Chapter III

PROCEDURE

The procedure adopted for the selection of subjects, selection of variables, criterion measures, reliability of data, collection of data and the statistical techniques employed for analyzing the data have been described in this chapter.

Selection of Subjects

The subjects for this study were selected from University and National Level Basketball Competitions, who had participated in Inter-varsity and National Basketball Championships during the year 1984-85.

Fifty four subjects from University and fifty one subjects from National level were selected. The average height of subjects was 5'-4" at University and 5'-6" at National level respectively. The players from Universities (i.e. Punjab, Delhi, Gurunanak Dev University, Amritsar, Bombay and Pune University) as well as the players from State Teams (Punjab, Maharashtra, Madhya Pradesh, Karnataka, and Railways) at National level were selected for this study.
The teams who qualified from Quarter Final onwards in Inter-varsity and National Tournaments were selected. The average age of the subjects was 18.5 years ranging from 16-21 years at University level and 21 years ranging from 18-24 years at National level respectively.

In order to ensure the full co-operation from the subjects, the scholar had a meeting with them in presence of their respective coaches and managers. 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 for the successful completion of the investigation.

All subjects voluntarily agreed to extend full cooperation and coaches of respective teams ensured that the subjects would be made available for the collection of data as and when required. The collection of data was done prior to and after the competition.

Selection of Variables

The research scholar reviewed the available scientific literature pertaining to the game of basketball from books, journals, periodicals, magazines, research
papers. According to the discussion with experts, feasibility criteria, availability of instruments, equipments and the relevance of the variables to the present study, the following variables were selected.

AAHPER Basketball Skill Test

a) Front Shot
b) Side Shot
c) Foul Shot
d) Under Basket Shot
e) Speed Pass
f) Jump and Reach
g) Over arm pass for Accuracy
h) Push pass for Accuracy
i) Dribble

Motor Components

In basketball game, a player must jump vigorously several times for a jump shot and rebound, play the game for long period of time, run fast frequently and change his paths abruptly in playing situations. Hence, power, cardio-vascular endurance, speed and agility were selected as important motor components for this study.
Psychological Variables

The following psychological variables were selected, keeping in view whether these important personality characteristics would contribute to the basketball performance.

- Extro-Introversion
- Neuroticism

Criterion Measures

1. The basketball playing ability was graded (out of 10 points) by a panel of three qualified judges during actual competition and the average of three grades was considered as subject's playing ability.

2. The objective basketball skill performance of subjects was assessed with the help of AAHPER Basketball Skill Test consisting of nine items.

3. The vertical jump recorded in cms. through Sargent Jump test was taken as the criterion for leg power.

4. The time taken in seconds (1/10 of a second) to cover 50 metres run was the criterion for measuring the speed component.
5. The distance covered and recorded to the nearest 25 metres in 8-minutes served as the criterion for Cardiovascular Endurance.

6. The time taken in seconds to shuttle four times a distance of 10 metres was recorded and taken as the criterion for Agility.

7. The Extro-Introversion and Neuroticism were determined with the help of E.P.I. Questionnaire test and the scores recorded were taken as the criterion measure for this variable.

**Reliability of Data**

The reliability of data was ensured by establishing the instrument reliability, tester reliability, tester competency, reliability of the tests and the subjects reliability.

**Instrument Reliability**

Stop watches, measuring tapes and scales were used in measuring all items of AAHPER Basketball Skill Test and the reliability of instruments was ensured by their manufacturers.
The speed was recorded to the 1/10th of second stop watches which were calibrated, Swiss made supplied by Krishna Watch Company, Bombay.

To measure cardio-vascular endurance, power and agility the same watches and measuring tapes were used.

Thus, the instruments used for assessing the subjects on all different variables were considered reliable and precise enough for the purpose of this study.

Tester Competency and Reliability of Tests

The tester competency was evaluated together with the reliability of the tests. To determine the reliability of tests, the performances of 10-subjects selected at random on the chosen variables were recorded twice under identical conditions by the scholar. The scores thus obtained were co-related using Pearson Product Moment Method between the two measures of each variable and the co-efficient of correlations are presented in Table 1.

Subject Reliability

The above test - retest coefficients of correlation also indicated subject reliability as the same subjects were used under similar conditions by the same tester. Neither motivational techniques were used nor training
### TABLE 1

**RELIABILITY COEFFICIENTS OF CORRELATION OF TEST-RETEST SCORES**

<table>
<thead>
<tr>
<th>Test Item</th>
<th>Coefficient of Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basketball Playing Ability</td>
<td>.953</td>
</tr>
<tr>
<td>Dribble</td>
<td>.962</td>
</tr>
<tr>
<td>Push Pass for Accuracy</td>
<td>.956</td>
</tr>
<tr>
<td>Over Arm Pass Accuracy</td>
<td>.951</td>
</tr>
<tr>
<td>Jump and Reach</td>
<td>.982</td>
</tr>
<tr>
<td>Speed Pass</td>
<td>.971</td>
</tr>
<tr>
<td>Under Basket Shot</td>
<td>.930</td>
</tr>
<tr>
<td>Foul Shot</td>
<td>.914</td>
</tr>
<tr>
<td>Side Shot</td>
<td>.906</td>
</tr>
<tr>
<td>Front Shot</td>
<td>.923</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>.981</td>
</tr>
<tr>
<td>Entro-Intro Version</td>
<td>.990</td>
</tr>
<tr>
<td>Agility</td>
<td>.894</td>
</tr>
<tr>
<td>Speed</td>
<td>.891</td>
</tr>
<tr>
<td>Cardio-vascular Endurance</td>
<td>.922</td>
</tr>
<tr>
<td>Power</td>
<td>.982</td>
</tr>
</tbody>
</table>
given to the subjects.

**Collection of Data**

**Description of the AAHPER Basketball Skill Test**

for Girls with Scoring Procedure

1. **Front Shot** (Figure 1).

Objective - To measure the players skill in making scoring shots at the basketball from a designated spot at the left front of the basket.

Equipment - Standard inflated basketball and rings (baskets).

Description - The player took shot from a spot just out-side of the free throw circle where the free throw line intersects the circle. This point on the left side facing the basket. A mark was drawn on the floor as shown in the diagram. Any method of shooting with one or two hands was used. The player tried to make the basket without hitting the back board. Fifteen trials were given in series of five at a time. The player left

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the spot at the end of each five shots and moved
around or let another player took her first series of
shots before continuing. A practice shot was allowed
before the actual test.

Rules - i) Players shot from the shooting
spot only.

ii) Fifteen shots were taken in all.

Scoring - Two points were counted for each
basket made regardless of how the ball went in the goal.
One point was counted for shots which hit the ring but
did not go in the basket, provided the ball hit the ring
before hitting the back board. The balls which hit the
basket did not count any points. Recorded the points as
made on each shot and then totalled the points for the
final score. The maximum score that might be on the 15
shots was 30 points.

2. Side Shot (Figure 2).

Objective - To measure the players skill in
shooting basket from the side near the corners of the
court.

Equipment - Standard inflated basketballs and
goals or baskets.
FIG. 2 - SIDE SHOT

S — SUBJECT
T — TESTER
R — RECORDER

20 ft

K
Description - The player took shots from a spot near the corner of the court at the side of the basket, and behind a line drawn 20 feet from the centre of the basket. Either one or both handed shots were used. The player shot 10 shots (times) from one side of the basket and then moved to the other side for 10 shots. A practice shot was allowed before the actual test.

Rules -  

i) Shots were taken from behind the line marked 20 feet from the basket.

ii) Ten shots from each side were attempted.

Scoring - Two points for each goal made and one point for balls which hit the rim of the basket but did not go in, though they might have hit the back board also. Score of each shot was made and then totalled the points for the final score. The maximum score was 40 points, 20 points on each side.

3. Foul Shot (Figure 3).

Objective - To measure skill in shooting free throw (foul shooting) from the free throw line.

Equipment - Standard inflated basketballs and rings or baskets.
FIG. 3 - FOUL SHOT

S — SUBJECT
T — TESTER
R — RECORDER
Description - The player took shot from behind the centre of the free throw line. The player was allowed to shoot by any method preferred. Twenty shots were taken in a series of five shots at a time. The player was instructed to leave the foul line at the end of each five shots and moved around or let another player take shots before continuing with her next series of shots. A practice shot was allowed.

Rules - i) Twenty shots were taken in all.
   ii) The player was allowed to place her feet in any position, behind the line.

Scoring - One point was scored for each goal made regardless of how the ball went in the basket, counted each shot as 1 or 0, recording the points on score card. Recorded the total score made. The maximum possible score was 20 points.

4. Under Basket Shot (Figure 4).

Objective - To measure skill with which a player could shoot, recover and shoot from a position directly under the basket.

Equipment - Standard basketball court, standard inflated balls, standard goals (baskets) and a stop watch.
FIG. 4 - UNDER BASKET SHOT

S — SUBJECT.
T — TESTER/TIMER.
R — RECORDER.
Description - The player stood under the basket holding a basketball. On the signal "go" the player started making one hand or two handed lay up shots, recovering the ball and shooting again as rapidly as possible tried to make as many goals as possible within 30 seconds. The player was timed from the signal "go" and till stopped on the signal "stop". A practice trial was also allowed before timing the player.

Rules - i) The ball was shot in any manner.

   ii) After shots were made or missed the player recovered the ball and continued shooting.

   iii) When the player lost the ball entirely she started over again, but only once.

   iv) Two complete trials were allowed.

Scoring - One point was scored for each basket made. The score on the test was the number of baskets made in 30 seconds. Two trials were recorded on the score card and the best trial was the player's score.

5. Speed Pass (Figure 5).

Objective - To measure speed with which a player could continue to pass and catch a ball.
FIG. 5 - SPEED PASS

S — SUBJECT
T — TESTER/TIMER
R — RECORDER

WALL
RESTRAINING LINE
9 ft.
Equipment - A leveled floor or ground, a wall with smooth surface, stop watch and standard inflated basketballs.

Description - The player stood behind a line on the floor parallel to and 9-feet from a solid smooth wall. On the signal "go" the player passed the ball against the wall as rapidly as possible until the ten passes were made which hit the wall. Any method of passing was used, but push pass was faster. A practice pass trial was permitted (allowed).

Rules - i) All passes were permitted to make from behind the line.

   ii) The ball could not be batted, but was caught and passed.

   iii) The ball could hit the wall at any height.

   iv) If the ball was dropped, the player recovered it and continued from behind the line until she had hit the ball on the wall ten times.

   v) Two complete trials were allowed.
Scoring - The test was timed from the instant the first pass hit the wall until the tenth pass could hit the wall (the player started on the signal "go" but the watch was not started until the ball hit the wall). The time recorded in seconds and tenths. Two complete trials were recorded. The score was the best time required to complete ten passes against the wall.

6. Jump and Reach (Figure 6).

Objective - To measure a reach (vertical jump) of a player over and above his normal standing reach, and to record the leg power.

Equipment - A levelled floor/ground and a wall with smooth surface upon which chalk marks were made. Calk pieces 3-4 inches long and yard stick. Prepared target for jump and reach test.

Description - The player stood holding a small piece of chalk in her fingers on the side of the wall with knees straight and feet flat on the floor. She reached up as far as possible and made a mark on the wall at the top of her reach. The player then crouched, swung her arms and jumped as high as possible and made a second mark on the wall. The distance between the first
FIG. 6 - JUMP AND REACH

WALL

S — SUBJEC T
T — TESTER
R — RECORDER
and second marks on the wall was measured with a yard stick to the nearest centimetres. A practice jump was allowed.

Rules - i) The player was standing flat footed with knees straight in making the first mark on the wall.

   ii) The jump was made on both feet without a hop.

   iii) Two trials were given.

Scoring - The score was the distance between the marks at the top of the reach and the mark at the top of the jump. The yard stick was kept perpendicular to the floor while measuring the distance between marks. The distance was recorded to the nearest cms. The distance of the two jumps was recorded separately. The score was the best of the two trials.

7. Over Arm Pass for Accuracy (Figure 7).

   Objective - To measure the accuracy with which a player could make a single over arm pass at a target.

   Equipment - Standard inflated basketballs, target painted or marked on the wall or one piece of the canvas hung on a smooth wall, chalk, measuring tape. The floor
FIG. 7 - OVER ARM PASS FOR ACCURACY

TARGET

WALL

38" DIA
18" DIA
58" DIA

3 ft.

35 ft.

RESTRARING LINE.
properly measured and marked as in the diagram.

Description - The player with a basketball stood behind a line parallel to, and 35 feet from the target marked or hung on a wall with smooth surface. The player threw the ball with single overarm at the target. The target was circular with three concentric circle separated by one inch wide white or black lines. The inner circle was 18" in diameter, a next circle 38" diameter and the outer circle was 58" in diameter. The bottom of the outer circle was 3-feet above the floor. A practice pass was allowed to all subjects.

Rules - i) The ball could only be held in both hands prior to the throw.

ii) The throw was permitted from behind the line.

iii) The player was allowed to take a step in throwing but both feet were behind the throwing line.

iv) Ten passes were taken.

Scoring - Three points were scored for the balls hitting in the centre circle, two points for balls hitting in the next circle, and one point for balls hitting
in the outer circle. The balls hitting on a line were counted as hitting in the area of higher scoring. The points scored on each throw were recorded as the total score. The maximum possible score was 30 points made on ten passes at the target.

8. Push Pass for Accuracy (Figure 8).

Objective - To measure accuracy with which a player could make a two handed push pass at the target.

Equipment - Standard inflated balls, a target painted or marked on a wall or on a mat, or on a piece of canvas hung on a smooth surface wall. Chalk piece, measuring tape. The floor used was properly measured and marked, as shown in the diagram.

Description - The player with a basketball stood behind a line 25 feet from and parallel to the face of the target marked or hung on a wall. The player used a two handed push pass (chest pass) and tried to hit the centre of the target. The target was the same as used for the over arm pass in Test 7. A practice pass was allowed.

Rules - i) Passes were made with both feet behind the passing line.
FIG 8 - PUSH PASS FOR ACCURACY

WALL

TARGET

18" DIA

38" DIA

58" DIA

3 ft.

25 ft.

RESTRAINING LINE
ii) The two hand push pass, or chest pass was used.

iii) Ten passes were taken.

Scoring - Three points were scored for balls hitting in the centre circle, two points for balls hitting in the next circle and one point was awarded for balls hitting in the outer circle. The ball hitting on the lines were counted as in the next higher area. Points made for each pass were recorded, and that was the total score. The maximum possible score was 30 points made on ten passes at the target.

9. Dribble (Figure 9).

Objective - To measure speed with which a player could dribble a ball around obstacles.

Equipment - Standard inflated basket balls, stop watch, six chairs arranged as shown in the diagram.

Description - The player stood behind the starting line with a ball in her hand and on the signal "go" she started with a dribble on the right side of the first chair and continued to dribble in and out alternately around the remaining five chairs and returned to cross the starting line. The chairs were arranged in a single
S — SUBJECT
T — TIMER/TESTER
R — RECORDER
C — CHAIRS
file in a straight line so that the front of the first chair was 5-feet from the starting line and the following chairs were 8-feet apart, measured from the front of each chair. All chairs had backs toward the starting line. The over all distance from the starting line to the far edge of the sixth chair was 45 feet. A practice trial was allowed.

Rules - i) The ball was dribbled with either hand.

   ii) Legal dribble were permitted.

   iii) The ball was dribbled atleast once as each chair was passed but not dribbled opposite to a chair.

   iv) Each player was allowed two trials.

Scoring - The score was the time in seconds and tenth that a player could take to dribble around between the chairs and back. Time was started on the signal "go" and stopped the instant the player crossed the starting line at the end of the trip. Two trials were timed and recorded. The best time of the two trials was the player's score on the test.
Motor Components

Vertical Jump

Sargent Jump\textsuperscript{2} test was used to assess power (explosive strength). The object of the test was to measure the power of legs in jumping vertically upward.

A smooth wall surface of at least 5-metres height from the floor was chosen. Markings were distinctly made on the wall starting from 2-metres and above the ground level. A measuring tape, scale and several chalk pieces were used.

The subject stood with one side of the wall with heels together and with a piece of chalk in hand. In this position the subject extended her arm upward as high as possible without raising heels and a mark was made on the wall with the chalk. Then the subject was asked to follow the instructions and jump as high as possible. The second mark was made on the wall with the chalk piece of the maximum height of her jump. Two trials were given.

\textsuperscript{2}Johnson and Helson, Practical Measurement for Evaluation in Physical Education, p. 201.
The distance between the normal reach mark (standing reach) and the maximum jump mark was measured to the nearest centimetres as the score. The two trials were given and the best distance was recorded as subjects' score.

8-Minutes Run/Walk Test

To determine the cardio-vascular endurance the subjects were made to run around the 400-metres track. The subjects were assembled behind the starting line of 400-metres race. At the starting signal, they ran and some times walked covering as much distance as possible within 8-minutes. At the signal to stop, the subjects remained where they finished long enough for test administrator to record the distance covered within 8-minutes time.

The maximum distance covered by the subjects in Cooper's 8-minutes Run/Walk Test was recorded to the nearest 25-metres as the cardio-vascular endurance score.

50-Metre Run

The 50-metre dash has been considered to be the

\(^3\text{Ibid.}, \text{p. 143.}\)
best measure of running speed.\textsuperscript{4} The distance shorter than 50-metre might not have measured the speed. Since, 50-metre dash test needs less space and time, it was selected to record the running speed of subjects. Only standing start was permitted. The minimum equipments such as stop watches and a clapper were used.

The subjects started together to have the competitive performance. The subjects were asked to stand on the starting line and to 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 subjects ran as fast as they could and the stop-watches stopped as soon as subjects torso touched the finish line. The time taken by the subjects from starting line to finish line was recorded to the nearest 1/10th of a second as the running speed score.

\textit{4x10 Meter Shuttle Run}

The purpose of Shuttle Run\textsuperscript{5} was to measure the

\begin{itemize}
\item \textsuperscript{4} \textit{Ibid.}, p. 251
\item \textsuperscript{5} \textit{Ibid.}, 215.
\end{itemize}
agility of the performer in running and changing direction.

The measuring tape, stop watches and the wooden blocks of 2"x2"x4" size were used in this test.

Each subject was asked to start behind the starting line after the signal "go". The subjects ran from starting line to the blocks which were placed at a distance of 10 metres from starting line and picked one of the blocks, returned to the starting line and placed the block behind the line. The same process was repeated with the second block. Two trials were permitted for each subject.

The score for each subject was the time taken to complete the distance of 4x10 metres shuttle run measured in the nearest 1/10th of a second. Two trials were given, the best out of two recorded times was taken as subject's score.

Psychological Variables

Extro-Introversion, Neuroticism

The Eysenck Personality Inventory (EPI) questionnaire test was administered to the subject. This test
was used to measure two pervasive and relatively independent dimensions of Neuroticism Stability and Extroversion-Introversion as identified by Eysenck. Each of the two dimensions were measured by means of 48 questions. The test time was approximately 15 minutes.

Statistical Techniques Employed for Analysis

The relationship of motor abilities to basketball playing ability and motor abilities to psychological variables was established by calculating Zero-order correlation, and relative contribution of a single motor or psychological variable to basketball playing ability by eliminating the effect of one or the other was found through partial correlation. The combined effect or contribution of motor and psychological variables considered separately to basketball playing ability was obtained through multiple correlation.

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