CHAPTER - III
METHODOLOGY
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METHODOLOGY

In this chapter the design of the study, the selection of subjects, selection of variables, reliability of the data, instrument reliability tester’s competency, reliability of the tests, subject’s reliability, orientation of subjects, collection of data and the statistical techniques employed have been described in this chapter.

3.1. DESIGN OF THE STUDY

The effective study design was followed to find out effect of implementing physical education as a mean to increase physical fitness and performance in athletics of high school children in Tamilnadu.

Totally one thousand male students studying in different schools throughout Tamilnadu were selected as subjects on random basis.

3.2. SELECTION OF SUBJECTS

For the purpose of the study one thousand high schools children (boys) studying from VI standard to VIII standard were selected as subjects for the purpose of this study.

The age of the children was between 12 and 14 years.

Children studying in rural schools and urban schools in all districts of Tamilnadu were selected as subjects.

The 1000 subjects for the purpose of the study were selected as follows from the following districts in Tamilnadu.

1. Chennai - 100 boys
2. Thiruvannamalai - 100 boys
3. Thanjavur - 100 boys
4. Trichy - 100 boys
5. Karur - 100 boys
6. Salem - 100 boys
7. Coimbatore - 100 boys
8. Sivagangai - 100 boys
9. Madurai - 100 boys
10. Tirunelveli - 100 boys

3.3. SELECTION OF VARIABLES

The investigator reviewed the available scientific literatures, books, journals, periodicals, magazines and research papers pertaining to the study. Taking into consideration of the feasibility criteria availability of the instruments and relevance of the variables to the present topic the following variables were selected for the investigation.

3.3.1. Physical Fitness Variables

1. Speed
2. Power
3. Agility
4. Flexibility
5. Endurance
6. Abdominal Strength and
7. Arm Strength
3.3.2. Athletic Performance Variables

100 metres performance
Long jump performance
Shot put performance

3.4. REASON FOR SELECTING SPEED

An essential physical component for successful performance in many activities is speed. Speed, like reaction time concerns many body parts and vary among one part to another.

Speed is one of the components of physical fitness. Speed is a conditional ability. It has a complete nature as it depends to a considerable extent on the central nervous system. Speed ability should not be equated with mechanical speed which is equal to the distance covered per unit of time. In several sports actions, no distance is covered at all speed ability primarily signifies the ability to execute motor movements with high speed and these movements may be cyclic in nature.¹

Speed is the important ingredient in many sports. Speed in sports context can have different meaning. One is instantaneous speed. For example the speed at take off in a jump or at release in throw. Another one average speed over 100 mts dash or for a Marathon race. Speed will mean maximum speed and thus apply to sports events where the highest possible speed is strive for in a single short effort or in a repeated maximum efforts together fasting about 10 seconds. Taking into account of the importance speed was chosen as a variable.²


3.5. REASON FOR SELECTING POWER

Power is the rate of doing work. Power is the capacity of an individual to bring into play maximum muscle contraction at the faster rate of speed. Performance in standing broad jump reveals the explosive power of an individual. Need of power in standing broad jump is highly essential in relating to the energy used in jumping. Sprinting, kicking etcetera. The strengthening exercise like press up’s weight training, running up hill may improve explosive power.

Explosive power is the ability to release maximum muscular force in the shortest time as in executing a standing broad jump.

Leg explosive power is most important for field events such as standing broad jumps, running broad jump, and high jump. Because of the above qualities power was selected as a variable.

3.6. REASON FOR SELECTING AGILITY

Agility is another important component of physical fitness.

Johnson and Nelson say Agility may be explained as the physical ability which enables an individual to rapidly change body position and direction in a precise manner.4

In any physical activity or in a grave situation, the controlled ability to step to start and to change direction rapidly and more quickly is a very essential factor and this quality decides ones performance level and the speed of acquiring only skill. The absence of that ability among the participants would spoil the original skill.


Agility is a necessary pre-requisite for all physical exercises requiring the participation of the whole body and the inter play of all the groups of muscles.

Agility plays a significant role in the training of techniques and in competition. The aim in training skills is to bring the athlete closer and closer to the ideal form of the sequence of movement. Because of the above reasons, agility was chosen as a variables.

3.7. REASON FOR SELECTING FLEXIBILITY

The basis to proficiency in motor movement is flexibility. It is significant in the performance of many skills such as a motor fitness factors. It is concerned with the degree of movement and it limits the degree to which to body or body parts can bend or twist by means of flexion and extension of muscles. Because of these qualities flexibility was chosen as variables for this study.

3.8. REASON FOR SELECTING ENDURANCE

Another variable chosen for the study is endurance.

"Endurance is the ability to resist fatigue".6

Endurance is a very important ability in sports. Endurance is the product of all psychic and physical organs and systems. No other motor ability depends so much on the working capacity to complete psycho physical apparatus to human as endurance.


In sports, endurance ensure optimum speed of motor actions. The ability to maintain pace or tempo of an exercise or during a competition is impossible without the requisite level of endurance. Good endurance also ensures high quality of skill of movement execution which finds expression in accuracy, precision, rhythm and consistency.

Endurance training results in the improvement of functioning of various organs and systems of the human body.

This in turn improves the ability to recover quickly from training and competition load. At the same time endurance activities enable the sportsman to better resist the fatigue i.e. to delay the fatigue.

Endurance activities have been found to be high value for maintenance of organic health or increasing general resistance against infections and for cure and treatment of various diseases and metabolic disorders.

Because of the above qualities, endurance was chosen as a variable for the study.7

3.9. REASON FOR SELECTING SHOULDER STRENGTH

Shoulders strength is a conditional ability. It depends largely on the energy liberation processes in the muscle strength. It is also perhaps the most important motor ability in sports as it is a direct product of muscle contractions. All movements in sports are caused by muscle contractions and therefore. Strength is a part and parcel of all motor abilities, technical skills and technical actions.8

7 Ibid., pp. 130-131.
Shoulder strength is the ability or the capacity of a muscle group for exerting force against resistance. Strength is inextricably related to motor performance muscles that are strong result in better protection of body joints and fewer sprains and other muscular difficulties.

Muscular strength helps in maintaining proper posture. Considering the above importance shoulder strength was chosen as a variable for the study.

3.10. REASON FOR SELECTING ABDOMINAL STRENGTH

Another important variable chosen for the study is abdominal strength. The abdominal muscles and oblique muscles that flex and twist the trunk, respectively are referred to as the midsection muscles.

The tightened abdominal muscles help to produce a streamlined appearance.

The abdominal strength is very much useful in the field of sports and games, when an individual possess a high degree of abdominal strength he will be able to perform any type of activity such as running, jumping and throwing.

The abdominal strength helps to maintain the body posture thereby involving in many activities in the field of sports and games. Lifting a load on moving an inanimate or animate object essentially depends on the abdominal muscular strength.

Considering the above facts the abdominal strength was selected for the study.

3.11. REASON FOR SELECTING 100 METRES

100 metres run is the ability of the individual to successive movements of some kind in the shortest period of time. Sprinting 100mts can be understood as the ability of the individual at the maximum speed possible.
One hundred metres performance is the indicator of the speed of an individual. The fastest athlete can be a good performer in hundred metres performance.

3.12. REASON FOR SELECTING SHOTPUT

Shotput is an event which reveals the capacity of the individual to bring into play a maximum muscle contraction at the fastest rate of speed.

Shotput event is the indicator of arm strength, shoulder strength and the angle of projection.

3.13. REASON FOR SELECTING LONGJUMP

The long jump is one of the most simple and natural events in track and field. Despite its apparent simplicity, a great deal of skill and conditioning is required to run full speed down a runway, consistently hit an eight inch board, and take off and land. For this reason it is imperative that the coach and an athlete treat the long jump as a technique skill that can be improved only through proper training.

Performance in long jump reveals the explosive power of an individual. Need of power in long jump is highly essential in relation to the energy used in jumping, sprinting kicking etcetera.

The explosive power measurement is expressed in terms of the distance through which the body or an object is propelled through space. The long jump include projecting into the air. Leg explosive power is most important for long jump event. Because of the above qualities, long jump was selected as a athletic variable.
3.14. RELIABILITY OF DATA

The reliability of data was ensured by establishing the instrument reliability, tester's competency, reliability of the tests and subject reliability.

3.15. INSTRUMENT RELIABILITY

Swiss made stop watches calibrated to one tenth of a second were used. To determine the reliability of the instruments, the measurements on each of the variable were recorded five times under similar conditions using the same watches and also the scores were compared with other scores taken from the instruments purchased from other reputed firms and they were found equal. Besides that the instruments were purchased from standard companies and hence they were considered reliable.

3.16. TESTER'S COMPETENCY

The tester's competency was established together with the reliability of the test. To determine the reliability of the test, the performance of ten subjects on the chosen variables were recorded twice under identical condition. This was done by test re-test method on two consecutive days. The scores thus obtained for each variable by test, re-test method were correlated using Pearson's product moment correlation to establish the tester's competency and the consistency of the scores.
TABLE - I

RELIABILITY CO-EFFICIENT OF TEST, RE-TEST SCORES

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Variables</th>
<th>Correlation Co-efficient to test re-test scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Speed</td>
<td>0.92</td>
</tr>
<tr>
<td>2.</td>
<td>Power</td>
<td>0.92</td>
</tr>
<tr>
<td>3.</td>
<td>Agility</td>
<td>0.91</td>
</tr>
<tr>
<td>4.</td>
<td>Flexibility</td>
<td>0.90</td>
</tr>
<tr>
<td>5.</td>
<td>Endurance</td>
<td>0.89</td>
</tr>
<tr>
<td>6.</td>
<td>Shoulder Strength</td>
<td>0.93</td>
</tr>
<tr>
<td>7.</td>
<td>Abdominal Strength</td>
<td>0.91</td>
</tr>
<tr>
<td>8.</td>
<td>100 mts performance</td>
<td>0.92</td>
</tr>
<tr>
<td>9.</td>
<td>Long Jump performance</td>
<td>0.94</td>
</tr>
<tr>
<td>10.</td>
<td>Shot put performance</td>
<td>0.93</td>
</tr>
</tbody>
</table>

\( \text{df} = N - 1 = 20 - 2 = 9 \) Table value at 0.05 level

The obtained r value is more than the table value and significant at 0.05 level.

3.17. SUBJECT RELIABILITY

The test retest scores also indicated the subject reliability as the same subjects were used under different conditions by the tester.

3.18. ORIENTATION OF SUBJECTS

Prior to the test administration, the training and test procedures were explained in detail to the subjects to ensure proper understanding and to secure effective co-operation so as to obtain reliable data from the subjects.
3.19. COLLECTION OF DATA

The data were collected on thousand subjects initially. Among them three hundred subjects who were found very weak in the physical fitness and in the athletic performance were chosen finally. The physical education programme was given to those three hundred subjects for a period of twelve weeks. Thereafter final data were collected repeatedly at the end of 4th week, 8th week and 12th week.

Physical fitness tests were used to find out the physical fitness of the subjects in athletics. Three athletic events were used to measure the performance.

Initial data on the physical fitness variables and performance variables were collected. Thereafter the physical education programme was given as a treatment every day for six days in a week and for a total of 12 weeks. Data were also collected at the end of 4th week, 8th week and 12th week.

3.19.1. Speed

Test - I

50 metres dash.

Purpose

To measure the maximum speed of subjects in a straight path of 50 metres.

Equipment

A 50 metres long plain ground with markings for start and finish, stop watch, lime powder score sheet and clapper.
Procedure

A starting line and a finishing line 50 metres away from starting line were marked. The line of 1.22 metre width was also drawn from the starting line to finishing line.

After a short warm up the subject took position behind the starting line. On the command "go" the subject run as fast as possible across the finishing line which was at a distance of 50 metres. The clapper was sounded simultaneously with the command "Go" for the help of times who stood at the finishing line.\(^9\)

Score

The score was the time elapsed to the nearest 1/10th of a second between the starting command and instant the subject crossed the finishing line. The best time out of two trails was recorded as the individual's score.

3.19.2. Power

Test - II

Standing broad jump test.

Purpose

To find out the leg explosive power.

Equipment

Out door jumping pit and measuring tape.

Procedure

The subject was asked to take a position with toes just touching the take off line, feet slightly apart. Taking off from both heels simultaneously, he jumped as far as possible landing on both feet; in jumping he was advised to crouch slightly and swing the arms to aid the jump. The best of the three trails were recorded.\(^{10}\)

Scoring

The nearest point touched by any part of the body at right angles to the take of line was measured. Measurement was made to the nearest centimetre.

POWER
3.19.3. Agility
Test - III

4 x 10 yards shuttle run test.

Purpose

To measure the speed and change of direction (agility) of the subjects.

Equipment

Two parallel lines 30 feet (10 yards) apart were drawn on the ground. A stop watch with calibration of 1/10 of seconds, a whistle measuring tape two wooden blocks (2"x2"x4") and score sheet for administering the test.

Procedure

The performer stands behind the starting line on the signal 'Go' he runs to the blocks, picked up one, returned to the starting line and placed the block behind the line, he then repeated the process with second block, allowed some rest between the two trails.

Scoring

The score for each subject was the length of time required (to the nearest tenth of a second) to completed the course. Recorded only the best trail.\footnote{Johnson and Nelson, \textit{Loc. Cit.}, pp.217-218.}
AGILITY
3.19.4. Flexibility

Test - IV

Sit and reach test.

Purpose

To measure the flexibility of the subjects.

Equipment

The test apparatus was especially constructed box with a measuring scale in 23 inches had set at the level of the feet.

Procedure

Line up with the 23 inches mark yard stick to the top stick to the top edge of the wooden platform. The subject set down and line up his heels with the near edge of the 23 inch mark slide, he sat back beyond 23 inches end of the yard stick with knees locked and heels not more than 5 inches part, stretched forward and touched the fingertips of both hands as many inches down the stick as possible.

Scoring

The score was measured to the nearest (yard stick) inch, the longer distant point in the scale reached on the three trails.
FLEXIBILITY
3.19.5. Endurance

Test - V

9 minute run.

Purpose

To measure endurance.

Equipment

A standard 400 metres track and 200 metres track with flags placed at 40 metres interval around the track and a stop watch.

Description

The subject was asked to run around the track continuously for nine minutes. Every subject had a partner to count the number of rounds completed by the subject. At the end of nine minutes the investigator blew the whistle and the subject was asked to hold the flag which he just passed. The distance covered by each subject was recorded in metres.\textsuperscript{12}

Scoring

The nine minute run distance was recorded to the nearest of ten metres.

3.19.6. Shoulder Strength

Test - VI

Pull - Up

Test administration

Purpose

To measure the shoulder strength of the subjects.

Facilities and Equipments

A horizontal bar positioned at a height that allowed the students to hang without touching the ground.

Procedure

The bar was adjusted to a height that permitted the subject to hang free from the floor. From the hanging position with the over hand grip (plan forward) the body was then pulled upward until the chin rested over the bar and then was lowered until the arms were straight. The movement was repeated to exhaustion. The subject was not allowed to kick, jerk or use a hip movement.

Scoring

The score was the number of correctly executed chins.
SHOULDER STRENGTH
3.19.7. Abdominal Strength

Test - VII

Sit Ups Test

Purpose

This test were conducted to evaluate the abdominal strength of the subject.

Equipment

Stop watch.

Procedure

The subject lies flat on his back with his feet approximately two feet apart. His fingers must interlock and place behind his neck. His elbows were flat against the floor. His feet were held by a partner. On the signal to start, the subject sits up touching the left elbow to the right knee, return to the original starting position sits up again and touches the right elbow to the left knee and returns. This exercise is repeated on alternate sides. Each time and elbow touches the knee one point is scored.

Scoring

One point were scored for each correct sit-up. Number of points scored in one minute were recorded.
ABDOMINAL STRENGTH
3.20. PERFORMANCE IN ATHLETICS

3.20.1. 100 Metres Dash

To measure the performance in 100 mts dash of subjects in a straight path. A long plain ground with markings for start and finish line exactly 100 metres a part were marked. The stopwatch, lime powder, score sheet and clapper were used.

A starting line and a finishing line 100 mts away from starting line was marked. The line of 1.22 metre width was also drawn from the starting line to finishing line. After a short warmup the subject took position behind the starting line. On the command 'go' the subject ran as fast as possible across the finishing line, which was at a distance of 100 metres. The clapper was founded simultaneously with the command 'Go' for the help of times who stood at the finishing line.

Scoring

The score was the time elapsed to the nearest 1/10th of a second between the starting command and instant the subject crossed the finishing line.
3.20.2. Long Jump

The jumping sand pit was levelled and made ready for conducting the test. The white pointed take-off board was fixed properly. Sufficient instructions were given about the test. Two helpers were assigned to assist in measuring and levelling the sand. All the subjects were given the chest numbers. On calling their respective number they executed their jumps. Three trails were allowed for each subject. The best of the three trails was treated as the subjects score. The investigator read the measuring tape after correct jump was recorded.
ROTATION OF VARIOUS JOINTS

OPPOSITE TOE TOUCHING
JUMPING JACK

THREE TOUCH AND ARCH BACK
SIT UPS

VERTICAL JUMP
ON THE SPOT RUNNING

BEND AND STRETCH
SPLIT JUMP

LEG THRUST
3.21.2. Physical Education Subject - Rhythms and Light Apparatus Exercises

1. Kummi
2. Kolattam
3. Karagam
4. Any folk dance
5. Aerobic dance
6. Lezium
7. Wand
8. Dumb - bell
9. Hoop
10. Indian club

The above said rhythms and light apparatus exercises were given for two days in a week on Tuesdays and Fridays.
KARAGAM

ANY FOLK DANCE
3.21.3. Track and Field Events

The below mentioned athletic training was given for two days a week on Wednesdays and Saturdays.

1. 100 metres
2. Long jump
3. Shot put

The above events were given for subjects with general and specific physical conditioning.
3.22. STATISTICAL PROCEDURES EMPLOYED

The following statistical procedure was employed to find out the effect of physical education programme on fitness components and performance in athletics at the end of 4th week, 8th week and 12th weeks. Analysis of variance repeated measure techniques was employed as suggested by Garret.

\[
F = \frac{Msb}{Msw}
\]

\[
Msb = \frac{Ssb}{K(N-1)} = \frac{S \times 2}{N-2}
\]

\[
Msw = \frac{Ssw}{K(N-1)} = \frac{S \times 2}{N-2}
\]

\[
= df = N - K or N - 1
\]

Scheffe's post hoc test was used to find out which period had improved better.\(^\text{13}\)

\(^\text{13}\) Henry E. Garret Statistics in Psychology and Education (Bombay Vakills, Feffer and Simous Private Ltd., 1966), p.139.