Chapter - III

PROCEDURE

In this chapter, selection of subjects, selection of variables, reliability of data, experimental design, procedure for administrating test, collection of data and statistical technique for analyzing data have been mentioned.

Selection of Subjects

The subjects for this study were 90 [ninety] male netball players from different universities those who participated in intercollegiate’ and inter-varsity championship. Besides it’s the members of national coaching camps were also constitute the sample.

Selection of Variables

On the basis of review of related literature, experts opinion in the field of netball and exercise physiology and scholar’s own understanding, following variables have been selected for the purpose of this study.

Physical Variables

i- Standing height

ii- Sitting height

iii- Leg length
iv- Upper arm length  
v- Fore arm length  
vi- Hand length  
vii- Body composition

Physiological Variables

[a] Resting Pulse Rate  
[b] Resting Blood Pressure  
[c] Vital Capacity  
[d] Resting Respiratory Rate  
[e] Maximum Breathe Holding Time  
[f] Air-flow Rate  
[g] Cardio-vascular Efficiency

Reliability of Data

The reliability of the data was ensured by establishing the instrument reliability and the tester’s reliability.

Instrument Reliability

The instruments used for the study were available at the human performance laboratory of Lakshmibai National Institute of Physical
Education, Gwalior. Instruments were calibrated and tested prior to the collection of data. Thus, these were considered accurate enough for the purpose of this study.

**Tester's Reliability**

The tester's reliability was established with the help of test retest method, the performance of thirty subjects selected at random on the selected variables were recorded several times under identical conditions by the research scholar. A Pearson's Product Moment Correlation was computed between the two measures of each variable, the reliability coefficient have shown higher values. The values of coefficients are given in Table 1.
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**Collection of Data**

The data pertaining to Physical and Physiological variables were obtained by using standard test and measurement procedure:
Physical Variables

Standing Height

Subjects were made to stand erect without shoes against the marked scale on the stand. The subjects were instructed to keep the heels together, head without tilt and to take and hold full breath while measurement was taken. A wooden bar was held horizontally on the head touching the scale marked on the stand. The subject was asked to step out and the reading indicated by the horizontal bar was recorded. Stature was recorded to the nearest half of a centimeter.
Photograph of Standing Height

Figure - 1
Sitting Height

The subject set erect on a table with his feet unsupported. The right angle formed at the knee without touching the edge of the table. The hand rested on the thighs. The head was oriented in the frank fort plane and the distance between the highest points on the head and sitting surface was taken, while gentle upward traction was exerted in the mastoid region while the subject was holding inspiration. The sitting height was recorded to the nearest half of a centimeter.¹

Leg Length

Subjects were instructed to stand erect and leg length was taken with the flexible steel tape from the greater trochanter to the floor. The leg length was recorded correct to the nearest half centimeter.²

Upper Arm Length

The subject stood erect by keeping his arms along with his body. Upper arm length was measured with the flexible steel tape. The tip of the tape was placed at the upper edge of the head of acromiale to the tip of the

² Cureton, Physical Fitness of Champion Athletes, 49.
top of the point of radiale. The upper arm length was recorded correct to the nearest half of a centimeter.³

**Forearm Length**

The subjects were instructed to stand erect and relaxed. Forearm length was measured with the flexible steel tape. The tip of the tape was placed at the upper edge of the head of the radius to the tip of the middle finger. The forearm length was recorded correct to the nearest half of a centimeter.

**Hand Length**

Subjects were instructed to place the hand on the table with palm facing upward and fingers close with wrist extension and elbow flexion in relaxed position. The hand length was taken with flexible steel tape from the base of the thumb to the tip of the middle finger.

**Body Composition**

The body composition was represented by the percentage of fat of the subjects. To obtain the percentage of body fat of each subject skin fold measurement on right side of the body were taken at four selected sites. Skin

³ Ibid., p. 48.
fold caliper was used for the purpose of the thickness of the skin folds were recorded in millimeters.\textsuperscript{4}

The following were the sites used for taking skin fold measurements: Biceps Skin fold, Triceps Skin fold, Sub-scapularis Region and Supra-iliac Region.

**Biceps Skin folds:**

With the subject standing erect with arm hanging loosely, a fold of skin was picked up on the anterior of the mid part of biceps and the skin fold thickness was measured. The position of the fold was vertical and reading to the nearest half millimeter was recorded.

**Triceps Skin folds:**

The skin fold thickness was taken over the triceps muscle at a point half way between the tip of the shoulder (acromiale process) and the tip of the elbow (olecranon process). The point was located with forearm flexed to 90\(^\circ\) and while taking the measurement the arm was kept hanging free. The fold of skin was lifted parallel to the long axis of the arm and the reading to the nearest half millimeter was recorded.

Photograph of Biceps Measurement

Figure - 2

Photograph of Triceps Measurement

Figure - 3
Sub-scapularis Region:

The skin fold thickness was taken at the tip of the scapula with the subjects in a relaxed standing position. The fold was lifted in the diagonal plane at about 45° from vertical and horizontal planes and the reading to the nearest half millimeter was recorded.

Supra-iliac Region:

The skin fold thickness was taken three to five centimeters above the anterior – superior iliac spine on a diagonal line giving downward and inward and the reading to the nearest half millimeter was recorded.

The sum of the skin fold thickness of four sites of the body was used in order to obtain percentage of body fat with the help of standard conversion table suggested by Durnin and Rehman.⁵

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Photograph of Sub Scapularis

Figure - 4

Photograph of Supra Illiac

Figure - 5
Physiological Variables

Resting Pulse Rate

Resting pulse rate was recorded while the subject was in supine position. The subjects were instructed to be in supine position for at least 15 to 20 minutes before recording to resting pulse rate. Then the research scholar kept his finger tips on the radial artery of the subject and the pulse beats were palpated for 15 seconds for each subject and finally it was converted in minute's form (B/M). The resting pulse rate was recorded in terms of number of pulse per minute.
A sphygmomanometer (mercury type) and a stethoscope were used to measure blood pressure. A 15 to 20 mm Hg cuff was connected to the arm. The pressure on the brachial artery was then gradually released until the arterial pulse beats could be distinctly heard and the point at which the sound disappeared was recorded as diastolic pressure.

Photograph of Resting Pulse Rate

Figure - 6
Resting Blood Pressure

A sphygmomanometer (dial type) and a stethoscope were used to measure blood pressure (systolic and diastolic). The subject was placed in a supine lying position for 15 to 20 minutes for recovery from any unusual tension.

The left upper arm of the subject was encircled by an inflatable rubber bag containing in cuff was connected to pressure pump and manometer. By pumping air to pressure in the bag was rapidly raised to 180 mm Hg, which was sufficient to obliterate completely the brachial pulse, disappeared. The pressure was then lowered to a point where the pulse could be felt by using a stethoscope; the pulsation of the brachial artery at the bend of the elbow could be distinctly heard. At this point the pressure shown on the deal was recorded as systolic pressure.

The pressure on the brachial artery was then gradually reduced until the arterial pulse beats could by distinctly heard and the point at which the sound disappeared was recorded as diastolic pressure.
Photograph of Blood Pressure

Figure - 7
Vital Capacity

Vital capacity was measured in ml. by using dry spirometer. The spirometer was brought in to zero position. The subject performed maximum inspiration and after closing the nose, the air was blown as intensely as possible in the mouth piece. Then the amount of expired air was read directly from the calibrated scale and that was the score of vital capacity.\(^6\)

Resting Respiratory Rate

Resting respiratory rate was recorded while the subject was in supine position. The subjects were instructed to be in supine position for 15 to 20 minutes before recording the resting respiratory rate. Then the research scholar kept his palm just below the thoracic cavity that is on the diaphragm of the subject and was palpated for 60 seconds for each subject. The resting respiratory rate was recorded in term of the total number of inhalation and exhalation per minute.

Photograph of Vital Capacity

Figure - 8
Photograph of Resting Respiratory Rate

Figure - 9
Maximum Breath Holding Time

Positive Breath Holding Capacity

To measure the positive breath holding capacity, the subjects were instructed to place the nose lip tightly. They will be asked to inhale through the mouth to the maximum capacity. As soon as the subjects took a deep breath to the fullest capacity of their tags and close the lips, the stop watch was started. As soon as the subjects opened their lips to exhale, the stop watch was topped and the time given by the watch was recorded as the score of positive bid holding capacity.

Negative Breath Holding Capacity

To measure the negative breath holding capacity, the subjects were instructed to place the nose clip tightly. They were asked to exhale through the mouth to the maximum capacity. As soon as the subjects exhale and close the lips, the stop watch was started. As soon as the subjects open their lips to inhale, the stop watch was stopped and the time given by the watch was recorded as the score of the negative breath holding capacity.

Air-Flow Rate

The air flow rate of the subjects was recorded with the help of air flow meter. The instrument has a detachable mouth piece connected to a small plastic drum which has a graduate dial with marking ranging from 0 -100 (one liter). The dial has also an indicator which revolves when air blows into a
small plastic drum like apparatus. When the indicator comes to rest at point along the graduate dial. The reading on the dial shows the air flow rate in liters/ minute. After noting down the reading the dial is rotated clockwise, so that indicator points to zero again7.

**Cardio-Vascular Efficiency**

The cardio-vascular efficiency was measured especially in relation to the pulse at rest, after exercise and after rest following the exercise through the physically efficiency index obtained by the administration of Harward Step Test in which a wooden platform of 20 inches height, stop watch, metronome an stethoscope were used as equipment.

To administer the test, each subject was asked to stand near the 20 inches high platform. On the command "Ready" "Start" the subject stepping up and down to bench to a four count rhythm which is explained as follows. On count one the subject stepped on the bench with one foot, on count "two" the subject lifted the body up straightening the leg already placed on the bench and placed the second foot also on the bench, keeping the trunk upright. On count "three" the subject placed one foot on the floor, and on count "four" the other foot also brought down to the floor. The subject was allowed to lead off with either foot or to change the leading foot during the rest. The subject was permitted to step up with a jump and as instructed to

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extend the knee fully when both the feet were on the bench or the floor. The four count rhythm was maintained with the help of metronome. The stepping exercise continued for a maximum five minutes at the rate of 30 steps per minute, unless the subject was forced to stop because of exhaustion. In either case, the duration of exercise was recorded in seconds, 300 seconds being the maximum. Immediately after the stepping exercise, the subject was asked to rest in a chair and after one minute the tester recorded the pulse rate of the subject for the duration of 30 seconds. Pulse was counted by using stethoscope, placing it on the left hand side of the chest where heart is situated.

The final score of each subject was calculated in terms of physical efficiency index by the following formula.\(^8\)

\[
P.\ E.I. = \frac{\text{Duration of exercise in seconds} \times 100}{2 \times \text{sum of pulse counts in recovery}}
\]

Photograph of Cardio Vascular Efficiency Step I

Figure - 10
Photograph of Cardio Vascular Efficiency Step II

Figure - 11
Photograph of Cardio Vascular Efficiency Step III

Figure - 12
Photograph of Cardio Vascular Efficiency Step IV

Figure - 13
Analysis of Data

The data obtained for physical and physiological variables were analyzed by using the following statistical techniques:

1. Mean
2. Standard deviation
3. Analysis of variance

In order to test the hypothesis, level of significance was set at 0.05.