Authority of India (S. A. I.) (2007–2009) in the Siliguri, West Bengal. The entire subject resided in the S. A. I. hostel and had almost the same daily programme of sports authority. All the subjects possessed sound physique. The total number of subjects was sixty (N = 60). Thirty students from each group were selected randomly for the study.

3.3 Criteria Measured

In the present study, personal data, selected motor ability test, academic achievement, and Psychological parameters were considered as criteria between district level football and kabaddi male players.
3.3.1 Personal Data:

Among personal data age, height and weight were considered.

3.3.2 Selected Motor Ability Test:

Selected motor ability test was measured by following tests adopted from A. A. H. P. E. R. Youth Fitness Test Battery.

i) Sit ups. ii) Shuttle Run. iii) Standing Broad Jump.

iv) 50 Yard dash. v) 12 minute Run-Walk.

3.3.3 Academic Achievement:

Academic achievement was recorded from the marks obtained at the annual examination by the students in the school.

3.3.4 Psychological Variables:

The psychological variables considered were:

i) Intelligence level.

ii) Reaction time.

iii) Sports achievement motivation.

3.3.5 List of Equipments used during the Tests:

1. Weighing machine.
3. Electronic stop watches.
5. Standard stadiometer.
6. Wooden blocks.
7. Whistle.
8. One table.
9. One chair.
10. Stick timer.
11. Questionnaire for sports achievement motivation.
12. Mat.
3.4 Procedure for administering Tests

Before conducting each test item the test procedure was explained to all the subjects as they were duly motivated to have best performance out of them. The test was conducted in Sports Authority of India, (S. A. I.) and the playground in Kanchenjunga Stadium and Tarai Tarapada Adarsha Vidyalay School, in Siliguri, West Bengal, India. The procedure for administering the tests / measurements was presented below.

3.4.1 Measurement of Personal Data:

Among personal data age, height and weight were considered. The test items of personal data variables with their measurement units have been presented in Table–1 and the score card of personal data of the subjects have been presented in Appendix–A.

3.4.2 Age:

For age, school records were considered as valid proof otherwise the researcher had collected the date of birth of the subjects from their birth certificates. After collecting their date of birth, age was calculated in nearest years (Photo 1).

Photo 1 : Measurement of Age of the subject
3.4.3 Height:

The height of the subjects was measured in the standard stadiometer, available in the Sports Authority of India (S. A. I.). The reading of the scale was taken in centimeter (Photo 2).

Photo 2: Measurement of Height of the subject
3.4.4 Weight:

The weight of the subjects was taken by a standard weighing machine kept in the S. A. I. training center and during the measurement the subjects had minimum garments. The recording was taken in nearest kilogram (Photo 3).

Photo 3: Measurement of Weight of the subject
Table 1

Personal Data with their Measurement Units

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Test Item</th>
<th>Sex</th>
<th>Measurement Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age</td>
<td>Male</td>
<td>Birth certificate</td>
</tr>
<tr>
<td>2</td>
<td>Height</td>
<td>Male</td>
<td>Standard stadiometer</td>
</tr>
<tr>
<td>3</td>
<td>Weight</td>
<td>Male</td>
<td>Weighing machine</td>
</tr>
</tbody>
</table>

3.5 Measurement of selecting Motor Ability Test

Much work has been done in the area of physical fitness but it is difficult to develop a single test item that adequately ensures all aspects of physical fitness. There are few known tests of motor fitness, such as A A H P E R. Youth Fitness Test, Barrow motor ability test, Oregon motor fitness test etc. But the researcher selected five items of A A H P E R Youth Fitness Test Battery (1976) to measure the motor ability of the subjects.

Singer (1976) strongly suggested that the AAPHER Youth Fitness Test Battery could be used to assess the physical fitness and motor fitness components viz., speed, strength, agility, power and endurance. The test items of motor ability variables with their measurement units have been presented in Table-2 and the score card of selected motor ability test of the subject have been presented in Appendix-B.

3.5.1 Measurement of Strength Endurance:

Sit-Ups

Purpose: To measure abdominal strength and endurance.

Required Facilities and Equipment: The only equipment required was a mat.

Procedure: The subject laid on the mat in flat position on back with knees bent and feet on the floor with the heels not more than one foot from the buttocks. The angle of the knee was kept not less than 90 degrees. The fingers were interlocked and placed behind the neck. The subject curled up to a sitting position and touched the elbows to the knees. This chain continued as many times as possible within the stipulated time (Photo 4).

Scoring: One point was scored for each correct sit up. The score was the maximum number of sit ups completed in 60 seconds.
3.5.2 Measurement of Agility :

Shuttle Run

Agility refers to the maneuver ability of the body and body parts. It is a combined construct of speed, strength, and balance. It tends to be specific for different motor performance. The dodge run is a standard test for evaluating the running agility which comprises zigzag running whereas the shuttle run test is an effective test included in the A. A. H. P. E. R. Youth Fitness Test, was selected as a standard test for measuring agility of the subject.

**Purpose** : To assess the agility of the subjects.

**Required Facilities and Equipment** : Two parallel lines drawn on the field 30 feet apart; two wooden blocks $(2 \times 2 \times 4$ inches), two electronic digital stop watches of $1/100$ sec. (Model – GEM, Licence, Hanhert, Germany) and one clapper for start.

**Procedure** : The subject was asked to stand behind the starting line; two wooden blocks were placed at the other end of the line with the sound of the starting clapper the subject ran fast towards the other line, took one of the blocks and returned to the starting line and placed it behind the starting line. The subject then ran back to pick-up
the second block and crossed the starting line. Time taken was recorded by the time keepers with the help of stop watches of 1/100 sec. Two subjects were subjected to run at a time to maintain the competitiveness in order to motivate them for better timing. Two trials were taken (Photo 5).

**Scoring**: After half an hour rest in between, time of better trial was recorded in seconds.

![Photo 5: Measurement of Agility of the subjects](image)

### 3.5.3 Measurement of Athletic Power:

#### Standing Broad Jump

Athletic power measurement, as expressed in terms of the distance through which the body of an object is propelled in the space. Those tests involve both force and velocity: other factors also influence testing result. But force and velocity are not measured as such, the measure is based on the distance (in unit), in athletic power measurement. The objectivity of the test is 0.96 which was established by Jack Clayton, 1972. The reliability and validity have been indicated by Johnson and Nelson was 0.963 and 0.667 respectively.
**Purpose**: To measure the athletic leg power.

**Required Facilities and Equipment**: Plane surface of the ground, marking materials for take-off line and measuring steel tape for recording the distance covered.

**Procedure**: The subject stood behind a take-off line with feet slightly apart in parallel. Body weight of the subject was equally distributed on both feet. With the signal of the tester the subject flexed the knees, lowered the centre of gravity (CG) little ahead and jumped ahead by taking-off with both feet following an arm-swing. The subject was motivated to jump as far as possible. Three successive trials were provided to each subject (Photo 6).

**Scoring**: The distance from the inner edge of the take-off line and the nearest point of contact of any part of the body after jump, was measured in cm. The best jump was recorded.

*Photo 6: Measurement of Athletic Leg Power of the subject*
3.5.4 Measurement of Speed:

50 Yard Dash

**Purpose**: The purpose of the test was to measure the running speed of the subjects.

**Required Facilities and Equipment**: Three electronic digital stop watches of 1/100 sec. (Model-GME, Licence, Hanhert, and German), one whistle. Three marked lanes of 1.22 m width on track with a perpendicular line at both end between 50 yards. The two perpendicular lines were considered as starting and finishing lines.

**Procedure**: Three runners at a time took their starting position behind the starting lines. With the sound of the starting whistle the runners ran down in their respective lanes and crossed the finishing line as fast as possible. The time was recorded by the timekeepers. The reliability of the timekeepers was high. Three trials were given with adequate rest of 40 min. A recall starter was deployed to avoid false start by the subjects (Photo 7).

**Scoring**: The score was the elapsed time between the sound of the whistle and the time of the chest crossing the plane of the finishing line measured to the nearest tenth of a second against each subject.
3.3.5 Measurement of Endurance:

12 Minute Run-Walk

**Purpose**: Endurance is an essential component of physical fitness. In all standard physical fitness tests a number of endurance tests are included. To cope up with the relevance with other field tests' for evaluating the components of physical fitness Cooper’s 12 minutes Run & walk test was chosen.

**Required Facilities and Equipment**: A smooth running track, digital electronic stop watches (1/100 sec.) and measurement tape, one whistle, flags are placed around the track at 40 yard intervals.

**Procedure**: In a running track, subjects used standing start. At the signal ready GO! The subject starts running the track. The running may be interspersed with walking. Six subjects ran at a time with having the subject’s pair off before the start of the event. The partner is instructor to count the number of laps that are run within the allotted time. When 11 minutes have elapsed, the instructor calls out the time left to run. At the end of 12 minutes, the instructor blows blast on his whistle and runner notes the flag he has just passed (Photo 8).

**Scoring**: Total distance was measured by meter of each of them.

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Photo 8: Measurement of Endurance of the subjects
Table – 2
Test Items of Selected Motor Ability Variables with their Measurement Unit

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Test Item</th>
<th>Sex</th>
<th>Motor Performance</th>
<th>Measurement Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Sit Ups</td>
<td>Male</td>
<td>Strength Endurance of Abdominal Muscles</td>
<td>Number / Minute</td>
</tr>
<tr>
<td>2.</td>
<td>Shuttle Run</td>
<td>Male</td>
<td>Agility</td>
<td>1 / 100 Second</td>
</tr>
<tr>
<td>3.</td>
<td>Standing Broad Jump</td>
<td>Male</td>
<td>Athletic Power</td>
<td>Feet / Inches</td>
</tr>
<tr>
<td>4.</td>
<td>50 Yard Dash</td>
<td>Male</td>
<td>Speed</td>
<td>1/100 Second</td>
</tr>
<tr>
<td>5.</td>
<td>12minute Run &amp; Walk</td>
<td>Male</td>
<td>Endurance</td>
<td>Meter</td>
</tr>
</tbody>
</table>

3.6 Measurement of Academic Achievement

Academic achievement was measured by the marks obtained from the annual examination by the students in their own school records (Photo 9).
3.7 Measurement of Psychological Variables

As psychology plays a dominant role in every sphere of human life, it also has many eminent factors which influence human psychology. In short, there are many factors influencing the individuals mind and those factors are reflected on his/her psychology for finding out the variables on psychology. Although psychological variables comprises many components, but amongst them three principal components have been selected to assess the psychological variables of the subjects. Psychological variables were intelligence level, reaction time and sports achievement motivation.

3.7.1 Measurement of Intelligence Level:

Out of different psychological variables, one is intelligence level. It is measured by the Standard Progressive Matrices (Raven, 1977). The standard progressive matrices sets (A, B, C, D & E) is a test of person’s capacity at the time of the test apprehend meaningless figures presented for his observation, see the relation between them, conceive the nature of the figure completion each system of relations presented, and by doing so develop a systematic method of reasoning. The five sets provide six to eight opportunities for grasping the method and five progressive assessments of a person’s capacity for intellectual activity. The original standard progressive matrices (sets A, B, C, D & E) have been presented in Appendix–C. The test items of psychological variables with their measurement units have been presented in Table–3 and Photo 10).

Photo 10 : Measurement of Intelligence Level of the subjects
Intelligence Level:

Subject’s intelligence was measured by Standard Progressive Matrices (SPM), sets A, B, C, D and E on the subjects. The standard Progressive Matrices contained sixty problems divided into five sets. Each set contained six to eight meaningless figures and the actual answer figure, which must tally with the question figure to the problem. In each set the first problem was nearly self-evident. The problems which follow become progressively more difficult. Each problem in the scale was really the “mother” or “source” of a system throughout. Hence the name was “Progressive Matrices”. The original standard progressive matrices (sets A, B, C, D and E) had been presented in Appendix – C.

Materials Required: A set of test books was required for this purpose. These were used repeatedly. Each person was required a record form and a pencil.

Accommodation: The test was conducted on a group of students according to accommodation available in the playground. Approximately one and half an hour was allowed for each group tested. The subjects to be tested were allowed to sit comfortably in the playground with questionnaires and sufficiently apart to prevent copying. Sufficient space was left so that supervisors could pass easily between the subjects without disturbing them.

Procedure: Pencils and questionnaires were distributed among the pupils. The pupils to be tested were asked to fill in particulars about themselves in the questionnaires. When this was done the questionnaires were given to them. They were asked not to open the questionnaires until everyone was ready.

The researcher said to open the first page of the questionnaires. The researcher exhibited a demonstration to the subjects by opening the first page to show how to fill up the questionnaire. At the top researcher said to see set A and that was A, it had a column A there on their scoring form. It was A the subject what it was. The upper part was a pattern with a bit missing. Each of those bits below (he pointed to each in turn) was the right shape to fit the space, but the subject not all complete. Number 2 and 3 were wrong. Researcher fitted the space but the subject were not the right pattern. The researcher was questioned about number 6. Then the researcher told the right pattern.
(researcher illustrated that the pattern was the same as the pattern above) but it did not go all over. The subject told to put the finger on the one was quite right.

The researcher noticed if that was done correctly. If necessary, subject gave further explanation and then told to them that 4 was the right one. So the answer to A1 was 4 and wrote 4 there against number 1 in column A on their scoring form.

The researcher waited for everyone to finish and continued that on every page in their book there was a pattern with bit missing. The subject to decide each time, which of the bits below was the right one to complete the pattern above. When the subject found the right bit they had to write the number of the bit down on their scoring form against the numbers of the pattern. They were simple at the beginning and got harder as subject go on. There was no catch. If the subject paid attention on the way the easy ones go. The subject would find the later ones less difficult. The subject should try each in turn, right from the beginning to the end of the book. The subjects were advised to work at their own pace, not to miss any out and not to turn back. The subject was asked that how many right bits they could get, but they could have as much time as they liked. The researcher told the subjects to turnover and did the next one. When sufficient time had been allowed for everyone to write down the answer to A2, the researcher said that the right one of course was number 5. He said to see that they had written the figure 5 against number 2 in column A in their form. The researcher told to go like that by themselves until they got to the end of the book. Progressive matrices figure displays the process used in taking the intelligence level test of the subjects (Raven, 1938).

**Scoring:** The number of the right figures were counted and recorded as the result of the score.

**3.7.2 Measurement of Reaction Time:**

**Hand Reaction Time:**

Reaction time of the subjects was considered as standard measured for the study. Reaction times of hand of the subject had been measured through Nelson Hand Reaction Test respectively with a stick timer by following the procedure mentioned later.
Objectives: To measure the speed of reaction with the hand in response to a visual stimulus.

Required Facilities and Equipment: Nelson Reaction Timer, table and chair

Procedure: The subject will sit with his forearm and hand resting comfortably on the table (or bench or chair). The tips of the thumb and index finger will be held in a ready pinch position about three or four inches beyond the edge of the table. The upper edge of the thumb and index finger should be in a horizontal position. The tester holds the stick timer near the top, letting it hang between the subject's thumb and index finger. The base line should be even with the upper surface of the subject's thumb.

The subject was directed to look at the concentration zone (which was a black shaded zone between the 120 and 130 lines) and was told to react by catching the stick on scale (by pinching the thumb and index finger together) when it was released. The subject should not look at the tester's hand, nor is she allowed to move her hand up or down while attempting to catch the falling stick. Twenty trials are given. Each drop is preceded by a preparatory command of “ready”.

Scoring: The subject catches the timer, the score is recorded just above the upper edge of the thumb. The five slowest and five fastest trials are discarded, and an average of the middle ten is recorded as the score. Numbers on the timer represent thousandths of a second (5/1000 sec). The formula of reaction time is given below.

\[
\text{Reaction Time} = \sqrt{\frac{2 \times \text{Distance the stick falls}}{\text{Acceleration due to gravity}}} 
\]

(Nelson Reaction Timer, 1965)

3.7.3 Measurement of Sports Achievement Motivation:

Achievement based competition not only brings in advantage to the participant but also enhances the prestige of the individual socially. Further achievement motivates and motivation rejuvenates the urge and effort for higher achievement. The vicious circle continuous indefinitely like a spire. Sports achievement motivation it was measured by the questionnaire. By following the procedure mentioned later.
Required Facilities and Equipment – Questionnaire of SAMT:

Sports Achievement Motivation Test (SAMT) of Kamlesh (1987) is a questionnaire of 20 statements, the response value of which ranges from 0 to 40. On the basis of the percentile norms suggested in the test, subjects scoring below 24 could be characterized low in sports achievement motivation, those scoring 30 and below but above 24 as moderate and those scoring above 30 as highly motivated. The copy of the test is given in the Appendix-D. The reliability co-efficient of test was found to be 0.94 (Photo 11).

Procedure: The subjects were asked to take sit in the playground and questionnaire were served. Before starting the test, the purpose and direction of the test was clearly explained to them. They were directed to tick mark ‘a’ or ‘b’ which they found appropriate against each of the 20 incomplete statements. No time limit was there for the test.

Scoring: Each correct answer carries 2 marks and the wrong answer carries 0 marks. Thus one may score for 20 statements in between 0 to 40. For statistical analysis this score was converted to standard score.

Photo 11: Measurement of Sports Achievement Motivation Test of the subjects
Table - 3
Test item of Psychological Variables with their Measurement Units

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Test Item</th>
<th>Sex</th>
<th>Measurement Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Intelligence Level</td>
<td>Male</td>
<td>Questionnaire</td>
</tr>
<tr>
<td>2.</td>
<td>Reaction Time</td>
<td>Male</td>
<td>Stick Timer</td>
</tr>
<tr>
<td>3.</td>
<td>Sports Achievement Motivation</td>
<td>Male</td>
<td>Questionnaire</td>
</tr>
</tbody>
</table>

3.8 Research Design

The subjects were divided into two groups i.e. Football and Kabaddi. The comparison in different variables were made between football and kabaddi players. In present study the tests and measurement were conducted on three consecutive days in a specified date. The researcher and his assistants conducted age, height and weight of the subjects in one day and second day taken selected motor ability status adopted from A. A. H. P. E. R. youth fitness test battery were taken, at last day psychological variables i.e. intelligence level, reaction time, and sports achievement motivation were measured. For collecting data the researcher took help from S. A. I coaches and physical educator for proper and scientific instruction to maintain the uniformity in conducting the test. The test was conducted in the Kanchenjunga Stadium ground. The researcher was close contact to his subjects. The study is a purely comparative one falling under the category of descriptive research.

3.9 Reliability of Data

Before administering the tests, the author had a series of meeting with the subjects for explaining and clarifying in details the testing procedures in order to remove misunderstanding in their minds. So, that they could put up their best efforts and endure the strain to be taken to complete the test items in addition to their regular practice session. All the subjects extended their full co operation by way of their voluntary participation in the conduct of the test items in the interest of the scientific investigation made in this study and also to enhance their own performance and achievement standards. The scholar did not use any special motivating technique to elicit the best efforts of the subjects but the subjects themselves were all the time enthusiastic and co operative. Actual collection of the data the reliability of data was ensured by establishing tester’s competency, selection variables, instrumental reliability, test reliability and subject reliability.
3.10 Tester’s Competency

All the measurements in this study were taken by the researcher himself. The investigator took the assistance of other physical education teachers and coaches. They were all trained and experienced. All information related to the questionnaire were collected by the researcher himself.

3.11 Selection of Variables

The selected motor ability variables of the subjects – sit ups, shuttle run, standing broad jump, 50 yard dash, 12 minute run & walk Academic achievement and psychological variables – intelligence level, reaction time, sports achievement motivation were taken as variables for this study.

3.12 Reliability of Instruments and Tools

The reliability of collected data depended upon the reliability of the instruments, which had been used for collecting the data. The reliability of stopwatches, measuring tapes, stadiometer and weighing machine were ensured by their manufactures.

A. A H P E R Youth Fitness Test Battery was selected for motor ability test, Standard Progressive Matrices (sets A, B, C, D and E) (Raven, 1938) was used for intelligence level and Nelson hand reaction test (1965) was used for reaction time. Sports achievement motivation questionnaire was standardized tests with high degree of validity, objectivity and reliability.

3.13 Reliability of Tests

i) Standard test were conducted for measuring selected motor ability parameters

ii) Academic achievement was measured with the help of a marks obtained at the annual examination by the students in the school

iii) Standardized questionnaire were used for measuring psychological parameters

3.14 Environmental Condition

The tests and measurement for this study was conducted in February, 2008 for three consecutive days. The temperature and humidity of different test days were same and did not affect the measurement of the subjects of different days.
3.15 Statistical Procedure

The standard statistical procedure had been adopted for analysis and interpretation of the data collected through various standard tests and measurements. Most of the statistical analyses were computed through computer. The result of the study was obtained by following statistical procedures as mentioned hereunder:

1) At first the mean and SD were computed.
2) To assess the comparison of the groups, t-test (Garrett, 1973) was applied for indicating the significant difference. The level of significance was set at 0.05 level.

For analysis of data, statistical procedure was used. Value of ‘t’ test was calculated for independent variables. The mean was calculated as a measure of central tendency by using the formula:

\[ \bar{X} = \frac{\sum X}{N} \]

where, \( \bar{X} \) denoted the mean, \( \sum X \) denoted the sum of total score and \( N \) denoted the number of scores.

The standard deviation was calculated as the measure of variability. The formula used for this was:

\[ \text{Standard deviation (} \sigma \text{)} = \sqrt{\frac{\sum (X - \bar{X})^2}{N}} \]

where \( \sigma \) denoted the standard deviation, \( \sum (X - \bar{X})^2 \) denoted the total of square of the deviation and \( N \) denoted the number of scores.

For independent variables, the significance of the difference between two means was tested by calculating ‘t’ value. The formula used for this was:

\[ t = \frac{\text{Difference between two means}}{\text{Standard error of difference between two means}} \]

\[ = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}} \]

\[ = \frac{\bar{X}_1 - \bar{X}_2}{SE_d} \]

where ‘t’ indicated the critical ratio, \( \bar{X}_1 - \bar{X}_2 \) indicated the difference between two means and \( SE_d \) was the standard error of difference between two means (Garrett, 1973).