Chapter III

PROCEDURE

In this chapter, the selection of subjects, selection of variables, criterion measures, collection of data, reliability of data, administration of tests/procedure of recording measurements and the statistical technique employed for the analysis of data have been described.

SELECTION OF SUBJECTS

Fifty female athletes of Jai Narain Vyas University and Govt. College of Physical Education Jodhpur, Rajasthan studying in various under graduate and post graduate courses in Physical Education were selected as subjects for this study.

SELECTION OF VARIABLES AND CRITERION MEASURES

The research scholar made sincere efforts to review the related literature in the area of study and held series of discussions with experts and scholar’s own understanding of the problem, the following variables were selected for the purpose of this study.

ANTHROPOMETRIC MEASUREMENTS

**Standing Height:** Measured by using a wall with marked scale.

**Weight:** Measured by using weighing machine.

**Shoulder Width:** It was recorded correct to the nearest half centimeter, with the help of flexible steel tape.
**Procedure**

**Hip Girth**: It was recorded correct to the nearest half centimeter, with the help of flexible steel tape.

**Thigh Girth**: It was recorded correct to the nearest half centimeter, with the help of flexible steel tape.

**Thigh Length**: It was recorded correct to the nearest half centimeter, with the help of flexible steel tape.

**Fore Leg Length**: It was recorded correct to the nearest half centimeter, with the help of flexible steel tape.

**Leg Length**: It was recorded correct to the nearest half centimeter, with the help of flexible steel tape.

**Calf Girth**: It was recorded correct to the nearest half centimeter, with the help of flexible steel tape.

**Foot Length**: It was recorded correct to the nearest half centimeter, with the help of flexible steel tape.

**Ponderal Index**: It was obtained by using the formula: standing height divided by the cube root of weight.

\[
P_I = \frac{\text{Height}}{\sqrt[3]{\text{Weight}}}
\]

**Crural Index**: It was computed from the formula: fore length divided by the thigh length and recorded to the two decimal places.

\[
\text{Fore leg length} \div \text{Thigh length}
\]
Procedure

PHYSICAL VARIABLES

**Speed:** It was measured by administering 50 meters dash to the nearest 1/100\textsuperscript{th} of a second.

**Agility:** It was measured by administering 4x10 meters shuttle run to nearest 1/100\textsuperscript{th} of a second.

**Endurance:** It was measured by administering 9 minute run/walk to nearest 1/100\textsuperscript{th} of a second.

**Strength:** It was measured by administering by two kg medicine ball throw and was recorded to nearest in centimeter.

**Flexibility:** It was measured by administering sit and reach to nearest 1/100\textsuperscript{th} of a second.

RELIABILITY OF DATA

The reliability of data was ensured by using standard instruments and by establishing tester competency and reliability of tests.

**Tester Competency**

To ensure that the investigator was well versed with the techniques of conducting the tests and taking the measurements, the investigator had a number of practice session in testing procedures under the guidance of an expert. All the measurements and tests were conducted by the investigator with the assistance of Athletic coaches who were also well acquainted with the tests and measurements.
Tester reliability in conducting anthropometric measurement and physical variables were established by test retest process thereby consistencies of results were obtained by product moment correlation of 50 subjects. The coefficient are presented in Table-1

**TABLE-1**

**RELIABILITY COEFFICIENT OF TESTS RETEST SCORES**

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Variables</th>
<th>Coefficient of Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Standing Height</td>
<td>98.9</td>
</tr>
<tr>
<td>2.</td>
<td>weight</td>
<td>97.6</td>
</tr>
<tr>
<td>3.</td>
<td>Shoulder Width</td>
<td>94.3</td>
</tr>
<tr>
<td>4.</td>
<td>Hip Girth</td>
<td>92.8</td>
</tr>
<tr>
<td>5.</td>
<td>Thigh Girth</td>
<td>91.4</td>
</tr>
<tr>
<td>6.</td>
<td>Thigh Length</td>
<td>92.7</td>
</tr>
<tr>
<td>7.</td>
<td>Leg Length</td>
<td>93.5</td>
</tr>
<tr>
<td>8.</td>
<td>Fore Leg Length</td>
<td>94.6</td>
</tr>
<tr>
<td>9.</td>
<td>Calf Girth</td>
<td>92.4</td>
</tr>
<tr>
<td>10.</td>
<td>Foot length</td>
<td>93.8</td>
</tr>
<tr>
<td>11.</td>
<td>Speed</td>
<td>88.4</td>
</tr>
<tr>
<td>12.</td>
<td>Endurance</td>
<td>89.8</td>
</tr>
<tr>
<td>13.</td>
<td>Strength</td>
<td>91.6</td>
</tr>
<tr>
<td>14.</td>
<td>Agility</td>
<td>87.5</td>
</tr>
<tr>
<td>15.</td>
<td>Flexibility</td>
<td>89.2</td>
</tr>
</tbody>
</table>

From the test-retest coefficient of correlation (Table-I) it is shows that the tester reliability was significantly high establishing
in competency of the scholar to administer the tests. The coefficient correlation also indicated the reliability of the tests selected at high correlations was obtained when the tests were repeated.

**Instrument Reliability**

The steel tape and weighing machine used for anthropometric measurements i.e., Standing Height, weight, Leg Length, Foot length, Fore Leg Length, Thigh Length, Calf Length, Thigh Girth, Hip Girth, Shoulder Width and also to measure the performance of subjects in broad jump was non-elastic and flexible steel tape calibrated and approved for used by competent authority.

The stop watches were all calibrated which was used for the performance of subjects in shuttle run, 50 meter dash and 9 meter run/walk. The medicine ball was also used to measure strength capability of the jumper’s.

All the instruments were calibrated and thus accepted so; it is enough for the purpose of the study.

**COLLECTION OF DATA**

Before the administration of test the research scholar personally meet the University and National level players and they were advised to assemble at Jai Narain Vyas University and Govt. College of Physical Education Sports ground, Jodhpur, Rajasthan respectively for conducting the tests at different specific dates. The research scholar briefly explained the tests items. There
was no ambiguity regarding tests all the subjects cooperated voluntarily. The test was conducted for two days in each places and it was conducted only in the morning session between 6.30 A.M. to 8.30 A.M. The relevant data regarding anthropometric measurements and physical variables of Jumpers were collected personally and with the help of other experts.

**ADMINISTRATION OF TEST**

**Anthropometric Variables**

**Standing Height**

The height of the subjects was taken with the help of wall scale and hard board. Subjects was suggested to standing erect without shoes against a wall marked scale, subjects were instructed to keep the heels together body touching the wall with heels, buttocks and back, head erect without tilt and to take and hold a full breath and standing erect while height measurement was taken. A stiff hard board was held horizontally on his head, slightly pressing the head and touching the scale marked on the wall, at right angle. The subject was asked to step out by lowering the head and reading indicated by the lower end of the hard board was taken. The measurement was taken correct to the nearest half of a centimeter.

**Weight**

The weight of the subject was taken with a lever tight laboratory anthropometric weighing machine. The subject wearing
Procedure

shorts and vest only stood at the centre of the machine and the weight was recorded from the indicator needle of the dial. The weight was read and recorded correct to a half of a kilogram

Shoulder Width

The subject stood with his shoulder relaxed. The inside edge of the fixed arm of the spreading calipers was kept resting on the outside edge of the acromial process of one shoulder blade, and the moving arm of spreading calipers was brought inward until inside edge of on out-side edge of acromial process of the other shoulder blade. The shoulder width was recorded correct to the nearest half centimeter.

Hip Girth

The measurement was taken with the help of flexible steel tape. It is the perimeter at the level of the greatest posterior margin and at approximately the symphysis pubis level interiorly. The subject during this measure stands erect, feel together, without volitionally contracting the gluteus muscles. It was recorded to the nearest centimeters.

Thigh Girth

Thigh girth was measured with a flexible steel tape placed around the thigh horizontally with its top edge just under the fold of the buttocks. The subject stood with his weight equally

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2 Ibid.
distributed on both feet. Thigh girth was recorded correct to the nearest half centimeter\textsuperscript{3}.

**Thigh Length**

Thigh length of the subject was measured with a flexible steel tape vertically form the most protuberant part of the patella bulge to the upper edge of the greater trochantor. Thigh length was recorded correct to the nearest half centimeter. Thigh length was recorded correct to the nearest half centimeter\textsuperscript{4}.

**Leg Length**

Leg length of the subject was measured with flexible steel tape from the bottom outside edge of the centre of foot to the upper edge of the greater trochanter. Leg length was recorded correct to the nearest centimeter\textsuperscript{5}.

**Fore leg length**

Fore leg length of the subject was measured with the help of flexible steel tape vertically form the bottom outside edge of the centre of the foot to the most protuberant part of the petal a Bulge (coinciding with the centre at the knee bend at the back). Fore leg length was recorded correct to the nearest half centimeter\textsuperscript{6}.

**Calf Girth**

The circumference of the calf was taken with the help of a flexible steel tape at the maximum circumference of the calf in a

\textsuperscript{3} Ibid.
\textsuperscript{4} Ibid.
Procedure

plane at right angle to its axis. The leg was held dangling over a tape top so that the tape measure was in horizontal plane. In this position the calf muscle is quite relaxed. The measurement was taken to the nearest centimeters.

**Foot Length**

With the subject standing, the distance between the most posterior point of the heel and the tip of the longest toe was measured with the spreading calipers. The inside edge of the fixed arm of the calipers was kept resting on the most posterior point of the heel and the moving arm of calipers was brought inward until inside edge of the moving arm rest on the tip of longest toe. The foot length was recorded correct to the nearest half centimeter.

**Ponderal Index**

\[
\frac{\text{Standing Height}}{\sqrt[3]{\text{Weight}}} \]

This ratio for each subject was calculated by substituting in the formula, the score of the height of a subject in inches correct to ¼ of an inch and the score of weight in pounds correct to nearest pound. The value for this ratio was obtained by using nomograph. This ratio is named as Ponderal Index in literature.

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8 Clarke, *Application of measurement to Health and physical Education*, pp.94-95./ Cureton, physical Fitness of champion Athlete, P-49.
**Crural Ratio**

\[
\frac{\text{Fore Leg Length}}{\text{Thigh Length}}
\]

This ratio was computed by dividing the score of fore leg length by the corresponding score of thigh length and the obtained value was recorded correct to four decimal places. This ratio is named as crural ratio in literature.

**PHYSICAL VARIABLES**

**Endurance (9M Run/Walk)**

**Purpose**

To measure the cardio vascular fitness.

**Equipment**

Stop Watch, Whistle and the distance markers. Etc.

**Procedure**

It is usually most efficient to assign each runner to a spotter. The runners start behind a line and, upon the starting signal, run/ walk as many laps as possible around the course within the 9 minutes. The spotters maintain a count of each lap, and when the signal to stop is given, they immediately run to the spots at which their runners were at the instant the whistle or command to stop was given.

**Scoring:**

The score in meters was determined by multiply the number of complete lap’s times the distance of each lap, plus the number of
segments of an incomplete lap, plus the number of meters stepped off between particular segments.

**Speed (50 meter dash)**

**Purpose:**

The 50 meter dash has been considered to be the best measured of running speed.

**Equipment:**

Stop watch and clapper

**Procedure:**

The subject started together to have the competitive performance. The subjects were asked to stand on the starting line and take a standing start. The clapper was clapped after the caution “Ready” The starter stood in such a position so that the ‘V’ of the clapper was visible to the time keeper. As the ‘V’ of the clapper was closed, the time keepers started their stop watches at the finish line. The subject ran as fast as they could and stop watches stopped as soon as torso touches the finish line.

**Scoring:**

The time taken by the subject from starting line to finishing line was recorded to the nearest 1/100th of a second as the running speed score⁹.

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Agility (4 x 10 M Shuttle run)

Purpose:

The purpose of the shuttle run was to measure the agility of the performer in running and changing direction.

Equipment:

Measuring tape, stop watches and wooden blocks.

Procedure:

Each subject was asked to start behind the starting line after the signal ‘go’.

The subject ran from starting line to blocks which were placed at distance of 10 meter from starting line and pick one of the block, returned to the starting line and placed the block behind the line. The same process was repeated in the second block. Two trials were permitted for each subject.

Scoring:

The score for each subject was the time taken to complete the distance of 4 x 10 meter shuttle run measured in the nearest 1/100th of a second. Two trials were given, the best out of the two recorded times was taken as subject score\(^{10}\).

Flexibility (sit & reach test)

Purpose:

The purpose of sit & reach test to measure the flexibility of the lower back and hamstring muscles.

\(^{10}\) Ibid, P-115.
**Procedure**

**Equipment:**

Box, meter ruler, tape, assistant. etc.

**Procedure:**

The subject warm-up for 10 minutes. This test involves sitting on the floor with legs stretched out straight ahead. Shoes should be removed. The soles of the feet are placed flat against the box. Both knees should be locked and pressed flat to the floor—the tester may assist by holding them down. With the palms facing downwards, and the hands on tops of each other or side by side, the subject reaches forward along the measuring line as possible. Ensure that the hands remain at the same level, not one reaching further forward than the other. After some practice for one- two seconds while the distance is recorded. Make sure there are no jerky movements.

**Scoring**

The score was recorded to the nearest centimeter or half inch as the distance reached by the hand.

**Strength (medicine ball throw)**

**Purpose**

To measure arm and back strength primarily along with coordination and balance secondarily.

**Equipment**

An open space approximately 90 x 25 feet and two kg medicine ball.
Procedure

The subject stands shoulder width apart behind the restraining line, facing opposite to the throwing direction and holds the ball with both the hands, fingers interlock. Bending the body forward and downward, taking swings and releasing the ball straight down the course. Three trials in succession, if all the three trials were foul and then the subject was asked to put the medicine ball until he makes the fair put.

Scoring

Best of three put measured to the nearest meter.

STATISTICAL ANALYSIS

The relationship between dependent variables (long jump and high jump performance) and independent variable (anthropometric measurement and physical variables) was established by computing Pearson’s Product moment Correlation (r). For testing the hypothesis the level of significance was set at .05.