CHAPTER III

PROCEDURE
In this chapter the source of data, collection of data, equipments used, procedure or testing programme in selected physical fitness items and method of taking specific physical fitness data have been described.

Construction of specific physical fitness tests for soccer players represents one of the most difficult tasks the trainer has to perform, but without these training, evaluation and measurements in soccer cannot realise its fullest potential in a purposeful manner. Till present time conventional tests of motor fitness and physical fitness and other test batteries were mostly used in order to evaluate the status of physical fitness of fully trained and the least trained soccer players, and same tools were being used to measure the physical status of the players of other games, without realising the specific requirements for their different games which was quite unscientific.

The ultimate aim of the present study was to provide specific tests, having the foundation of the doctrine of specificity which may measure and evaluate the physical fitness of soccer players.
In order to select the test items every possible care has been employed. Only those test items were taken which closely evaluate the required physical fitness characteristics of the soccer players. Researcher himself a soccer player followed the personal observation at the very first step for the game of soccer with specific purpose. It was observed that game of soccer being basically aerobic activity and endurance training occupies a paramount role in polishing and inculcating the better abilities. The duration of the match and extra times in the game of soccer required a high class aerobic fitness. The energy transportation mechanism that is cardio-respiratory function should be very efficient which could meet the demands of the prolonged working of the muscles involved in constant movements like running, heading etc. in the soccer game.

Players in the game of soccer require sprinting speed. The movements of soccer player are quite rapid and quick. However, these running sprints are confined from 5 to 10 yards. Sprinting movements involved in soccer take quick start and sudden stop with frequent changing of direction. They carry the characteristics of agility movements.

Agility and flexibility have vital importance.
Flexible and agile soccer player would have upper hand over rigid and less flexible player.

Strength plays a paramount role in the physical fitness status. Powerful kick and the power of legs at the time of jumping for heading, involved muscles had to generate the force which is definitely the net result of power. Well developed muscles of the abdomin and back were vital for the quick recovery after kicking and again receiving the rebound ball backwardly.

The researcher went through various texts, journals and other literature on physical fitness and tests and measurement in physical education and sports and various research reports etc. apart from personal observation.

During the North Zone Inter University Football Championship in the month of October, 1985, the researcher had an opportunity to observe the matches played at Punjab Agricultural University Campus, Ludhiana with specific purpose. The opinion over the possible specific physical fitness components was taken during this championship from soccer experts, coaches and other trainers who were attending this
championship. Again the All India Inter Zonal matches were observed and the expert opinion of the coaches of Inter Zonal teams was taken over the specific physical fitness components. After the systematic and prolonged analysis with the help of experts, the researcher was able to enlist few items which could approximately measure the specific fitness of soccer players. The utility and face value of each tentative test item was discussed with these coaches in order to establish face validity of each item.

3.01 LIST OF TEST ITEMS:
1. Kicking for distance.
2. Jump and Reach.
3. Half Squat Jumps (forward direction)
4. Heading the hanging ball.
5. Two hands over head Football Throw
6. Pull ups.
7. 20 yards dash.
8. 30 yards dash.
9. 50 yards dash.
10. W formation run.
11. Pole to pole run.
12. Dodgerun with the ball.
15. Leg Reach.
16. Trunk flexion.
17. Trunk extension.
18. Age.
19. Height.
20. Weight.

3.02 TEST ITEMS AND THEIR FACE VALUE

KICKING FOR DISTANCE:

Soccer is a game of kicking the ball. In the playing situation the player kicks the ball every time in order to cover maximum distance. A test with same type of movement and almost with the same intensity could only measure the characteristics of the player. Face value of this test predicts to meet these requirements. Keeping this in view the test has been included in the proposed test items.

JUMP AND REACH:

In the game of soccer, ball is sent above head height many times and player is expected to reach the ball up in the air. This type of action requires explosive power of the legs. Characteristics of the test item closely resemble the game. The test has the face validity to measure the jump and reach ability of the soccer player.
HALF SQUAT JUMP (Forward direction)

Often in the game of soccer come when a player performs jumping like actions time and again. Strength in the legs only makes this action possible. Therefore, this test has its value and justification for being included in the proposed test items.

HEADING THE HANGING BALL

Heading the ball is quite common in the game of soccer. Without the strength of the neck region muscles it is not possible to perform this action. The movements of the test item coincides with the movements in the game situation. Thus this test carries the face value. That is why this item got place among the proposed test items.

TWO HANDS OVER HEAD FOOTBALL THROW:

Every time when ball goes out of the field, throwing action with the ball is done. Throwing action requires the strength of the muscles of the shoulder region and explosive arms power generates the maximum force to throw the ball farther. This test item exactly resembles throwing action. Therefore, the test has its face value and therefore, it was included among the test items.
**PULL UPS:**

Keeping in view the importance of the fair charge in the game which requires strength of the shoulders, the test item 'Pull Ups' has its face value and justification for being included in the proposed test items.

**20 YARDS DASH**

Often in the game of soccer, players run 20 yards in order to attempt a tackle with full acceleration. Keeping in view the face validity of the 20 yards dash in soccer, this test was included among the proposed test items.

**30 YARDS DASH**

Players usually have small quick and sudden sprints to have the possession of the ball. This distance resembles the sprints in the game undertaken. Thus this test carries the face value and that is why the test '30 yards dash' got place among the proposed test items.

**50 YARDS DASH**

Soccer player never runs more than 50 yards at a stretch with full speed. Considering this fact there is every justification to include the test which may measure the maximum upper limit in sprinting.
So, '50 yards' dash item was included in the list of proposed test.

**W FORMATION RUN:**

Game of soccer requires stamina, endurance and speed endurance. Players usually run in different directions. The running in W formation run resembles the running in the actual game situation. Thus the test carries face value and that was the reason why this test got place among the proposed test items.

**POLE TO POLE RUN**

It was analysed that a soccer player usually covers 1500 yards running in a game. Also in drawn matches the game makes the player run from one pole to another. Only those players can meet this type of situation who are having top class cardio-respiratory fitness. Pace value of this test predicts to meet these requirements. Thus the test 'Pole to Pole Run' has every justification to be included in the list of items of the proposed test.

**DODGE RUN WITH THE BALL:**

An agile player has an upper hand in the game because an agile player can dodge better. Dribbling is mainly meant progressing with the ball and dodging
is quite common in soccer. The movements in the Dodge run with the ball resemble game dribbling and dodging. Face value of this test predicts to meet the requirements. That is the reason why that this test was included among the list items.

GAME AGILITY

In soccer a player has to make sideward, forward and backward movements. These movements are quite fast and he has to change direction frequently. The test 'game agility' is needed in evaluating the fitness characteristics of the soccer player which facilitate him to do these movements efficiently. Keeping in view these movements this test has been included in the list of proposed test items.

SHUTTLE RUN:

Soccer is a game which requires sudden change of directions. These actions are quite common in soccer. The test 'shuttle run' is having face value since the movements in the test are identical with the game situations. That was the reason why the test got place in the proposed test items.

LEG REACH:

Often in the game of soccer players generally have
to stretch to their full capacity in order to meet the ball. The stretching movement in the test resembles the movement which player often performs during game situations. The test has the face validity to measure leg stretching ability of the soccer player.

TRUNK EXTENSION

At the time of heading and throwing in the game of soccer players have to do movement of trunk extension. This type of movement resembles the movement present in the trunk extension test. Therefore, this test has its value and justification for being included in the proposed test items.

TRUNK FLEXION

This type of movement can also be seen during the heading situations and at the time of fair charge. Therefore, there was every justification to include this test among the list of the proposed items of the test.

AGE

Age plays a vital role in the game. For the purpose of proposed test items the chronological age was given due importance.
WEIGHT

Weight of a soccer player plays an important role in the performance. Excess body fat disfigures the body and hinders the quick movements. Many other components of fitness are influenced by this component. This was the reason why weight has been included among the proposed test items.

HEIGHT:

Height is a vital component for fitness. Taller player always remains at advantage while meeting the ball in the air. A tall goal keeper can easily hold the ball in the air before others try to attempt heading movement. Therefore, height presents some face value for its inclusion as one of the test items.

3.03 EQUIPMENT USED:

1. Steel Tape
2. Weighing machine.
3. Stop watch.
4. Footrulers.
5. Footballs
6. 20" scale for measuring flexibility.

3.04 INSTRUMENT RELIABILITY

A stop watch, foot rulers, measuring tape and footballs, weighing machine etc. used in this study were
of fine quality. A stop watch which indicated 1/10th of second was used and that was from Ellora Industries, Delhi. Measuring tape was purchased from National Tape Co., Ludhiana a few days before the commencement of this project. Larks weighing machine was used to measure the weight of the players.

All these instruments used in study were considered quite accurate and reliable.

3.05 Administration of the Test and Collection of Data:

The data was collected by administering the tests for the chosen test items in two phases:

- First phase to establish validity of the test.
- Second phase to establish the norms.

In the first phase all the 20 proposed test items were administered and data was collected. In the second phase data was collected in order to establish norms for the specific physical fitness of soccer players.

3.06 Collection of Data for the First Phase of the Study

The investigator explored the possibilities of selecting the university teams as well as the players. He personally met the coaches and other persons concerned seeking the permission and help to conduct the present
investigation. Out of all the participating universities in the North Zone Inter University Soccer Tournament the following teams and players were approached. Panjab University Chandigarh, GNDU Amritsar, Punjabi University, Patiala, Punjab Agricultural University, Ludhiana, Haryana Agricultural University, Hissar, Delhi University, Himachal Pradesh University, Simla, M.D.University, Rohtak, Kurukshetra University, Kurukshetra, J & K University, Srinagar, Aligarh Muslim University, Aligarh. The players of these universities and coaches readily consented and were kind enough to make special arrangements for the conduct of tests and granted permission to use the existing facilities and equipment.

Before the commencement of testing programme the investigator had collected all the subjects i.e. the players of the concerned university and briefed them on the modalities, the aim and objectives of present investigation.

3.07 SUBJECTS

The investigator randomly selected the universities. The players of these universities were selected as subject for the present study one by one. The subjects of these universities ranged in age from 18 to 25 years as per
the record available with them. The subjects were college students who had represented their respective universities.

Though the testing programme was started with the whole of the university team but a few players of one university dropped out on their own during the period of data collection.

For the purpose of the present investigation the number of subjects that constituted the various university soccer teams consisted of 100 subjects for the first phase.

3.08 PROCEDURE FOR COLLECTION OF DATA

At the beginning of the collection of data for the first phase the investigator gathered the subjects of one university at one time in a central place within the soccer field and explained to them the purpose of the present investigation and demonstrated before them the various tests so that subjects would form for themselves a mental picture of the various tests they were going to take. Questions on the part of subjects were allowed and then doubts and apprehensions removed.
Fig. 3.1 KICKING FOR DISTANCE
KICKING FOR DISTANCE:

FIGURE 3.1

EQUIPMENT AND SUPPLIES: Football balls, measuring tape, lime and 6 markers.

GROUND MARKING: On the ground restraining line was marked with lime.

DESCRIPTION: The subject was required to stand one step behind the restraining line where the ball was placed. At his own convenience the subject took one step and had a place kick. The Marker on the other side had marked the place of drop where the ball touched the ground with number 1. Similarly the subject was asked to take 3 place kicks with the Right foot and after that the subject was asked to take another three place kicks with the left foot. Thus the subject was required to take total six place kicks.

SCORING: First of all the distances covered in place kicks were measured in feet. Thus 6 readings were taken. Mean of all the 6 place kicks was taken as a final score.

IMPROPER PROCEDURE:
1. No subject was allowed to take place kicks without proper football uniform.
Fig. 3.2  JUMP AND REACH
2. No one was allowed to take more than one step before the execution of kick.

3. No one was allowed to take this test without proper soccer playing kit.

**JUMP AND REACH:**

**FIGURE 3.2**

**EQUIPMENT:** A yardstick, pieces of chalk and smooth wall surface of at least 12 feet from the floor. The test was performed in full playing kit of soccer game.

**MARKING:** A measuring scale was drawn on the wall starting from five feet above the floor and continued up to two feet in inch units.

**DESCRIPTION:** The subject was asked to stand with face toward a wall, keeping heels together and holding a piece of chalk in his hand nearest to the wall. Keeping the heels on the floor, he was asked to reach upward as high as possible and make a mark on the wall. The subject was then asked to jump as high as possible and to make another mark at the height of his jump. The subject was allowed to have slight practice before the actual test.

**SCORING:** The number of inches between the reach and jump marks were measured exactly as far as possible. Three trials were allowed and the best trial was recorded as the score.
Fig. 3.3
FORWARD DIRECTION
HALF SQUAT JUMPS

DISTANCE COVERED IN 20 SECONDS
IMPROPER PROCEDURE

1. A double jump or a crow hop was not allowed upon take off.

2. Chalk was not allowed to be held beyond finger tips.

HALF SQUAT JUMPS (forward direction):

FIGURE 3.3

EQUIPMENT AND SUPPLIES: Measuring tape, Ground lime.

The players were in full soccer playing kit.

GROUND MARKING: A straight line was drawn with lime and on the one end of this line restraining line was marked.

DESCRIPTION: The subject was asked to stand behind the restraining line. On the signal 'Go' he started jumping after taking half squat down in the forward direction extending the legs. Every time he was asked to do the same action till 20 seconds duration.

SCORING: The distance covered by taking half squat jumps (forward direction) was measured in feet as score.

IMPROPER PROCEDURE:

No subject was allowed to move further unless he took half squat down.
Fig.3-4 HEADING THE HANGING BALL

DISTANCE TO BE MEASURED
HEADING THE HANGING BALL

FIGURE 3.4

EQUIPMENT AND SUPPLIES: Three well inflated soccer balls, a measuring tape, three markers, lime and thread were used in this test. The players were in full playing uniform for soccer game.

GROUND MARKING: On the ground a restraining line was marked with lime.

DESCRIPTION: The Tester was required to hold the last end of the string in his hand perpendicular to the restraining line in such a way that ball remained at the head level of the subject. For this purpose the tester was standing on the chair. The subject standing behind the restraining line with a backward swing and a forceful forward movement of the neck executed a heading motion with the ball.

At the very moment the ball came in contact with the head of the subject, the tester released the string and ball made a forward movement.

In this way three chances were given.

SCORING: The distance covered was measured in feet and only the best of three chances was taken for the purpose of scoring. If ball was not released simultaneously to the tester another chance was given to the subject.
Fig. 3.5
TWO HANDS FOOTBALL THROW

DISTANCE TO BE MEASURED
IMPROPER PROCEDURE

The subject was not required to come running to the ball.

TWO HANDS FOOTBALL THROW:

FIGURE 3.5

EQUIPMENT AND SUPPLIES: Football, measuring tape, marking lime, the players with playing kit.

GROUND MARKING: On a football ground restraining line was marked.

DESCRIPTION: The subject was asked to hold the ball on his both hands, fingers well spread behind the ball, thumbs, pointing toward each other behind the ball and to stand behind the throw line (restraining line) keeping one foot forward and other slightly backward but he was allowed to keep both the feet parallel if he liked so. He was instructed to take the ball over his head backward and then with the force of both the hands to throw the ball forward. The contact of the feet was required to remain with the ground at the time of throw. He was given three chances.

SCORING: Distance covered in the best throw was measured in feet as score.

IMPROPER PROCEDURE

No body was allowed to throw the ball with the
Fig. 3.6 PULL-UP
force of one hand alone. His distance was not measured but he was given another chance.

PULL UPS:

FIGURE 3.6

EQUIPMENT: A chair, a horizontal bar raised to a height so that all subjects may hang with their feet off the floor (In the absence of horizontal bar, poles preferably (Hockey ground) were used. The players were in full soccer playing kit.

DESCRIPTION:

The subject was asked to step up on the chair and take a firm grasp of the horizontal bar, palms facing away from face. The moment he assumed a straight-arm-hang, the chair was removed. The subject was instructed to perform pulls upward until the chin was above the bar.

SCORING: Number of the times when the subject completed full pulls was counted as score.

IMPROPER PROCEDURE:

1. Subjects were not allowed to lift legs or take swing action while going upward.

2. Failure to return to dead hang (elbows straight) was not considered valid count.

3. Count was not taken when the chin of the subject was not raised above the bar.
Fig. 3.7  20, 30 & 50 YARDS DASHES
20 YARDS DASH:

FIGURE 3.7

EQUIPMENT: Two stop watches with a split second timer. Players in full soccer playing kit.

GROUND MARKING: A lane 4 feet wide and 50 yards long was marked on the football ground and first finish line was marked at the distance of 20 yards, the second finish line at 30 yards and third finish line at 50 yards away from the starting line.

DESCRIPTION: The subject was asked to stand on the starting line. The commands, "Are you ready?" and "Go" were given. At the command "go", the starter dropped his arm and the timer at the finish line started taking the time. The subject ran across the finish line as fast as it was possible.

SCORING: The time taken by the runner from the starting line till he crossed the finish line was recorded to the nearest tenth of a second.

30 YARDS DASH:

All the directions issued and the procedure followed for 20 yards dash were also followed for the test of 30 yards dash.
Fig. 3.8  W. FORMATION RUN

STARTING

FINISH

PENALTY SPOT
50 YARDS DASH:

All the directions issued and the procedure followed for 20 and 30 yards dashes were also followed for the test of 50 yards dash.

FORMATION RUN

FIGURE 3.8

EQUIPMENT AND SUPPLIES: A stop watch, 5 blocks or chairs, lime for marking 18 yards area of soccer ground, measuring tape. Players in full playing kit.

GROUND MARKING: 18 yards area was marked on the soccer ground and 5 chairs were placed as shown in fig. (3.8) Number one chair was at the joining point of the goal line and 18 yards area line. The second chair was placed at the front line of 18 yards area at a distance of 44 feet from one end of the area. The entire front line was divided into three equal parts of 44 feet. The third chair was placed on the penalty spot i.e. 12 yards away from the goal line. The fourth chair was placed 44 feet away from the second chair on the front line of the 18 yards area. The fifth chair was placed at the other joining point of the goal line and the 18 yard area line.

DESCRIPTION: The subject was instructed to start running on the command 'Go' from chair one to the second and over the second to the third and over the third to the
Fig. 3.9  POLE TO POLE RUN

Pole

120 Yards

120 Yards

ole

Pole
4th and over the fourth to the fifth. After going over the fifth, the subject reached the first chair again. The subject was asked to complete six such rounds.

SCORING: The time taken for 6 rounds was recorded as score in seconds.

POLE TO POLE RUN:

FIGURE: 3.9

EQUIPMENT: A stop watch, soccer ground, measuring tape, chair or flag. Players in soccer playing kit.

GROUND MARKING Where a soccer ground having standard dimensions i.e. length 120 yards was available, there was no need of marking the ground, but when a ground with standard dimensions was not available, length from one pole to the other was measured and in order to have the length of 120 yards, a chair was placed in place of the second pole at a distance of 120 yards from the 1st. pole.

DESCRIPTION

It was possible to have as many as four runners at a time, but the researcher had taken only one subject at a time. On the command 'Go', the subject started at a time. On the command 'Go', the subject started moving from the starting line situated at one pole in line with the goal line and returned after going around the opposite
Fig. 3-10 DODGE RUN WITH THE BALL
pole situated at a distance of 120 yards. Thus the subject completed one touch of the starting line. The subject was required to run around the pole covering such touches. The subject was told that he might walk whenever he felt it necessary. Every time, the subject touched the starting line, he was told the number of touches completed.

**SCORING:** The time was recorded in minutes and seconds and, later on it was converted into seconds for touches the subject had gone through.

**DODGE RUN WITH THE BALL:**

**FIGURE 3.10**

**EQUIPMENT:** Stop watch, 6 chairs of flags, football, lime, measuring tape. Players in soccer playing kit.

**GROUND MARKING:** A starting line was marked with lime and, at a distance of six feet from the starting line, two flags were installed with a distance of six feet between them. At another distance of 6 feet, two similar flags were planted and still farther, another pair of flags was installed at the distance of six feet, as shown in fig. (310).

**DESCRIPTION:** The subject was asked to stand at the starting line with a ball and on the signal 'Go', the
Fig. 3.11  GAME AGILITY

STARTING LINE

12 FEET SIDE STEP

12 FEET SIDE STEP

"A" POLE

20 FEET BACK PEDALLING TWICE

"B" POLE

20 FEET BACK PEDALLING TWICE

"C" POLE

20 FEET BACK PEDALLING TWICE

"D" POLE

12 FEET SIDE STEP
subject started dribbling the ball around the flag as per the path that is indicated in the diagram. Thus the subject was asked to complete one round of the flags.

**SCORING:** The number of seconds taken by the subject were recorded up to the 1/10 of the second level.

**IMPROPER PROCEDURE:**

If a subject did not follow the right path or missed a flag, his time was not taken. Another chance was given after a rest of 2 minutes.

**GAME AGILITY:**

**FIGURE: 3.11**

**EQUIPMENT AND SUPPLIES:** Goal posts, two chairs, stop watch, measuring tape and lime. Players in soccer playing kit.

**GROUND MARKING:** Two straight lines were drawn just perpendicular to the goal line at points where poles were installed. Centre point was measured in between the poles and was at a distance of 12 feet from each pole. A chair was placed there, and from this central point towards the penalty spot another chair was placed at this point, as shown in fig. (3:11).

**DESCRIPTION:** The subject was asked to line up with a back to the starting line and on the signal 'ready-go'
he performed the side step movement from point A to point B and went round the chair placed at point B. The subject back paddled from point B to point C and passed over the chair placed at point C. From point C, the subject started fast sprint towards point B and again, after going round the chair placed at point B the subject started back paddle movement upto point C. From point C again the subject sprinted upto point B. After reaching point B, the subject performed side step movement upto point D which was the finish line.

The subjects were given one trial before the actual test for practice purpose.

SCORING: The best of the two trials was recorded as the score to the nearest 1/10th of the second.

IMPROPER PROCEDURE:
1. While performing the side step, the cross steps were not allowed.
2. While back paddling, the subjects were not allowed to turn face towards point C.
3. If the subject followed the incorrect procedure, score was not counted, but he was given another chance.
Fig.312 SHUTTLE RUN

STARTING LINE

TOUCH LINE

30 Feet
SHUTTLE RUN

FIGURE 3.12

EQUIPMENT: Marking Lime, Stop-watch and two blocks of wood (2"x2"x4"").

DESCRIPTION: The performer started from behind the starting line on the signal 'Go' and ran to the blocks, picked up one, returned to the starting line, and placed the block behind the line; he then repeated the process with the second block.

SCORING: The score for each performer was the time taken (to the nearest tenth of a second) to complete the course.

ADDITIONAL POINTERS:

(a) Stress was laid on the importance of running as hard as possible across the finish line with the second block.

(b) Marking lime was used to designate the starting and finishing line.

(c) When blocks were not used, the performer was instructed to touch a point beyond the lines. This procedure was adopted to explain that blocks might get tumbled, dropped, kicked or thrown.

(d) This test was performed wearing the complete soccer playing kit.
LEG REACH

DISTANCE TO BE MEASURED
LEG REACH:

FIGURE 3.13

EQUIPMENT: A piece of chalk, measuring tape, lime, players in full soccer playing kit.

MARKING: A line was marked with the lime or chalk on the floor.

DESCRIPTION: Subject was asked to stand at the line marked, keeping toes and feet touching the line. He lunged extending his one leg forward to the maximum extent without losing balance. A line was drawn by the tester with a chalk near the edge of the heal of front foot. Then the subject returned to the standing position.

SCORING: The distance between the two lines was measured nearest to the 1/2 of an inch.

IMPROPER PROCEDURE:

1. The foot other than the one lunging was not allowed to cross the line. The subject committing this mistake was given another chance.

2. When the subject lost balance while returning, the trial was not considered and another chance was given.

TRUNK FLEXION:

FIGURE 3.14

EQUIPMENT: One bench, a 20 inch scale marked in quarter inch units. Players in full playing kit.
Fig. 3.14

TRUNK FLEXTION
APPARATUS ARRANGEMENT: A 20-inch scale was attached to the bench in such a way that half the scale was above and half below the level of the bench. Ten was marked on the scale at the bench level.

DESCRIPTION: The subject was asked to stand on the bench with legs fully stretched in such a way that he was able to bend forward keeping his legs straight. He was instructed to extend (stretch) his arms and hands downward as far as possible and hold for a count of three against the ruler.

SCORING: Distance covered by the subject was measured to the nearest quarter of an inch on the scale.

IMPROPER PROCEDURES:
1. Bend at the knees was not allowed.
2. Not holding the flexed position for the count of three was incorrect.

TRUNK EXTENSION:

FIGURE: 3.15

EQUIPMENT: Strap, Ruler, Players in full playing kit.

DESCRIPTION: The subject stood with the front of his
Fig. 315 TRUNK EXTENSION
body against a fence. A strap was placed around the subject's buttocks and attached to the fence so that his hips were held firmly against the fence. The subject then leaned backward as far as possible. This test was proposed to measure how far the subject could hyperextend his spine, or how far he could bend backward.

**SCORING:** The score was the horizontal distance from the fence to the subject's chin. The distance measured to the 1/2 of an inch was recorded.

**AGE:**
Chronological age was recorded in calendar months and years that is 18 years of age to 25 from their personal documents.

**WEIGHT:**
The subjects wore socks, shorts and jersey but without shoes. The weight was carried out on the spring weighing machine. Weight was recorded nearest to the 1/10 of a kilogram.

**HEIGHT:**
A scale in feet and inches was drawn on a plain cemented wall with the help of another person using National standard measuring tape. The height was
measured without the shoes. The subject was asked to stand along the wall while facing his back to the wall in erect and attention position. Tester stood in front of the subject with a wooden scale in his hand facing the wall. The scale was put on the vertex of the subject so that end of the scale touched the wall. Proper care was taken that scale was placed in a proper manner that it was parallel to the ground. The height was recorded in feet and nearest to the 1/4 of an inch.

3.09 COLLECTION OF DATA FOR THE SECOND PHASE OF THE STUDY

Work described in the first phase of the study identified the tests most likely to give a comprehensive coverage of important specific physical fitness factors. We still needed standards for evaluating the performance of Soccer players on the separate tests. The present second phase of the study is concerned with this next logical step in this series. Tests found to be most reliable and diagnostic in the previous work were assembled into "battery" and administered to Soccer players representing different universities of the North Zone.

TESTS INCLUDED IN THE SECOND PHASE OF THE STUDY.

<table>
<thead>
<tr>
<th>NAME OF THE TEST</th>
<th>PRIMARY FACTORS MEASURED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Kicking for Distance</td>
<td>Leg explosiveness and Trunk Flexibility.</td>
</tr>
<tr>
<td>2. Dodge Running with the ball</td>
<td>Soccer agility.</td>
</tr>
</tbody>
</table>
3. Leg Reach
4. 50 yards Dash
5. Two hands Football Throw
6. Pole to Pole Run

THE STUDY SAMPLE

An attempt was made to include all the universities of the North Zone which were participating in the North Zone Inter-University Soccer Tournament. The Table lists the players of Universities which participated in the study. No attempt was made to include University players from other zones since a probability sample was not possible because of the limited resources of the researcher. With these limitations in mind, the investigator felt that the norms developed were most applicable to the majority of soccer players in the North Zone Universities. This does not preclude the applicability of these norms to the players of other zones as long as the base-lines for these norms are clearly understood.

UNIVERSITIES PARTICIPATING IN THE STUDY:

1. Allahabad University, Allahabad.
2. Aligarh Muslim University, Aligarh.
3. Banaras Hindu University, Banaras.
4. Bhundel Khand University, Jhansi.
5. Delhi University, Delhi.
The tests were administered to 500 soccer players with focus on players between 18 to 25 years of age. Most of the players tested were in the age group of 19-24 years as players of 18 and 25 years of age were negligible in number.

The tests were administered by the researcher himself at Punjab Agricultural University, Ludhiana at
the time of North Zone Inter University Soccer tournament in the year 1985-86. The tests were also administered from time to time to players at different universities in the course of the study. Before the commencement of the testing programme, the investigator had briefed the individuals and players in groups on the modalities, aims and objectives of the present investigation.

During the second phase of the investigation which was conducted to establish norms for specific physical fitness of soccer players, 500 players drawn from different universities of the North Zone were administered the tests.

3.10 STATISTICAL PROCEDURE

This part of the procedure dwells upon the statistical procedures used to develop specific physical fitness tests from the data collected on 100 soccer players.

The design of the study was to construct specific physical fitness tests and then develop norms for university representing soccer players of the age group 18 to 25 years.
Factor analysis technique was used as tool to select test items out of 20 variables best suited to measure physical fitness of soccer players. These test items would serve as a comprehensive specific Physical fitness test for soccer players.

The method of Principal Components analysis, with latent root greater than one method of factor analysis was selected out of five factor-analysis methods i.e. principal components analysis, principal factor analysis, age analysis, alpha factor analysis and Reo's Canonical factor method. Though each of these factor analysis procedures has the same basic objectives yet many of the earlier researchers who have developed fitness test batteries, have followed the principal axis of rotation method.

The correlation matrix of inter correlation among the 20 variables was obtained by applying the Pearson Product Moment Formula. The data were then subjected to factor analysis utilizing the principal axis form of preliminary rotation as suggested by H.H.Harnian (1960), to obtain unrotated and rotated factors. The rotated matrix was selected for interpretation as recommended by the Comery (1973). For rotated
factors Kaisers Varimax Criterion (1958) was used. All statistical analysis was done on Edlin Computer at the Panjab University, Chandigarh Computer Centre.

The factors were identified after obtaining means and standard deviations for 20 variables. The rotated factor loading was obtained from Orthogonal rotation. The variables having more than 4 loadings on the factors were picked up to be included in the factor for its recognition and subsequent interpretation of the variables in the factor.

Seven factor was extracted, interpreted and given names. These seven factors accounted for 80.99 per cent of the total variance.

DEVELOPMENT OF TEST BATTERY

Utilizing the factor loadings of variables on each extracted factor in the rotated factor solution as the criterion coefficient, multiple regression technique was utilized to select a test item for test battery. In all six test items, one from each factor except the seventh factor, were selected to represent the test battery.
VALIDITY OF THE TEST ITEMS:

Face validity, construct validity and comparison validity were established for the test items which were chosen to form a test battery to serve as the criterion to measure specific physical fitness of soccer players.

FACE VALIDITY:

All the 20 preliminary test items were selected on the basis of their face validity on the recommendation of the various coaches who suggested that these test items had been true measures of Specific Physical Fitness of Soccer players.

CONSTRUCT VALIDITY:

Factor analysis technique was used as suggested by Flishman (1963) and Jaeger (1983).

Jaeger advocated, "Factor analysis is used extensively in research and evaluation studies that involve the development of new measurement instrument. It is particularly useful as tool for examining the validity of tests.

COMPARISON VALIDITY:

The third type of comparison validity was
established by the significant difference comparing of AAHPER Youth Fitness test on Soccer and non soccer players. Later on specific physical fitness test for soccer players developed by the researcher was applied to the same two groups. 'T' test was applied on the data collected to find out the significant difference between two sets of scores. This procedure also served to establish the specificity of the test items.

RELIABILITY:

Test and re-test on the same population by the same tester were followed to find out the correlation between the two test samples to establish the reliability of the test items.

OBJECTIVITY

Test and retest by two testers on the sample were followed to establish the objectivity of the test items.

DEVELOPMENT OF NORMS:

The final test consisting of six test items developed through factor analysis in the first phase of the study was applied on 500 soccer players ranging between 18 to 25 years of age who participated at least in the Inter University Competitions. The raw scores were grouped according to age and then percentile scales were developed.