CHAPTER - III

METHODOLOGY

In this chapter, details of selection of subjects, experimental design, selection of variables, selection of tests, reliability of instruments, competency of tester, reliability of data, orientation to the subjects, pilot study, training programs, test administration, collection of data and the statistical procedure that were used have been presented.

3.1. SELECTION OF SUBJECTS

The main purpose of the study was to find out the effect of varied packages of physical training for preparatory and competitive periods on selected motor ability components, physiological variables, speed parameters and hundred meters run performance of school level boys.

For the purpose of this study, eighty boys studying in the high school and higher secondary schools of Puducherry region were randomly selected as subjects and their range of age group was between fourteen to nineteen years.

3.2. EXPERIMENTAL DESIGN

The total subjects were divided into four groups called as I, II, III and IV and each group consist of twenty students. The groups I, II, and III were treated as experimental groups and the group IV was considered as control group. The initial tests on motor ability components, physiological variables, speed parameters and performance variable were taken and recorded for all the four groups.
All the three experimental groups were trained for six days per week for a period of 30 weeks. The training periods were divided into two stages. First 16 weeks were treated as preparatory period and the remaining 14 weeks were treated as competitive period.

Among the three experimental groups, group I was involved with packaging I preparatory period physical training with required intensity and required volume, group II was taken up with package II preparatory period physical training with above 90% intensity and required volume, and the group III was trained with the package III preparatory period physical training with fixed high intensity and fixed high volume. The control group was not involved in any physical trainings.

After 16 weeks of preparatory period training, the second test on all the motor ability components, physiological variables, speed parameters and performance variable were taken for all the four groups and recorded.

After the test, three experimental groups were further underwent physical training of competitive period training schedule for a period of 14 weeks, with the same pattern of intensity and volume which had been followed during preparatory period. After 14 weeks of competitive period physical training, the final test on all the motor ability components, physiological variables, speed parameters and performance variable were taken and recorded. The effects were analysed for both preparatory and competitive periods.

3.3. SELECTION OF VARIABLES

Before selecting the dependent variable for the study, the research scholar had gone through all the available literature from the books, journals, periodicals, magazines and research papers. On the basis of the available literature, personal experience, discussion done with research supervisor and consulting with sports experts; the following motor ability components, physiological variables, speed parameters and performance variable were selected for the study as criterion variables.
**Motor Ability Component**
1. Speed
2. Leg Explosive power
3. Agility
4. Flexibility

**Physiological Variables**
1. Resting pulse rate
2. Anaerobic power
3. Cardio- Respiratory endurance

**Speed Parameters**
1. 30 Meters run performance from flying start
2. 30 Meters run performance from crouch start
3. 300 Meters run performance.

**Performance Variable**
1. 100 Meters run performance.

**3.4. SELECTION OF TEST**

The purpose of this study was to assess the effect of packages of physical training for preparatory and competitive periods on selected motor ability components, physiological variables, speed parameters and hundred meters run performance.

The motor ability components such as speed, leg explosive power, agility and flexibility were measured by 50 meters run, standing broad jump, 4X 10 yards shuttle run and sit and reach test respectively.

Physiological variables such as resting pulse rate, anaerobic power and Cardio- Respiratory endurance were measured by counting the pulse per minute, Margaria Kalaman test and 12 minutes run and walk test respectively.
Speed parameter such as 30 meters run performance from flying start (Locomotive Speed), 30 meters run performance from crouch start (Acceleration Speed with reaction speed) and 300 meters run performance (speed endurance) were measured by clocking the time from start to finish of the runs respectively.

The 100 Meters run performance was measured by taking the time from start to finish of the 100 Meters run.

3.5. RELIABILITY OF INSTRUMENTS

Instruments such as Japan made Casio electronic stopwatches, measuring steel tape made by Freeman Company, Javelin made by Nelco, Starting blocks made by Nelco, starting gun and weighing machine were used for the study. All the instruments were in good working condition. Their calibration were tested and found to be accurate enough to serve the purpose of the study.

3.6. COMPETENCY OF TESTER

The investigator learned the procedure and method to handle and operate the instruments to administer the test. The tests were conducted on the subjects by both the investigator and qualified assistance. To ensure uniformity and reliability of the testing technique, the investigator had a number of practice sessions in the testing procedures with the guidance of experts.

3.7. RELIABILITY OF DATA

Reliability of data was established by test-retest process. Ten subjects were tested and retested on the same test for the selected variables. The scores obtained were distribution of single variable; hence, the reliability has to be determined for a uni-variate situation and not a bi-variate.
To determine the test reliability it makes sense then to use a univariate statistics like the intra class correlation co-efficient\(^1\). The intra class correlation co-efficient obtained for test and retests were presented in Table – I A.

**TABLE – I A**

**INTRACLASS CORRELATION CO-EFFICIENT OF TEST - RETEST SCORE**

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>TESTS AND VARIABLES</th>
<th>INTRACLASS CORRELATION CO-EFFICIENT. ‘R’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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<tr>
<td></td>
<td><strong>MOTOR ABILITY COMPONENTS</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>50 Metres run (Speed)</td>
<td>0.893 **</td>
</tr>
<tr>
<td>2.</td>
<td>Standing Broad Jump (Leg explosive power)</td>
<td>0.851 **</td>
</tr>
<tr>
<td>3.</td>
<td>4X 10 Yards shuttle run (Agility)</td>
<td>0.897 **</td>
</tr>
<tr>
<td>4.</td>
<td>Sit and Reach test (Hip Flexibility)</td>
<td>0.937 **</td>
</tr>
<tr>
<td></td>
<td><strong>PHYSIOLOGICAL VARIABLES</strong></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Counting the Pulse for 1 minute (Resting pulse rate)</td>
<td>0.981 **</td>
</tr>
<tr>
<td>6.</td>
<td>Margaria Kalanen Test (Anaerobic power)</td>
<td>0.885 **</td>
</tr>
<tr>
<td>7.</td>
<td>12 minutes run and walk (Cardio Respiratory Endurance)</td>
<td>0.897 **</td>
</tr>
<tr>
<td></td>
<td><strong>SPEED PARAMETERS</strong></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>30 metres run performance from flying start (Locomotor Speed)</td>
<td>0.971 **</td>
</tr>
<tr>
<td>9.</td>
<td>30 metres run performance from crouch start (Reaction Speed with Acceleration Speed)</td>
<td>0.982 **</td>
</tr>
<tr>
<td>10.</td>
<td>300 metres run performance (Speed Endurance)</td>
<td>0.892 **</td>
</tr>
<tr>
<td>11.</td>
<td>100 Metres run performance</td>
<td>0.921 **</td>
</tr>
</tbody>
</table>

**N = 10**

Table value for .05 level = 0.632
Table value for .01 level = 0.765

**Significant at .01 level.**

The test - retest values were highly reliable at 0.01 level of significance.

3.8. ORIENTATION TO THE SUBJECTS

Prior to the training and test administration, the training and test procedure were explained in detail to the subjects to ensure proper understanding and secure effective cooperation so as to desire reliable data from the tests. The subjects were verbally motivated to attend the training session regularly. Further the control group was specially advised to avoid the special practice of any kind of the specific training programme till the end of the experimental period. The subjects of all the groups were sufficiently motivated to perform their maximum level during testing periods.

3.9. PILOT STUDY

A pilot study was conducted for a period of two weeks, before finalizing the training programme to ensure that the intensity and duration of the programme were within the limits of the subject’s capacity to produce their desired effect. For this purpose, fifteen subjects were put into separate package of physical trainings to know the difficulties in the administration of varied package of physical trainings. The intensity and volume of the trainings were devised based on the observation obtained during the pilot study.

3.10. TRAINING PROGRAMME

Training programme for preparatory period and competitive period for all three experimental groups were devised and prepared by the research scholar by referring the training method books, journals, periodicals, magazines and research papers, and also consulting with research supervisor, experienced senior coaches and sports experts. Since research scholar himself had been working as an athletic coach for the past twenty four years, the researcher’s coaching experiences were also been considered while devising the training programme. Details of the training programmes were as follows.
Stage I - Preparatory period (16 weeks) Training Programme.

1. Package I Physical training – with required intensity and required volume. (Intensity will be gradually increased and volume of exercise will be gradually decreased)
2. Package II Physical training – with fixed high intensity and required volume. (above 90% of intensity and gradually decreased volume)
3. Package III Physical training – with fixed high intensity and fixed high volume. (above 90% of intensity and above 90% of volume)

Stage II - Competitive period (14 weeks) Training Programme

1. Package I Physical training – with required intensity and required volume. (Intensity will be gradually increased and volume of exercise will be gradually decreased)
2. Package II Physical training – with fixed high intensity and required volume. (above 90% of intensity and gradually decreased volume)
3. Package III Physical training – with fixed high intensity and fixed high volume. (above 90% of intensity and above 90% of volume)

The details of training programme was presented in appendix

3.11. ADMINISTRATION OF TESTS

3.11.1. Test Administration of Motor Ability Components

To assess the student’s performance on motor ability components, the following tests were administered.

(i) Speed - 50 metres run
(ii) Leg explosive power - Standing broad jump
(iii) Agility - 4 x 10 yards shuttle run
(iv) Flexibility - Sit and reach test.
SPEED – 50 METERS RUN

PURPOSE

Purpose of the test is to measure the maximum running speed of a subject in a straight path.

FACILITIES AND EQUIPMENTS

Straight lanes were drawn on the standard cinder track. Finishing line was marked, 50 metres away from the starting line. A Japan made casio electronic stopwatch with calibration of 1/100 seconds and a starting gun were used.

PROCEDURE

The subject was asked to stand behind the starting line and was also instructed to start with crouch position. The subject was asked to start, on hearing the “gun sound”, and run to cover the fifty meters with maximum effort. The watch was operated by seeing the smoke from the starting gun and was stopped when the subject’s tarso touches the inner edge of the vertical plane of the finishing line.

SCORING

The best time out of two trails was recorded.
PHOTO - I  50 METRES RUN

PHOTO – II  STANDING BROAD JUMP
LEG EXPLOSIVE POWER – STANDING BROAD JUMP

PURPOSE

Purpose of the test is to measure the leg explosive power of the subject.

FACILITIES AND EQUIPMENTS

Out door broad jump pit and a steel measuring tape.

PROCEDURE

The subject was asked to stand on the take off board with his feet parallel to each other. From this position the subject was asked to take a preliminary movement by flexing his knees and swinging his arms possible. The measurement of the jump was made from outer edge of the take off board to the nearest imprint made by the subject in landing. Three trails were permitted in succession and the distance of all the jumps were measured to the nearest centimetre.

SCORING

The best performance out of three trails was taken in to account.

AGILITY – 4 X 10 YARDS SHUTTLE RUN

PURPOSE

Purpose of the test is to measure the agility of the subject.

FACILITIES AND EQUIPMENTS

Two parallel lines 10 yards apart, were drawn on the cinder track, stopwatch, clapper and two blocks of word.
PROCEDURE

Two parallel lines, 10 yards apart, were drawn on the cinder track. Two wooden blocks were placed on the opposite line. The subject was asked to stand behind the starting line and was also instructed to start with standing position. On hearing the ‘clapping sound’ the subject was asked to run towards the block and returned back to the starting line, after picking up one block. Then the subject has to do the same process for the second time. The length of the time required to complete the course was recorded.

SCORING

The best time out of the two trials was recorded as score.
PHOTO – III  
4X10 YARDS SHUTTLE RUN

PHOTO - IV  
SIT AND REACH TEST
FLEXIBILITY – SIT AND REACH TEST

PURPOSE
Purpose of the test is to measure the hip flexibility of the subject.

FACILITIES AND EQUIPMENTS
Wooden box and metre scale.

PROCEDURE
The subject was asked to assume a sitting position on the floor with fully extended legs. A wooden box kept closer to the feet in such a way that, the bottom of the feet were forwardly fixed at the wooden box.

The subject was asked to flex the hip with fully extended arms; and hands were placed on the top of the wooden box. Three trials were given to each subject and each attempt, the subject was asked to hold the positions for one second. A metre scale was placed on the top of the box in between two hands and the measurement was taken from the edge of the wooden box to further most reaching point of the tip of the middle finger. The distance was measured in nearest centimeters. If the subject did not reach the edge of the box, no score was given.

SCORING
The best reachable distance of the subject was measured and recorded as score.

3.11.2. Test Administration of Physiological Variables

To assess the student’s performance on physiological variables, the following tests were administrated.

(i) Resting pulse rate – Counting the pulse for one minute.
(ii) Anaerobic power – Margaria kalaman test.
(iii) Cardio – respiratory endurance – 12 minutes run and walk test.
PHOTO – V  RESTING PULSE RATE

PHOTO – VI  MARGARIYA KALAMAN ANAEROBIC POWER TEST
RESTING PULSE RATE – counting the pulse for one minute.

PURPOSE

Purpose of the test is to count the resting pulse per minute.

EQUIPMENT

Stop watch and chairs.

PROCEDURE

The pulse rate of the subjects was recorded in a sitting position, in the morning session between 6.00 A.M to 8.00 A.M. Before taking the pulse rate, the subjects were asked to sit in a chair and relax for 15 minutes. To record the pulse rate, the three finger tips were placed on the left radical artery at the wrist in such a manner that pulse was clear and the number of pulse were counted for 15 seconds and then multiplied by four to record for full minute.

SCORING

The pulse were counted for 15 seconds and then multiplied by four to record.

ANAEROBIC POWER – Margaria Kalamen Test

PURPOSE

Purpose of the test is to measure the anaerobic power of the subject.

FACILITIES AND EQUIPMENT

Stair case, coir mat, stopwatch, weighing machine and steel measuring tape are needed for the test.
PROCEDURE

The subject was asked to stand, six metres in front of the staircase and was instructed to run over the stairs as fast as possible and was allowed to run over, two or three stairs at a time. Coir mats were placed on the third and ninth stair cases. The stop watch was operated, when the subject steps on a coir mat on the third stair, and the time was stopped when the subject steps on the second coir mat on the ninth stair. Time elapsed between the third and ninth stair was recorded to nearest hundredth of a second. The body weight of the subject was measured by using the weighing machine and it was recorded.

SCORING

The anaerobic power of the subject was calculated by the following formula:

\[
\text{Power} = \frac{(\text{Mass} \times \text{Distance})}{\text{Time}}
\]

Here,

Mass = weight of the subject in kilograms.
Distance = vertical height between the third and ninth stair in metres.
Time = elapsed time between the third and ninth stair in seconds.
The power was calculated in kilogram metre per second.
CARDO RESPIRATORY ENDURANCE – 12 minutes Run and Walk Test

PURPOSE

Purpose of the test is to measure the subject’s cardio respiratory endurance.

FACILITIES AND EQUIPMENTS

Standard steel tape, stopwatches, clapper and whistle are needed for the test.

PROCEDURE

To administer this test, a 400 metres cinder track was used. In this track, every twenty five metres were marked with lime powder. A lap scorer was allotted for each runner and at a time, eight subjects were tested. The runners were given a period of 5 to 10 minutes for warming up before the trail. On hearing the ‘clapper sound’, the subjects were asked to run from the starting point. They ran, jogged or even walked for twelve minutes and on hearing the whistle, exactly at the end of the twelvth minute, they stopped without covering further distance. The investigator with the lap scorers went around the track and recorded the distance covered by each subject.

SCORING

The distance covered by the subjects were measured and recorded in metres.
PHOTO – VII  12 MINUTES RUN AND WALK TEST

PHOTO – VIII  30 METRES RUN PERFORMANCE FROM FLYING START
3.11.3 Test Administration of Speed Parameters

To assess the student’s performance on Speed parameter the following test were administered.

(i) 30 metres run performance from flying start.
    (To measure the Locomotor speed)

(ii) 30 metres run performance from crouch start
     (To measure the Acceleration speed with reaction time)

(iii) 300 metres run performance
      (To measure the speed endurance)

30 METRES RUN PERFORMANCE FROM FLYING START

(To measure the Locomotor speed)

Purpose

To measure the Locomotor speed of the subject.

Facilities and Equipments

Straight lane was drawn for 45 metres length on the standard cinder track. Two javelins were erected at the 15 metres mark and two more javelins were erected at the 45 metres finishing line. Two, 30 metres arcs were drawn from 15 metres mark and 45 metres mark, a javelin was erected at the point were two arcs intersected. An electronic stopwatch and a wooden clapper were used for this test.
Procedure

The subject was asked to stand behind the starting line and was also instructed to start with standing position. The subject was asked to start, on hearing the clapper sound, and run to cover the forty five metres with maximum effort. The watch was operated by seeing the subject tarso crossing the 15 metres mark through two javelins and was stopped when the subject’s tarso crosses the 45 metres mark through two javelins.

Scoring

The best time taken by the subject to cross the 30 metres with maximum Speed, out of two trials was taken as score.
PHOTO – IX  30 METRES RUN PERFORMANCE FROM CROUCH START

PHOTO – X  300 METRES RUN PERFORMANCE
30 METRES RUN PERFORMANCE FROM CROUCH START

(To measure the acceleration speed with reaction speed)

Purpose

The purpose of the test is to measure the acceleration speed with reaction speed of the subject.

Facilities and equipments

Straight lane was drawn on the standard cinder track. Finishing line was marked 30 metres away from the starting line. An electronic stopwatch and a starting gun were used for this test.

Procedure

The subject was asked to stand behind the starting line and also instructed to start with crouch position. The subject was asked to start, on hearing the ‘gun sound’ and to cover up to 35 metres with maximum effort. The watch was operated by seeing the smoke from the starting gun and was stopped when the subject’s tarso touches the inner edge of the vertical plane of the 30 metres finishing line.

Score

The best time clocked by the subject to cross the 30 metres with maximum speed out of two trials was recorded as score.
300 METRES RUN PERFORMANCE

(To measure the speed endurance)

Purpose

To measure the speed endurance of the subject

Facilities and equipments

Standard 400 metres cinder track, measuring steel tape, white powder, stopwatches and starting gun.

Procedure

Four lanes up to 300 metres mark were marked by the white powder in the 400 metres track. Starting point of each lane was marked by considering the stagger distance. The subjects were instructed to start with crouch position. By considering the availability of stop watches, at a time four subjects were allowed to run. The runners were given a period of twenty minutes for warming up before trial. On hearing the gun’s sound, the subjects were asked to start from the starting line and ran with maximum effort. The watches were operated, when the smoke came from the starting gun and the watches were stopped, when the subject’s ‘tarso’ touches the inner edge of the finishing line.

Score

The time taken by the subjects to run up to 300 metres were clocked and recorded in 1/100m of the second.
3.11.4. Test Administration of Performance Variable

To measure the subject's 100 metres run performance, 100 metres run dash was administered.

100 METRES RUN PERFORMANCE – 100 Metres race

Purpose

The purpose of the study is to measure the 100 metres running performance of the subjects.

Facilities and Equipments

Straight lanes were drawn up to 100 metres on the standard track. Finish line was marked 100 metres away from the starting line. Electronic stopwatches starting block and a starting gun were used for this test.

Procedure

The runners were given a period of twenty minutes for warming up, before the trial. The subjects were instructed to start with crouch start from the starting block. By considering the availability of the stop watches, at a time 4 subjects were allowed to run the race.

On hearing the gun’s sound, the subjects were asked to start from the starting block and ran up to 100 metres with maximum effort. The watches were operated, when the smoke came from the starting gun and the watches were stopped, when the subject’s tarso touches the inner edge of the vertical plane of the finish line.
PHOTO – XI

100 METRES RUN PERFORMANCE
Score

The time taken by the subject to cross the 100 metres finish line with maximum speed were clocked and recorded in 1/100th of the second.

3.12. STATISTICAL PROCEDURE

The study was aimed at mainly to find out the effects of varied packages of physical training on selected dependent variables. In addition to that it has been analysed if there was any significant differences among the three different packages of physical training. The study was conducted as two stages for preparative and competitive periods.

The subject’s were selected at random, but the groups were not equated in relation to the factors to be examined. Hence, the differences among the means of the four groups in pre-test had to be taken into account during the analysis of the post test differences among means. This was achieved by the application of analysis of covariance where the final means were adjusted to adjust the differences in the initial means.

Hence, for this study, Analysis of co-variance was used to test the significance of adjusted mean difference among treatment groups, as recommended by Harison Clarke and David H. Clarke\(^2\). Since four groups were involved for this study, whenever the ‘F’ ratio was found to be significant for adjusted post test means, Scheffe’s Post Hoc test was followed to determine which of the paired means difference was significant. The data were analysed by computer using statistical packages.