CHAPTER III

METHOD AND PROCEDURE
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This chapter presents the methods and procedures to assess the physical fitness and to develop the physical fitness norms for the high school girls of Punjab belonging to the age group of 12 to 15. The sequence of the chapter is as follows:

1. Design
2. Sample
3. Selection of Variables
4. Selection of Tests
5. Reliability of tests
6. Administration of testing programme
7. Collection of data
8. Testing Procedure of Physical Fitness tests

Design

The study was cross-sectional in design in which four age steps were studied simultaneously and the development of the physical fitness of girls investigated. The design was such that it facilitated the comparison of physical fitness between urban and rural high school girls of Punjab.

Sample

The study sample consisted of 4,000 high school girls in the age group of 12 to 15. These subjects were selected from the various urban and rural schools of Punjab. Three hundred and thirty four subjects were randomly selected from
eleven out of the twelve districts of Punjab. Half of this number i.e. 167 each was taken from the urban and the rural schools of every district. Thus, the total number of subjects for eleven districts came to $334 \times 11 = 3674$.

The remaining 326 subjects were chosen from the twelfth district of Punjab to bring the sample figure to 4,000. This twelfth district happened to be that of Hapur. Half of the 326 subjects were from the urban schools of Hapur and half from its rural schools. From each district four urban and four rural schools were selected at random.

**Sampling distribution**

4000 subjects (Girls)

2000 Urban

2000 Rural

<table>
<thead>
<tr>
<th>Age</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>Rural</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
</tr>
</tbody>
</table>

The date of birth of each subject was taken from the school records. The exact age of each subject on the day of test was calculated. The subjects were divided into four age groups with the help of the calendar given by Tanner (1962). The details are given as under:
THE FORMATION OF AGE GROUPS

<table>
<thead>
<tr>
<th>Decimal Age</th>
<th>Age Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.500 - 12.490</td>
<td>12</td>
</tr>
<tr>
<td>12.500 - 13.490</td>
<td>13</td>
</tr>
<tr>
<td>13.500 - 14.490</td>
<td>14</td>
</tr>
<tr>
<td>14.500 - 15.490</td>
<td>15</td>
</tr>
</tbody>
</table>

Selection of Variables
The following physical fitness variables were selected for investigations:

1. Extent Flexibility,
2. Dynamic Flexibility,
3. Speed of Change of Direction,
4. Arm and Shoulder Strength,
5. Explosive Leg Strength,
6. Arm, Hand and Shoulder Strength,
7. Endurance Level of Arms and Shoulder,
8. Trunk Strength,
9. Coordinative Ability,
10. Gross Body Equilibrium,
11. Cardio-Vascular Endurance,
12. Speed of Running.

Section of Tests
The following tests were selected to be used in this study:

1. To measure extent flexibility twist and touch test was used.
2. To assess dynamic flexibility bend, twist and touch test was used.
3. Shuttle run test was selected to measure speed of change of direction.
4. To assess arm and shoulder strength soft ball test was used.
5. Standing broad jump test was conducted to measure explosive leg strength.
6. To measure arm, hand and shoulder strength hand grip test was used.
7. Push ups test was used to measure endurance level of arms and shoulder.
8. To assess trunk strength leg lifts test was conducted.
9. Cable jump test was selected to assess coordinative ability.
10. To measure gross body equilibrium balance A test was used.
11. To assess cardio-vascular endurance 600 metre run walk test was selected.
12. 50 metre dash test was selected to measure speed of running.

Above mentioned Fleishman's Physical Fitness Test items had been used to ascertain the fitness level of high school girls at four age levels. These test items were easy to administer and did not require sophisticated equipment and have been considered more useful as compared to other test batteries available.

In addition to these tests the body weight and height of the subjects were also taken.

Reliability of Tests

The reliability of tests pertaining to the selected physical fitness test variables was established using the test-retest method. For this purpose the performance of 100 subjects selected at random was taken twice on the criterion of physical fitness test variables under identical conditions. The coefficients of correlation between the test-retest scores were obtained, and are presented in Table 1.
Table 1

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Coefficient of Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Extent Flexibility</td>
<td>90</td>
</tr>
<tr>
<td>2</td>
<td>Dynamic Flexibility</td>
<td>93</td>
</tr>
<tr>
<td>3</td>
<td>Shuttle Run</td>
<td>88</td>
</tr>
<tr>
<td>4</td>
<td>Softball Throw</td>
<td>85</td>
</tr>
<tr>
<td>5</td>
<td>Standing Broad Jump</td>
<td>87</td>
</tr>
<tr>
<td>6</td>
<td>Hand Grip</td>
<td>90</td>
</tr>
<tr>
<td>7</td>
<td>Push Ups</td>
<td>93</td>
</tr>
<tr>
<td>8</td>
<td>Leg Lifts</td>
<td>95</td>
</tr>
<tr>
<td>9</td>
<td>Cable Jump</td>
<td>85</td>
</tr>
<tr>
<td>10</td>
<td>Balance-A</td>
<td>89</td>
</tr>
<tr>
<td>11</td>
<td>600 Metres Run-walk</td>
<td>86</td>
</tr>
<tr>
<td>12</td>
<td>50 Meter dash</td>
<td>90</td>
</tr>
</tbody>
</table>

Administration of Test Programme

This study was conducted on 4000 subjects studying in different girls high schools of Punjab State. It was not possible for the investigator to collect the data individually. To overcome this difficulty the help of many other people was sought. The investigator explained the test and testing procedures to the helpers and all the test items were demonstrated to them. Sufficient practice was given to them to conduct the tests correctly.
The synchronised stop watches and steel tapes were used by the investigator for the sake of high reliability and correct measurements of physical fitness test items. INCO Grip Dynometer was used to measure the static strength of the arm-hand and shoulder of the subjects. The measurement value of the Grip dynamometer was 0.1 kg.

Collection of data

The twelve tests were administered one after the other separately. The subjects were given instructions regarding each test which was followed by a demonstration to show them as to how they should take the test. Groups (20 students in each group) rotated to undertake three different tests, followed by three more tests until all the tests were finished.

Testing Procedure of Physical Fitness Tests

Height

The height of the subjects was measured with the help of a stadiometer to the accuracy of one centimeter. The height of each subject was taken without shoes and socks.

Weight

The body weight of the subjects was taken with the help of a portable weighing machine to the accuracy of 0.5 kg. Each subject stood barefooted on the weighing machine with only her suits on.

Twist and Touch Test

This test was administered to measure the capacity of a subject to rotate the spine. A test measuring scale, 75 centimetre long, was drawn on a wall and was marked off in one centimetre intervals from 0 to 75 centimetre. The scale was wide enough to suit the students of different heights. Another line, perpendicular to the wall and in line with 30 centimetre marked on the scale was drawn on the floor. The
subject to be tested was asked to stand with her left side towards the wall, her toes touching this line, feet together and perpendicular to the line marked on the floor. The subject stood at an arms length away from the wall so that she could just touch the wall while performing. The subject was then asked to extend her right arm straight at shoulder height, keeping her feet together, on the line with her palms down, fingers together and extended. She was then asked to twist clockwise (around her back), as far as possible so that she could touch the scale marked on the wall with her right hand. During this movement, the tester helped the student to keep her feet in place by keeping her (tester's) feet alongside the student's right foot. Each student was given one trial to get the feel of the test, any mistake made by her was corrected by the tester. Her second trial was counted and recorded as her score. The point at which she reached and maintained her posture for at least two seconds her score was taken.

Bend, Twist and Touch Test

This test was administered to measure the speed with which the subject can flex, extend and rotate her spine. The subject was asked to stand with her back towards the wall and at a distance from the wall from where she could bend without hitting the wall with her buttocks. She was asked to stand straight with her feet shoulder's width apart. A sign of "X" was marked on the floor between the subject's
feet. On the command "go" the subject bent forward and touched the "X" marked between her feet with both hands and then straightened up, twisted to the leg side and touched the "X" marked on the wall with both hands. This was counted as one cycle. In the next cycle, the subject repeated the same procedure at her right side. The instructor, demonstrated three such cycles, emphasizing speed. The number of cycles completed in 20 seconds were taken as her score.

**Shuttle Run Test**

To measure the speed with which the subject could abruptly and completely change her direction of body movement, two parallel lines, 20 metres apart on the track surface were drawn. One observer was stationed at the starting line and one at the finish line. The observer at the finish line had a stop watch to record the subject's time. The subject was asked to stand with one toe on the starting line. On the command "go" she had to run to the opposite line, 20 metres away, touch the ground on the far side of it with either foot, return to the starting line and repeat the process. She was told to cover the one way distance five times for a total of 100 metres. The observer at each end noted that the student touched over the lines and did not get confused over the repetition of the laps. On the last lap she was told to run through the finishing line to enable her to clock best time. Timekeeper started the watch when the command "go" was given to the subject and stopped it when the subject crossed the
finishing line after completing the fifth lap. The time taken by the subject to cover the 5 laps (5 x 20 = 100 metres) was recorded to the nearest tenth of a second and was counted as the score of the subject.

Softball Throw Test

The explosive power of arms and shoulder was measured by softball throw test. This is an outdoor test requiring an open field approximately 50 metres long. A restraining line was marked on the ground and the subject was required to throw the softball as far as she could from standing position. She was not allowed even to move her feet and was asked to take a comfortable position behind the restraining line. During the throw, she was not allowed to shift the position of her feet. The subject was given three chances and the best among them was her score. If she lifted either of her feet while throwing, the throw was not measured, but was counted as one of the three throws allowed to her. All the throws were made over head. The measuring tape was used to measure the best of three throws, to the nearest foot. If the throw was off line (to one side), the measured distance was perpendicular from the starting line to the point of impact.

Standing Broad Jump Test

This test was administered to measure the explosive power of the legs. The subject was asked to stand just behind the take-off line with her feet apart and parallel. She was
asked to jump as far forward as possible. Before jumping, she was asked to take her arms backward and bend the knees. The jump was done. No restriction was put on the movements of the arms. The subject was warned that the jump would not be counted if she fell back after landing. Three trials were given to each subject. The distance between the take-off line and the landing point was taken as the subject's score. The best attempt of the subject was counted and the distance was recorded in metres and centimetres.

**Hand Grip Test**

This test was administered to measure the static strength of the arm, the subject was told to stand erect with her hands down, away from the body and palms facing the upper part of the body. The dynamometer was placed in the palm of her preferred hand. She was told that with the command "squeeze", she had to squeeze the dynamometer once, sharply and steadily as hard as she could. A demonstration of the proper grip and arm position was given. During the test trial due care was taken that the student's fingers did not cover the dial, and she did not rest or brace any part of her arm against her body. The student was given three trials separated by at least a minute's rest. The highest reading of the three trials (the scale is read in kilograms) was recorded as her score of the event.
Push Ups Test

Push ups test was administered to measure the muscular endurance of the arms and shoulder girdle. The subject was to lie in a prone position, her hands were beside the chest, fingers pointed forward. Her hands were placed apart enough so that the forearms made a right angle with the floor. Feet were together, body straight, and only chin and chest were allowed to touch the floor. The body was raised until the arms were stiff, and the back was not to be arched.

She was told to do as many push ups as possible in 15 seconds. One tester was counting the push-ups and another was keeping time. The time keeper at the end of 15 seconds would say, "stop". The number of push-ups in 15 seconds was recorded as her score.

Leg Lifts Test

To measure the strength endurance of abdominal muscles, the leg lifts basic fitness test was used. The subject was asked to lie flat on her back with her hands clasped under her neck. Another student was asked to hold the subject's elbow to the ground. The subject was asked to raise her legs, keeping them straight, until they were vertical, and then to return to the original position. She was not allowed to rock the body. The head, small of the back and base of the spine were to remain on the ground and the exercise was stiff.
one-two motion. It was ensured that the elbows were kept on the ground throughout the process of the test. The full cycle was demonstrated to the student and the subject was given two trials to get the feeling of the exercise. Corrections were made wherever required. The emphasis was on the speed and continuity of the test without slowing down. One tester was counting the leg lifts and another was maintaining the time record. The time keeper at the end of 30 seconds gave the right signal to stop. The number of times the subject raised her legs to a vertical position in the 30 seconds duration was recorded as her score.

**Balance-A Test**

To measure the gross body equilibrium, the students were given a basic fitness test of balance. She was told to balance on the rail using the preferred foot, with the long axis of the rail. She was given a practice trial with her eyes open. She was told that her score would be the length of time from when she said "Go" until she touched the floor with any part of her body or removed either of the hands from her hips. She first placed her hands on her hips and stood up on the rail. When the subject reached her balance and wanted to start the trial, she said "Go". The administrator then began timing the subject. After the practice trial, the procedure was repeated with the eyes closed. The examinee was administered two separate test trials with her eyes closed.
The time for which the subject maintained her balance in each trial was recorded separately and added together for the purpose of the total score.

600-metre Run-Walk Test

To measure cardiovascular efficiency, this test was used. It was typically conducted outdoors. A 200 metre track was marked on a football field, hockey field or any other space available. Subjects were asked to run as far as they could and then they could walk for a short distance whenever they felt tired. They were advised to keep a speed which they could maintain throughout the course. Subjects were told to run in groups of 4 or 5. Each helper had one stop-watch with her and one runner was assigned to her. Time taken by the subject to cover the distance was recorded in minutes and to the nearest seconds.

50-Metre Dash Test

To measure the speed, a basic fitness test of 50 metre dash was used. In this the subjects were told to take position behind the starting line, with one knee on the ground and the tips of their fingers on the starting line. Three commands were given to them: First "Take your mark", at which they had to get ready for the starting command. Second, "Get set", with this they raised their body
off their haunches, and got themselves balanced properly as far forward as possible for the start. They were advised not to lean too far forward for it may cause a false start. With command, "Go", the starter brought her hand down, also as a signal to the time-keepers. The time taken by the subject to cover the distance was recorded in seconds (to the nearest tenth of second) and counted as the score.

**Statistical Design**

In the first instance, the test-retest reliability of the data was determined on a sample of 100 subjects by the use of correlation of coefficients.

The data were analysed firstly to determine the nature of distribution of scores by calculating the values of skewness and kurtosis for Fleishman's twelve physical fitness variables of high school girls of Punjab using formula:

$$Sk = \frac{(P_{90} + P_{10})}{2}$$

The age wise (Age consisted of four groups - 12, 13, 14 and 15) norms for this study were computed in terms of Percentile scale.

Mean, median and standard deviations were used to find out the nature of the variable as revealed by the data of the high school girls.

The statistical technique of analysis of variance (2 x 4) ANOVA was used mainly for testing the hypotheses. Significant
differences on all physical fitness variables under investigation were also determined by employing the 't' test.

The level of significance to test the hypotheses was chosen as .05.

The whole data was processed and analysed at the Department of Computer Science, Panjab University, Chandigarh.