Chapter – III

PROCEDURE

This chapter consists of procedure adopted with selection of subjects, selection of variable, criterion measures, reliability of data, collection of data, administration of tests and statistical procedure.

Selection of Subjects

Fifteen hundred boys from VIth to Xth standard were taken for the purpose of this study. Total three hundred boys were taken from each standard from different schools of Gwalior, like, Kendriya Vidyalaya No.1, Kendriya Vidyalaya No.3, Air Force Vidya Bharti, Ebenezer, R.K.V.M., Rishi Ghalb and Radiant Public School. Confirmation of their health was made prior to testing, whether they were fit enough to withstand the stress of testing programme.

In order to ensure the full cooperation from the subjects, the scholar had a meeting with them in the presence of their class teacher and principal. The purpose of this study was made clear by explanation in order to ascertain that there was no ambiguity among the subjects regarding the efforts, which they had to put in successful completions of
investigation. The subjects voluntarily agreed to extend full cooperation and school principals ensured that the subjects would be made available for the collection of data as and when required.

Selection of Variable

A feasibility analysis as to which of the variable could be taken up for the investigation, keeping in view the availability of equipments, acceptability to the subjects and legitimate time that could be devoted to fortunes and to keep the entire study unitary and integrated, was made in consultation with experts.

With the above criterion in mind, the psycho-motor abilities, physiological variables and physical components were selected.

Psycho-motor Abilities

i) Reaction Time

ii) Depth Perception

iii) Anticipation Ability

Physiological Variable

i) Resting Heart Rate

ii) Vital Capacity

iii) Breath holding capacity
a) Positive Breath Holding Capacity 

b) Negative Breath Holding Capacity 

**Physical Components**

i) Leg Strength 

ii) 600 Yard Run 

iii) Flexibility  

a) Trunk flexibility 

b) Knee flexibility 

iv) Agility 

v) Speed 

**Criterion Measures**

The criterion measures chosen for testing the hypothesis were:

**Psycho-motor Abilities.**

i) Reaction time nearest to 1/10,000 of a second. 

ii) Depth perception was measured nearest to 1/10th of a centimeter. 

iii) The anticipation ability was measured in 1/1000 of a second i.e. in millisecond.
Physiological Variables

i) Resting Heart Rate was measured from radial artery for one minute.

ii) Vital capacity was measured in liters nearest to 1/100 of a liter.

iii) Breath holding capacity (positive and negative) was measured in seconds.

Physical Components

i) Strength was measured in kilograms nearest to ½ of a kg.

ii) Endurance was measured in minutes and seconds nearest to 1/10\(^{th}\) of a second.

iii) For knee flexibility degree was used. For trunk flexibility measurement was done upto 1/10\(^{th}\) of an inch.

v) Agility was measured nearest to 1/10\(^{th}\) of a second.

vi) Speed was measured nearest to 1/10\(^{th}\) of a second.

Reliability of Data

Establishing the instrument reliability, tester competency and subject reliability ensured the reliability of data.
Instrument Reliability

Stopwatches, measuring tapes, dynamometer depth perception box, anticipation machine, reaction time machine, goniometer and wet spirometer were of standard firms, which cater to the needs of various research laboratories. All those instruments, which were used, are present in the laboratory of the Lakshmibai National Institute of Physical Education, Gwalior and their calibrations were accepted as accurate enough for the purpose of the study.

Testers Competency

Reliability of the investigator in measuring psycho-motor abilities, physiological variables and physical components was established by test and retest method by computing co-efficient of correlation between the scores obtained twice of 25 subjects. The coefficient of correlation obtained are given in table No. 1
Table – 1

RELIABILITY COEFFICIENT OF TEST RETEST SCORES FOR PSYCHO-MOTOR ABILITIES

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Tests</th>
<th>Coefficient of Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>Reaction Time</td>
<td>.93</td>
</tr>
<tr>
<td>ii)</td>
<td>Depth Perception</td>
<td>.93</td>
</tr>
<tr>
<td>iii)</td>
<td>Anticipation Ability</td>
<td>.92</td>
</tr>
</tbody>
</table>

N = 25.
* Significant at 0.05 level of confidence  \( r_{0.05} (23) = .396 \)

Table – 2

RELIABILITY COEFFICIENT OF TEST RETEST SCORES FOR PHYSIOLOGICAL VARIABLES

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Tests</th>
<th>Coefficient of Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>Resting Heart Rate</td>
<td>.90</td>
</tr>
<tr>
<td>ii)</td>
<td>Vital Capacity</td>
<td>.91</td>
</tr>
<tr>
<td>iii)</td>
<td>Positive Breath Holding Capacity</td>
<td>.90</td>
</tr>
<tr>
<td>iv)</td>
<td>Negative Breath Holding Capacity</td>
<td>.91</td>
</tr>
</tbody>
</table>

N = 25.
* Significant at 0.05 level of confidence  \( r_{0.05} (23) = .396 \)
Table – 3

RELIABILITY COEFFICIENT OF TEST RETEST SCORES FOR PHYSICAL COMPONENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Tests</th>
<th>Coefficient of Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>Leg Strength</td>
<td>.92</td>
</tr>
<tr>
<td>ii)</td>
<td>600 Yard Run</td>
<td>.93</td>
</tr>
<tr>
<td>iii)</td>
<td>Trunk Flexibility</td>
<td>.95</td>
</tr>
<tr>
<td>iv)</td>
<td>Knee Flexibility</td>
<td>.90</td>
</tr>
<tr>
<td>v)</td>
<td>50M.</td>
<td>.93</td>
</tr>
<tr>
<td>vi)</td>
<td>4 X 10 M Shuttle Run</td>
<td>.90</td>
</tr>
</tbody>
</table>

N = 25.
* Significant at 0.05 level of confidence  r0.05 (23) = .396

From table 1, 2 and 3 it was evident that tester reliability was significantly high, thus establishing the competency of the scholar to administer the tests.

**Subject Reliability**

The above test retest coefficients of correlation method established that subject reliability was significant at 0.05 level of confidence, as the same tester used the same subjects under similar conditions and no motivational techniques were used nor any training was given.
Collection of Data

The necessary data was collected by the administration of the tests for the chosen variables. Some of the tests were administered in schools and some in the laboratory of Lakshmibai National Institute of Physical Education, Gwalior.

Before the administration of the tests, the subjects were briefed on the objectives and requirement of the various variables that were to be tested. All were given a chance to practise and to get familiar with the desired test. The apparatus and the procedure were explained prior to the administration of the tests.

Procedure for Administration of Tests

Reaction Time

Purpose:

To measure the Reaction time ability of the subjects.

Equipment:

Anand Electronics Reaction time apparatus.

Procedure:

For measuring reaction time, the apparatus was set according to prescribed procedure. The detachable screen was fixed in the desired
holes, which divided reaction time apparatus into two sides. One subjects side and other testers' side. The tester rang a bell, which was a sign for the subjects to press the right or left key as selected by tester with selector switch. Then, the tester pressed, one of the short keys giving the required stimulus (light stimulus). The short key was a double key, which gave the stimulus and also started the chronoscope. As soon as, the subject received the stimulus, he lifted his finger from the right or the left key, which stopped the chronoscope, and the reaction time to the light stimulus was read and recorded from the chronoscope.

Scoring:

Three trials were permitted to each subject and the average of the three was taken as individual's score.

Depth Perception

Purpose:

To measure depth perception of the subjects.

Equipment:

Depth perception box.

Procedure:

Depth perception box was a hollow wooden box, which had a metric scale on its top having negative reading towards slit and positive towards illuminated backgrounds. This scale had the zero-point at its
middle and it was calibrated into centimeters at each side of the zero point. There was a slit at one end of the box and an illuminated background at the other end. Inside the box, there were two still rods of same dimensions, which could be seen through the slit. Both rods were movable either away or towards the slit and at the top of box, 2 small rectangular wooden plates were provided to which two rods inside the box were attached. Two threads were attached to those rectangular plates, by pulling of which plates moved and in turn rods moved.

The subject was seated on a stool at the slit end. The height of the stool was adjusted in such a way that when seated on it, the subject’s eye should be at level with the observational slit seeing the rods against illuminated background.

The subject remained at a distance of one meter from the box and then he was asked to hold the thread and bring the two rods to zero on the scale without seeing at the scale. He was asked to take his own time and remain in relaxed condition. The moment he felt that the two rods had come in straight line, he left the thread and got up from the stool.

**Scoring:**

The deviation from zero on the scale either to positive or negative side was taken as individual’s score. Best of the three trials were taken as his final score.
Anticipation Ability

**Purpose:**

To measure the anticipation ability of the subjects.

**Equipment:**

Basic ability anticipation apparatus.

**Procedure:**

The subject was made to sit on an adjustable stool. The alarm was set by rotating the alarm time control. Rotating the control button provided to the right side of apparatus speed of the runway was set. Time was set to 000.0ms by pressing reset switch provided on the apparatus itself. Now, on pressing start switch by an experimenter, the subject, seated on adjustable stool, got alarm signal in the form of sound as well as green light on the runway which was fitted in front on the subject on the wall at a suitable height. The alarm remained on, till the set time, set for it, was over. As soon as alarm was over, a single red light started running at the set speed, which remained so throughout the testing for all the subjects. The subject’s job was to stop the running light as soon as it touches the marked arrow by pressing stop switch either on instrument or on the remote. The time taken was displayed in milliseconds with early or late displays. The clock kept on running till the subject pressed the stop switch or the experimenter pressed the reset switch.
Scoring:

Best of three trials in milliseconds was taken as individual’s score. The value for the early display in milliseconds was taken as negative score whereas late display in milliseconds was taken as positive score. But if the running light stopped at marked point than score was taken as zero.

Physiological Variables

Resting Heart Rate

Purpose:

To measure the resting heart rate of the subjects per minute.

Equipment:

Stop Watch

Procedure:

The number of heartbeat of the subject was measured per minute. The testing started in the early morning hours at 8.30 am, at school’s yoga room consisting of a ground mat on the floor. The physical education teacher was present to cooperate with all the help that was essential in conducting the test.

The subjects were divided into batches of ten each. Each batch of subjects was called at a time and they were directed to be down on the
mat and remain lying on the mat with ease and relaxed quietly for half an hour. At the expiry of the last 30th minute the scholar started taking heartbeat. Fingertips were placed on the radial artery at the wrist and the palpitations of the artery were counted per minute.

**Scoring:**

Palpitations of the radial artery were counted for one minute.

**Vital Capacity**

**Purpose:**

To measure the vital capacity of the subjects.

**Equipment:**

Wet Spirometer

**Procedure:**

Vital capacity was measured with the help of a wet spirometer graduated in litres and placed at such a height that all could perform the test by standing erect. The spirometer bell was immersed in the water filled in spirometer drum. It was ensured that the pointer of the scale was at the zero mark at the beginning of the test. The subject took two deep breaths before starting the test, and then after fullest inhalation, the subject placed the mouthpiece in his mouth attached to the nose and connected to the drum of the spirometer, taking care in his mouth to see
that no air escaped through the edges of the mouthpiece. The subject exhaled slowly and steadily while bending forward slightly until maximum volume of air could be expelled without talking in the second breath. The subjects were instructed to take care that they blew out only through the mouth and not through the nose even partially. The nose of each subject was clipped by a nose clipper to prevent the air from escaping through the nose.

**Scoring:**

Three trials were permitted and the best of it was taken as his score nearest to one tenth of an inch.

**Breath Holding Capacity**

**Positive Breath Holding Capacity**

**Purpose:**

To measure the positive breath holding capacity of the subjects.

**Instrument:**

Electronic time watch.

**Procedure:**

A suitable chair was provided to the subjects to sit comfortably. The subject was asked to take maximum possible inhalation and hold it for whatever time it was possible for him to do so. As soon as their chest
movement was observed to have stopped consequent to full inspiration, his nose was pinched with a clip and simultaneously a stopwatch was started. The subject was asked to prevent the leakage of air through the mouth and was instructed to keep his mouth closed. But as soon as he opened his mouth to take in breath or he was unable to hold breath any longer, the stopwatch was stopped.

**Scoring:**

The time of holding the breath was recorded to the nearest second. Best of the three successive attempts with suitable rest interval in between was recorded as his score.

**Negative Breath Holding Capacity**

**Purpose:**

To measure the negative breathe holding capacity of the subjects.

**Equipment:**

Electronic time watch.

**Procedure:**

To measure the negative breath holding capacity, the subject was instructed to place the nose clip tightly. He was asked to exhale through the mouth to the maximum capacity. As soon as, the subject had exhaled
to the fullest capacity of his lungs and closed their lips, the stopwatch was started.

As soon as the subject had opened his lips to inhale, the stopwatch was stopped and the time given by the stopwatch was recorded as the score of the negative breath holding capacity.

Scoring:

The time for negative breath holding was recorded nearest to a second. Best of the three successive attempts with suitable rest interval in between was recorded as his score.

Physical Components

Leg Strength

Purpose:

To measure the leg strength of the subjects.

Instrument:

Dynamometer.

Procedure:

The subject stood on the dynamometer base with feet parallel and about six inches apart. A belt was used around the subject’s hip to stabilize the bar, as the lifting force of legs was too great to be held by hands. The subject was required to hold the centre of the bar, palm down at the level of the pubic bone. The loop end of the belt was strapped over
one end of the handle of the cross bar and the free end of the belt was looped around the other end of the bar. The belt was placed as long as possible over the hips and glutei muscles. The knees were slightly bent. The bar was on the subject’s thigh during the lift. The hands were hooked on the handle. Before the subject was instructed to lift, the tester ensured that the arms and back was straight, head erect and straight up. At the end of the lift when subject’s legs were nearly straight the reading was taken.

**Scoring:**

Reading was taken nearest to 1/2kg. Three trials were permitted and best of it was taken.

**600-Yard Run (Endurance)**

**Purpose:**

To measure the endurance of the subjects.

**Instrument:**

50 x 50 Yard Square.

**Procedure:**

On the field of the school a 50x50 yard square was marked to administer the 600 yard run / walk test. The subjects were assembled at the track and were explained the procedure of taking the test while at the same time the doubts pertaining to the test were also made clear. It was explained to them that they were expected to cover the distance in the
shortest possible time by running or if they found themselves exhausted even before the completion of course, they may slow down or even walk but the object was to cover the distance. The subjects started off in batches of six and stand start was adopted.

**Scoring:**

The individual score was the time taken to complete the distance between starting and finishing line and recorded in minutes and nearest to 1/10th of a second.

**Trunk Flexibility**

**Purpose:**

To measure flexibility of the trunk of subjects.

**Instrument:**

Sit and Reach box.

**Procedure:**

The subject sat on the rubber matting with shoes removed, legs separated enough to straddle the stem board; the feet were placed on the foot prints and pressed firmly against the cross board. The arms are extended forward with the hand’s palm down on the upper surface of the scale. In this position, the subject bobs forward four times and holds the position of maximum reach on the fourth count. The knees must be
straight. If the hands reach unevenly the hand reaching the shorter distance determines the score.

**Scoring:**

The individual score was recorded nearest to $1/10^{th}$ of an inch.

Three trials were given and best of it was taken.

**Knee**

**Purpose:**

To measure the knee flexibility of the subjects.

**Instrument:**

Goniometer.

**Procedure:**

The subject was laid in prone position on bench with knees at the end of the bench. The stationary wing of the goniometer was fixed with the femur and the centre of the goniometer with lateral epicondyle of femur. The subject was asked to flex knee joint without lifting the thigh from the bench and required to hold that position for sometime. The moving arm was adjusted after flexion of the leg.

**Scoring:**

The final reading was recorded in degrees. Three trials were permitted and best of it was taken as individual’s score.
Shuttle Run

**Purpose:**

To measure agility of the subjects.

**Instrument:**

Two wooden blocks of 5x5x10cm and a stop watch.

**Description:**

Two parallel lines A and B were marked on the ground 10 meters apart. For this test item the starting and finishing line was the same. Two wooden blocks were placed behind line ‘A’. Each subject positioned himself behind line ‘B’ and on the signal “ready, go” ran to the opposite end line, picked up a block, ran back to the starting line, placed the block behind it, ran back and picked up the second block and carried it across the starting line.

**Scoring:**

Time was clocked from the starting to the carrying of the second wooden block across the starting line to the nearest 1/10th of a second. Three trials were allowed and the better time recorded on this test item was taken as subjects’ score.

50 Meter. Dash

**Purpose:**

To measure the speed of the subjects.
**Instrument:**

Clapper, Stop Watches and Measuring Tape.

**Description:**

Two parallel lines were marked on the ground at 50M distance from each other. One of these served as starting line and the other as the finishing line.

Two subjects were started at a time with a clapper and two timekeepers of each subject recorded the time taken to cover the distance of 50M. The score was the time taken by the subject from the starter signal to the instant he crossed the finish line.

**Scoring:**

The slower timing of the two watches corrected to the nearest one tenth (1/10\textsuperscript{th}) of a second was recorded as the score for each subject in this test item.

**Analysis Of Data**

One-way analysis of variance (ANOVA) was used for finding the effect on psycho-motor abilities, physiological variables and physical components as a function of growth from sixth to tenth standard school children of the Greater Gwalior.