Chapter III

PROCEDURE

In this chapter, the selection of subjects, criterion measures, administration of training programme and conducting of the tests, collection of data (for initial and post test), reliability of data, experimental design and statistical procedure employed for analyzing the data have been described.

Selection of Subjects

One hundred girls student were selected randomly from different schools of B.H.E.L Haridwar. Who used to play regularly for their school teams. The age group of the subjects selected for study was between the ages of 14 to 16 years. The subjects were divided into five groups, each consisting of twenty subjects. Group A practiced on Grassy Surface, Group B on Non-Grassy Surface, Group C on Wooden Surface and Group D on Sand Surface and Group E was the control group. All the subjects were residing at different places.
Selection of Variables

The Selection of variables was done by using the following criteria:

The research scholar gleaned through the scientific literature pertaining to the cross sectional analysis of physical and physiological variables from different library sources available at the library of the Lakshmibai National Institute of Physical Education, Gwalior and also consulted experts in these areas to select the physical, physiological and anthropometric variables with regard to the purpose of the study. Along with the said literature and expert opinion, the administrative feasibility in terms of availability of instruments and expertise for measuring and recording of data was also given due consideration while selecting physical, physiological and anthropometric variables.

Based on the above mentioned criteria the following variables were selected.

Physical Variables

(i) Strength (Explosive Strength)
(ii) Speed
(iii) Agility
(iv) Endurance (Cardio Vascular Endurance)

**Physiological Variables**

(i) Resting Heart Rate

(ii) Blood Pressure

(iii) Vital Capacity

(iv) Respiratory Rate

**Anthropometric Variables**

(i) Weight

(ii) Height

(iii) Calf Girth

(iv) Thigh Girth

**Criterion Measures**

The Criterion measures chosen for testing of the hypothesis in this study were as follows:

(i) **Explosive Strength**: It was measured with the help of standing broad jump and recorded in meters and centimeters.

(ii) **Speed**: It was measured with the help of 50 yard dash and recorded in to the nearest $1/100^{th}$ of a second.
(iii) **Agility**: It was measured with the help of 4x10 meters shuttle run and it was recorded to nearest 1/100 of a second.

(iv) **Endurance (Cardio Vascular Endurance)**: It was measured as distance covered in 12 minutes run/walk test and recorded in meters/ then converted into kilometers.

(v) **Resting Heart Rate**: To measure the resting heart rate, total number of heart beats per minute during resting condition was recorded.

(vi) **Blood Pressure**: To measure both systolic and diastolic blood pressure of the performer, sphygmomanometer and stethoscope were used and recorded in mm/hg.

(vii) **Vital Capacity**: To measure the lungs capacity of the performer wet Spirometer was used and was recorded in liters.

(viii) **Respiratory Rate**: To measure resting respiratory rate, total number of exhalations and inhalations per minute were recorded.

(ix) **Body Weight**: To measure the body weight of the performer weighing machine was used and it was recorded in kg.

(x) **Height**: To measure the height of the performer Anthropometric rod or stadiometer was used and it was recorded in cm.
(xi) **Thigh Girth:** To measure the thigh girth of the performer steel tape was used and it was recorded in cm.

(xii) **Calf Girth:** To measure the calf girth of the performer steel tape was used and it was recorded in cm.

**Administration of Training Programme and Conducting of the Tests**

The training programme was administered to the subjects at different grounds in campus of B.H.E.L, Haridwar. Prior to the actual administration of the training programme, all the subjects were properly instructed regarding the procedure of the tests and the necessary number of practice trials was provided to each subject to familiarize with the actual conduct of the test. The research scholar took the help of some experienced Physical Education Teachers for conducting the training programme and the tests were well oriented by the research scholar himself prior to the test administration.

In order to motivate the students to put in best performances, the significance of this study was clearly explained to them and an element of competition was introduced.

The training programme was administered in the evening sessions. The tests were conducted in the morning session from 7.30 a.m. to 9.30 a.m.
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Exercise</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Warm up (running and Stretching) Specific Conditioning</td>
<td>7 minutes</td>
</tr>
<tr>
<td>(For 1\textsuperscript{st} 2 weeks)</td>
<td>(Jogging, running, stretching, Jumping and aerobic exercises)</td>
<td>10 minutes</td>
</tr>
<tr>
<td></td>
<td>Limbering down</td>
<td>4 minutes</td>
</tr>
<tr>
<td>2.</td>
<td>Warm up Specific Conditioning</td>
<td>6 minutes</td>
</tr>
<tr>
<td>(For 2\textsuperscript{nd} 2 weeks)</td>
<td>(Jogging, running, stretching, Jumping and aerobic exercises)</td>
<td>15 minutes</td>
</tr>
<tr>
<td></td>
<td>Limbering down</td>
<td>5 minutes</td>
</tr>
<tr>
<td>3.</td>
<td>Warm up Specific Conditioning</td>
<td>8 minutes</td>
</tr>
<tr>
<td>(For 3\textsuperscript{rd} 2 weeks)</td>
<td>(Jogging, running, stretching, Jumping and aerobic exercises)</td>
<td>20 minutes</td>
</tr>
<tr>
<td></td>
<td>Limbering down</td>
<td>6 minutes</td>
</tr>
<tr>
<td>4.</td>
<td>Warm up Specific Conditioning</td>
<td>9 minutes</td>
</tr>
<tr>
<td>(For 4\textsuperscript{th} 2 weeks)</td>
<td>(Jogging, running, stretching, Jumping and aerobic exercises)</td>
<td>25 minutes</td>
</tr>
<tr>
<td></td>
<td>Limbering down</td>
<td>8 minutes</td>
</tr>
<tr>
<td>5.</td>
<td>Warm up Specific Conditioning</td>
<td>10 minutes</td>
</tr>
<tr>
<td>(For 5\textsuperscript{th} 2 weeks)</td>
<td>(Jogging, running, stretching, Jumping and aerobic exercises)</td>
<td>30 minutes</td>
</tr>
<tr>
<td></td>
<td>Limbering down</td>
<td>10 minutes</td>
</tr>
</tbody>
</table>
Strength (Explosive)

Name of the Test:

Standing Broad Jump

Purpose:

Standing broad jump was administered to obtain data on explosive strength.

Procedure:

A take off line was drawn near one edge of the jumping pit. The subject was asked to take her position with toes just behind the take off line and feet slightly apart. Taking off with both feet simultaneously, she jumped as far as possible and landed on both feet. In jumping, the jumper crouched slightly and swung the arms forward to aid the jump. Three trials were given to each subject. The best out of them was recorded.

Score:

The best of the three distances covered by the jumper was recorded in centimeters and then converted into meters as score of the subjects.
Speed

Name of the Test:

50 yards dash

Purpose:

50 yards dash was administered to obtain data on speed.

Procedure:

Two subjects ran at a time. Both of them took the starting position behind the starting line. The start was given by sounding the clapper using the command “On your mark” “set” followed by the clap. The time for each subject was recorded by the time-keepers who had been stationed at the finishing line.

Score:

The period of time taken between the starters signal and the instant the subjects crossed the finishing line was recorded to the nearest one hundredth of a second, as the score of the subjects.

Agility

Name of the Test:

4 x 10 yards shuttle run.
Purpose:

To measure agility, 4 x 10 yards shuttle run test was administered.

Procedure:

Two blocks of wood of 2 inches x 2 inches x 4 inches and a stopwatch were the equipment required for conducting the test. Two parallel lines were marked on the ground 10 yards apart. The wooden blocks were placed behind one of the line. The subject started from behind the other line. The subject started from behind the other line on signal "go". The subject ran to the blocks and picked one block, ran back to the starting line and placed the block behind the line. She then ran back and picked up the second block which he carried back across the starting line.

The timing of each runner was recorded by two time keepers. The lower timing to the nearest hundredth of a second was noted down. Two trials were given with sufficient interval of rest.

Score:

Better timing of the two trials was recorded to the nearest one hundredth of a second as the score of the subject in agility.
Endurance

Name of the test:
12 Minute Run/Walk

Purpose:
To measure the cardio-vascular endurance of the subject, 12 minutes run/walk test was administered.

Procedure:
The test was administered in the 400 meters track. The track was marked in ten meters segments. The subjects were divided into two groups. One lap scorer was assigned for each subject. A starting signal by sounding clapboard was given and simultaneously a stop watch was started by the time-keeper. The subjects were asked to run and when running was not possible resort to walking as far as possible within the 12 minutes time limit. At the signal of the time-keeper’s whistle was blown at the end of the 12 minutes, at which the subjects stopped in their places. The lap scorers noted down the distance covered by each subject to the nearest ten meters.

Score:
The distance covered by the subject in 12 minutes run/walk was recorded in meters, and then converted into kilometers, as the score of the subjects.
Resting Heart Rate

Purpose:

The purpose of the test was to measure the number of pulse rate of the subjects in a minute.

Procedure:

Heart rate was obtained in the morning. The scholar approached the subject in the morning and used a calibrated stopwatch and a stethoscope for counting heart rate. The subjects was asked to sit in a comfortable chair. The pulse rate measured by slightly pressing the finger tips against the carotid artery in the neck and the pulse rate was counted for duration of one minute.

Score:

Total number of heart beats per minute for each subject was recorded as her score.

Blood Pressure

Purpose:

The purpose of the test was to measure the systolic and diastolic blood pressure of the subject.

Procedure:

A sphygmomanometer (dial type) and a stethoscope were used to measure the blood pressure (systolic and diastolic) of the
subjects. Each subject was asked to sit relaxed in a chair. It was
taken on all subjects in the morning hours. The cuff of the
sphygmomanometer was wrapped around the left upper arm of
the subject first above the elbow. The cuff was then connected to
the pump and the manometer. After closing the outlet valve of
the pressure pump, the pressure in the inflatable rubber bag was
rapidly raised to 180 mmHg by pumping air which was
sufficient to obliterate completely the bronchial artery, so that
the flow of blood through the artery was asserted and radial
pulse disappeared. The sound of pulsation was monitored by
keeping the chest piece of the stethoscope over the bronchial
artery and listening to the sound through the ear piece of the
stethoscope as the pressure over the artery was being
manipulated. The pressure was then gradually lowered by
opening the value.

As soon as the pressure in the cuff fell first below the systolic
pressure, it allowed the passage of small amount of blood
through the compressed artery into the distal segment. This
produced a clear tapping sound and the pressure shown on the
dial was noted as soon as this sound was heard. This denoted the
measure of systolic blood pressure as the cuff pressure was lowered still further, more blood flowed through due to rebound relaxation of the arterial vessel and this was indicated by a louder sound. The pressure at which sound could be muffled by manipulating the pressure pump was read on the manometer scale. This denoted the measure of diastolic blood pressure. These measurements were repeated twice for each subject and the better one was recorded as her score in these variables.

**Score:**

The better reading was recorded in millimeter of mercury (mmHg) as the subject’s scores in systolic and diastolic blood pressure.

**Vital Capacity**

**Procedure:**

Vital capacity was measured with the help of wet spirometer. It was ensured that the pointer of the scale was at the zero mark at the beginning of the test. The subject store near the table where wet Spiro meter was kept and drum of the same was filled with water. The subject was asked to take a deep breath and then he took the mouth piece into the mouth and released the breath into
the rubber pipe which was attached with drum dipped in the water as a result of which the inner drum started rising and a chain was connected with it over pulley which had marking in liter. The subjects were instructed that they should blow out only through the mouth not by nose even partially. The nose of each subject was clipped by the nose clip to prevent the air from escaping through the nose.

**Scoring:**

The best out of three was recorded as the score of the subjects in liter.

**Respiratory Rate**

**Purpose:**

To measure the Resting Respiratory Rate.

**Procedure:**

The subjects were asked to rest in supine lying position on the mat. The respiratory rate was felt by placing the hand just below the thoracic cavity. The total number of exhalations and inhalations per minute was recorded for each subject.

**Scoring:**

The total number of exhalation and inhalations in per minute was recorded as a score.
Body Weight

Purpose:

The purpose of the test was to measure the human body weight with empty boills.

Procedure:

A weighing machine was used to measure the body weight of the subjects. Each subjects asked to take all his/her shoes and clothes. Except brief standard garments to be worn by the subjects for the measurement. The subject stands erect on the platform of the balance with equal weight on both feet.

Scoring:

The weight was recorded in 0.5 kg as the score of the subject.

Height

Purpose:

The purpose of the test was to measure the standing height and sitting height of the subject.

Procedure:

A anthropometer rod were used to measure the standing height and sitting height of the subjects.
Standing height:

The subjects was asked to stand erect, barefooted on a plane horizontal surface against a wall, with his/her heels, back of the shoulders head touching the wall. Subject was requested to stretch the body upwards as much as possible without leaving the ground. The subject was asked to saw in front at a height of his eyes. Then the anthropometer rod is kept in front of the subject and the crossbar was adjusted.

Scoring:

The measurement was recorded in cm.

Sitting Height:

The subjects was asked to sit on a table top with power legs hanging, things resting on the table and stretch his body upwards. A pressure was applied to the mastoid process and the head was adjusted in F.H plane. The crossbar of the anthropometer was brought down to touch vertex on the head.

Scoring:

The measurement was recorded in cm.
Calf Girth

Purpose:

The purpose of the test was to measure the maximum circumference of the lower leg.

Procedure:

A steel-tape was used to measure the calf girth of the subjects. Subjects was asked to stand erect, the steel tape is wrapped horizontally around the naked lower leg at the maximal bulge of the calf muscle.

Scoring:

The measurements was recorded in cm.

Thigh Girth

Purpose:

The purpose of the test was to measure the circumference of the thigh at a mid point of length.

Procedure:

A steel tape and skin making pencil was used to measure the thigh girth of the subjects. The subjects was asked wearing only shorts in legs was asked to stand at ease with equal weight on both the feet. The middle of the thigh was marked by a
horizontally line dividing the distance between the lateral and lower most point the lateral condole of femur, in equal two parts. The steel tape is wrapped around the thigh at the level of the horizontally line.

Scoring:

The circumference was measured by keeping the steel tape in a horizontally direction and was recorded in the cm.

**Collection of Data Initial and Post Test**

A Ten week training programme was undertaken on different surfaces for the collection of data. The training was conducted on different grounds in campus of BHEL, Haridwar. The practice was held everyday (5 days in a week). The training programme was prepared with the help of the guide. For conducting the training programme, help was also taken from the physical education teachers.

A pre-test of subjects were taken on physical, physiological and anthropometric variables before commencement of the training programme.
After the completion of 10 weeks training programme, the collection of data of all the five groups were retaken on physical, physiological and anthropometric variables.

Collection of data was made during the morning hours on five different grounds from 7.30 a.m. to 9.30 a.m.

**Reliability of Data**

To establish the reliability of the data, test-retest method was used. The performances of all subjects before the ten weeks training programme and after the ten weeks training programme on the selected items (speed, strength, endurance, agility, resting heart rate, blood pressure, vital capacity, respiratory rate, weight, height, Calf girth, Thigh girth) were taken each time twice on two different days under identical conditions. Pearson’s product moment correlations were computed to correlate both days performance of subjects on each items separately.,

The reliability co-efficient obtained for each test items on speed, strength, endurance, agility, resting heart rate, blood pressure, vital capacity, respiratory rate, weight, height, calf girth and thigh girth
before and after the ten weeks training programme are presented in Table 1.

Table 2

<table>
<thead>
<tr>
<th>Test Items</th>
<th>Co-efficient of Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strength</td>
<td>.98</td>
</tr>
<tr>
<td>Speed</td>
<td>.97</td>
</tr>
<tr>
<td>Agility</td>
<td>.96</td>
</tr>
<tr>
<td>Endurance</td>
<td>.97</td>
</tr>
<tr>
<td>Resting Heart Rate</td>
<td>.96</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>.95</td>
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<tr>
<td>Vital Capacity</td>
<td>.98</td>
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<tr>
<td>Respiratory Rate</td>
<td>.97</td>
</tr>
<tr>
<td>Weight</td>
<td>.98</td>
</tr>
<tr>
<td>Height</td>
<td>1</td>
</tr>
<tr>
<td>Calf Girth</td>
<td>.97</td>
</tr>
<tr>
<td>Thigh Girth</td>
<td>.97</td>
</tr>
</tbody>
</table>
Experimental Design

To compare the effects of training on Grassy, Non grassy, wooden and sand surfaces on physical, physiological and anthropometric variables of female players from different schools of BHEL Haridwar, random group design was used. Hundred subjects were selected randomly and were divided into five groups i.e. Group A – Grassy surface, Group B- Non-grassy surface, Group C- Wooden surface, Group D- Sand Surface and Group E- Control Group.

Statistical Procedure

In order to compare the effects of training on Grassy surface, Non grassy surface, Wooden surface and Sand surface on speed, strength, endurance, agility, resting heart rate, blood pressure, vital capacity, respiratory rate, weight, height, calf girth, thigh girth of female players, analysis of Co-Variance (‘f’-ratio) was applied. The level of significance was set at .05 level of confidence.