

CHAPTER III

METHODOLOGY

In this chapter, the sources and selection of the subjects, selection of variables, experimental design, pilot study, training schedule, tester competency, subject reliability, test administration and statistical analysis have been explained.

3.1 SELECTION OF SUBJECTS

The purpose of the study was to find out the effect of proprioceptive neuromuscular facilitation (PNF) exercises, high intensity plyometric(HIP) and combined exercises(PNF&HIP) on selected motor fitness and skill variables among college level football players. To achieve purpose college level football players who participated at inter-collegiate level competitions were selected from different colleges in Delhi. 80 inter collegiate level football players in the age group of 19 to 23 were randomly selected as subjects for this study. The subjects were randomly divided into four groups, experimental group I proprioceptive neuromuscular facilitation (PNF) exercises, experimental group II high intensity plyometric(HIP), experimental group III proprioceptive neuromuscular facilitation (PNF) and high intensity plyometric(HIP) and control group consisting of 20 in each.

The subjects were oriented for the purpose of the study and all the subjects volunteered to undergo the treatments as the research would further enhance their abilities and contribute for the training methods.

3.2 SELECTION OF THE VARIABLES

The researcher reviewed the various scientific literatures pertaining to PNF exercises, high intensity plyometric exercises on selected motor fitness and skill variables in football from books, journals, and research papers. Taking into consideration the feasibility and availability of instruments the following variables were selected. Within the limitations of the present study, the investigator selected the following variables to achieve the objective of the study:

Dependent Variables

Motor Fitness Variables

1. Speed
2. Agility
3. Flexibility
4. Endurance
5. Explosive power

Skills

1. Kicking
2. Receiving and Pass

3. Dribbling
4. Heading
5. Shooting

Independent Variables

1. Twelve weeks Proprioceptive Neuromuscular Facilitation (PNF) training
2. Twelve weeks High Intensity Plyometric training (HIP)
3. Twelve weeks Combined Training of PNF and HIP

3.3 EXPERIMENTAL DESIGN

The study was formulated as a true random group design consisting of a pre-test and post test. The subjects (N=80) were randomly assigned to four equal groups of twenty. The selected subjects were divided into four groups randomly. Experimental Group I was considered as PNF exercises group, experimental group II was considered as high intensity plyometric training, experimental group III was considered as combined group to undergo both PNF exercises and high intensity plyometric exercises and control group was not involved in any special treatment. Pre test was conducted for experimental Groups I, II, III and the control group on all the ten variables 5 motor fitness variables and 5 skill variables selected for the study, namely, speed, agility, flexibility, endurance, explosive power, kicking, receiving and passing, dribbling, heading and shooting. Experimental groups underwent their

respective training for 12 weeks. Immediately after the completion of 12 weeks training, all the subjects were measured of their post test scores on the selected criterion variables. The difference between the initial and final scores was considered the effect of respective treatments. To find out statistical significance of the results obtained, the data were subjected to statistical treatment using ANCOVA. In all cases 0.05 level was fixed to test the significance of the study.

3.4 PILOT STUDY

To ensure the uniformity in the intensity and duration of the experimental training program a pilot study was conducted. Nine students other than the selected subjects were selected and they were divided into three groups of 3 in each. The intensity of the PNF exercises, High intensity plyometric training and combined training were decided by the maximum heart rate method. The method consisted of calculating the working heart rate and target heart rate. The working heart rate was the difference between the maximal heart rate and resting heart rate. The target heart rate was determined as the percentage of working. Experimental research groups I, II and III were given intensity of experimental treatments selected for this study. These intensified training were administered under the strict supervision of the researcher.

Based on the response of the subjects in the pilot study the training schedules for all the three experimental groups were scheduled. The number of

repetitions assigned to each subject was tested and it was found that they were within the reach of the individuals' capacity.

3.5 CRITERION MEASURES

The tests used to assess the selected motor fitness and skill variables and the units of measures are given in Table I

TABLE I

TESTS USED TO ASSESS THE MOTOR FITNESS VARIABLES AND SKILL VARIABLES SELECDTED FOR THIS STUDY

S.No	Variables	Tests	Units of Measure
1	Motor Fitness a. Speed b. Agility c. Flexibility d. Endurance e. Explosive Power	50 M Run 4 x 10 M Shuttle Run Sit and Reach 12 mts run/walk Vertical Jump Test	Seconds Seconds Cms Meters Meters
2	Skill variables a. Kicking b. Receiving & Pass c. Dribbling d. Heading e. Shooting	Long Kick Test Foot Receiving & Pass Zig Zag Dribbling Test Heading to Score Shooting for Accuracy	Points Points Seconds Points Points

3.6 RELIABILITY OF DATA

The reliability of data was ensured by establishing the instrument reliability, testers' competency and subject reliability.

3.6.1 INSTRUMENT RELIABILITY

Stop watches calibrated to 1/100th of a second were used in this study for recording timings and these times were compared with other standard watches in different situations and they were considered reliable. A standard steel tape was used for measuring. , Foot balls and corns are standard ones procured from reliable companies. All the instruments used were standard and therefore their calibrations were accepted accurate enough for the purpose of the study.

3.6.2 TESTER'S COMPETENCY

To ensure that the investigator and his assistants were well versed with the techniques of conducting the tests, the investigator had a number of practice sessions in testing procedure. Reliability of tester's competency was established by the test re-test process. The repeated measurement of individuals on the same test was done to determine reliability at different occasions. It was a univariate not a bivariate situation, it makes sense then to use a univariate statistics like the intraclass correlation coefficient (Baumgartner and Jackson, 1975).

The intraclass correlation coefficient obtained for test-retest data are presented in Table II.

Table II

**INTRA CLASS CORRELATION BETWEEN TEST AND RETEST FOR
TESTER RELIABILITY**

S.No	Variables	Tests	Obtained 'r'
1	Bio Motor Abilities		
	a. Speed	50 M Run	0.92*
	b. Agility	4 x 10 M Shuttle Run	0.91*
	c. Flexibility	Sit and Reach	0.90*
	d. Endurance	12 M Run / Walk	0.89*
	e. Explosive Power	Vertical Jump	0.88*
2	Skill Variables		
	a. Kicking	Long Kick Test	0.84*
	b. Receiving & Passing	Foot Receiving & Pass	0.87*
	c. Dribbling	Zig Zag Dribbling Test	0.82*
	d. Heading	Heading to Score	0.83*
	e. Shooting	Shooting for Accuracy	0.88*

Required table value at 0.01 with 8 degrees of freedom 0.811

* Significant at 0.01 level

3.6.3 SUBJECT RELIABILITY

Prior to the administration of the tests the purpose of the study and the procedures of the test were elucidated in detail to the subjects in order to receive co-operation so as to obtain reliable data from the subjects. The intraclass correlation value of the above test and retest also indicated subject reliability as similar subjects were used under similar conditions by the same tester.

3.7 TRAINING PROTOCOLS

3.7.1 PNF STRETCHING EXERCISES

Experimental group I underwent 12 weeks PNF stretching exercises as follows:

PNF stretching is currently the fastest and most effective way known to increase static-passive flexibility. PNF is an acronym for proprioceptive neuromuscular facilitation. It is not really a type of stretching but is a technique of combining passive stretching and isometric stretching in order to achieve maximum static flexibility. PNF refers to any of several post-isometric relaxation stretching techniques in which a muscle group is passively stretched, then contracts isometrically against resistance while in the stretched position, and then is passively stretched again through the resulting increased range of motion. PNF stretching usually employs the use of a partner to provide resistance against the isometric contraction and then later to passively take the joint through its increased range of motion.

The following were the most common Proprioceptive Neuromuscular Facilitation (PNF) stretching techniques followed in this study.

HOLD RELAX

This technique is also called the contract-relax. The subjects assumed an initial passive stretched position, the muscles were being stretched

isometrically contracted after which the muscles were briefly relaxed and then immediately subjected to a passive stretch which stretched the muscles even further than the initial passive stretch. The final passive stretch was held.

HOLD RELAX SWING

This technique actually involved the use of dynamic or ballistic stretched in conjunction with static and isometric stretched. It was similar to the hold-relax technique except that a dynamic or ballistic stretch was employed in place of the final passive stretch.

SLOW REVERSED HOLD RELAX

Isotonic contraction of the antagonist followed by an isometric contraction of the agonist followed by a relaxation phase.

RHYTHMIC ROTATION

Rhythmic rotation means passive motion in a rhythmic rotation. Supported by full Progressive Range of Motion (PROM) into the direction desired rotation of the body part alternately in both directions in a slow rhythmic manner around a longitudinal axis.

HOLD RELAX CONTRACT

This technique is also called the contract-relax-contract, and the contract-relax-antagonist-contract (or CRAC). It was involved performing two isometric contractions: first of the agonists, then, of the antagonists. The first

part was similar to the hold-relax. Thereafter assuming an initial passive stretch, the stretched muscles were isometrically contracted. Then the muscles were relaxed while its antagonist immediately performed an isometric contraction.

The schedule of PNF stretching for 12 weeks duration is presented in Tables III to VIII.

TABLE III

**TRAINING SCHEDULE FOR PROPRIOCEPTIVE NEUROMUSCULAR
FACILITATION (PNF) STRETCHING TECHNIQUES
FOR I and II WEEK**

Exercises	Holding Duration	Number of Repetitions	Duration of Relaxation
Hold Relax	7 seconds	2	20 seconds
Hold-Relax-Swing	7 seconds	2	20 seconds
Slow Reversed-Hold-Relax	7 seconds	2	20 seconds
Rhythmic Rotation	7 seconds	2	20 seconds
Hold-relax-contract	7 seconds	2	20 seconds

TABLE IV
TRAINING SCHEDULE FOR PROPRIOCEPTIVE NEUROMUSCULAR
FACILITATION (PNF) STRETCHING TECHNIQUES
FOR III and IV WEEK

Exercises	Holding Duration	Number of Repetitions	Duration of Relaxation
Hold Relax	8 seconds	3	20 seconds
Hold-Relax-Swing	8 seconds	3	20 seconds
Slow Reversed-Hold-Relax	8 seconds	3	20 seconds
Rhythmic Rotation	8 seconds	4	20 seconds
Hold-relax-contract	8 seconds	5	20 seconds

TABLE V
TRAINING SCHEDULE FOR PROPRIOCEPTIVE NEUROMUSCULAR
FACILITATION (PNF) STRETCHING TECHNIQUES
FOR V and VI WEEK

Exercises	Holding Duration	Number of Repetitions	Duration of Relaxation
Hold Relax	9 seconds	4	20 seconds
Hold-Relax-Swing	9 seconds	4	20 seconds
Slow Reversed-Hold-Relax	9 seconds	4	20 seconds
Rhythmic Rotation	9 seconds	5	20 seconds
Hold-relax-contract	9 seconds	6	20 seconds

TABLE VI

**TRAINING SCHEDULE FOR PROPRIOCEPTIVE NEUROMUSCULAR
FACILITATION (PNF) STRETCHING TECHNIQUES
FOR VII and VIII WEEK**

Exercises	Holding Duration	Number of Repetitions	Duration of Relaxation
Hold Relax	10 seconds	5	20 seconds
Hold-Relax-Swing	10 seconds	5	20 seconds
Slow Reversed-Hold-Relax	10 seconds	5	20 seconds
Rhythmic Rotation	10 seconds	6	20 seconds
Hold-relax-contract	10 seconds	7	20 seconds

TABLE VII

**TRAINING SCHEDULE FOR PROPRIOCEPTIVE NEUROMUSCULAR
FACILITATION (PNF) STRETCHING TECHNIQUES
FOR IX and X WEEK**

Exercises	Holding Duration	Number of Repetitions	Duration of Relaxation
Hold Relax	11 seconds	6	20 seconds
Hold-Relax-Swing	11 seconds	6	20 seconds
Slow Reversed-Hold-Relax	11 seconds	6	20 seconds
Rhythmic Rotation	11 seconds	7	20 seconds
Hold-relax-contract	11 seconds	8	20 seconds

TABLE VIII

**TRAINING SCHEDULE FOR PROPRIOCEPTIVE NEUROMUSCULAR
FACILITATION (PNF) STRETCHING TECHNIQUES
FOR XI and XII WEEK**

Exercises	Holding Duration	Number of Repetitions	Duration of Relaxation
Hold Relax	12 seconds	7	20 seconds
Hold-Relax-Swing	12 seconds	7	20 seconds
Slow Reversed-Hold-Relax	12 seconds	7	20 seconds
Rhythmic Rotation	12 seconds	8	20 seconds
Hold-relax-contract	12 seconds	9	20 seconds

3.7.2 HIGH INTENSITY PLYOMETRIC EXERCISES

The plyometric training programme was scheduled for six days (Monday to Saturday) per week in the morning between 6.30 a.m. and 7.45 a.m. for twelve weeks.

The plyometric training programme consisted of warm up and stretching for 10 – 15 minutes, selected plyometric exercises and cool down for 5 – 10 minutes.

The initial intensity was fixed at 80 – 85%. The intensity of the exercise was gradually increased, once in every four weeks. The intensity was fixed between 85% and 90% during 4-8 weeks and 90% and 95% during 8-12 weeks.

The subjects were asked to perform 10 repetitions in each exercises and 90 seconds rest was given as the recovery between sets.

The number of sets was gradually increased once in four weeks along with the intensity.

The training was given under the direct supervision of the investigator.

The detailed plyometric training programme and design is given in tables – IX and X respectively.

TABLE IX
SHOWING PLYOMETRIC EXERCISES

S.No	Exercises	Rest Between Sets
1	Squat Jumps	90 Seconds
2	Jump to Box	90 Seconds
3	Lateral Jump to Box	90 Seconds
4	Bounding	90 Seconds
5	Bounding with Rings	90 Seconds
6	Depth Jump	90 Seconds
7	Medicine Ball Chest Pass	90 Seconds
8	Box Drill with rings	90 Seconds
9	Medicine Ball Standing throw	90 Seconds
10	Lateral Hurdle Jump	90 Seconds

TABLE X
SHOWING HIGH INTENSITY PLYOMETRIC TRAINING
PROGRAMME DESIGN

Design	1-4 Week	5 – 8 Week	8 – 12 Week
Intensity	160 foot contacts	200 foot contacts	240 foot contacts
Repetitions	8	8	8
Set	1	2	3
Rest	90 seconds between set	90 seconds between set	90 seconds between set

The description of the plyometric training imparted are detailed below

1. SQUAT JUMPS

1. The subjects were made to stand with feet shoulder-width apart, trunk flexed forward slightly with back straight in a neutral position.

2. Arms were in the ready position with elbows flexed at approximately 90 degrees.

3. In lower body the thighs were kept parallel to the ground and immediately explode upwards vertically and drove the arms up. The squat position was not held before jumping up, the time was kept between dipping down and jumping up to a minimum.

4. Landed on both feet. Rest was given for 1-2 seconds and repeated prior to took off the ankles extended to their maximum range (full plantar

flexion) to ensure proper mechanics.

2. JUMP TO BOX

1. The subjects were made to stand facing box with feet slightly wider than hip-width apart.

2. The lower body was brought into a semi-squat position and immediately jumped up onto the box and did not hold a squat position before jumping up the subject kept the time between dipping down and jumping up to a minimum.

3. Feet were landed softly on the box. Step back down (not jump back down) and repeated.

3. LATERAL JUMP TO BOX

1. The subjects were made to stand side on the box with feet slightly wider than hip-width apart.

2. The lower body was in a semi-squat position and jump up onto the box. The subjects held a squat position before jumping up keep the time between dipping down and jumping up to a minimum.

3. The subjects landed softly on the box. Step was taken back ward (not jump back down) and repeated.

4. BOUNDING

1. The subjects were made to jog into the start of the drill for forward momentum.

2. After a few feet, forcefully pushed off with the left foot and brought the leg forward. At the same time drove the right arm forward.

3. This was repeated with other leg and arm

4. This exercise was an exaggerated running motion focused on foot push-off.

5. BOUNDING WITH RINGS

1. The subjects were made to jog into the start of the drill for forward momentum.

2. After a few feet, forcefully pushed off with the left foot and brought the right leg forward. At same time they swung left arm forward and land into the first ring, which was 3-4 feet out and to the left, with the right foot.

3. This was continued and repeated with other leg and arm into the second ring, which was now 3-4 feet up and to the right.

4. This exercise was an exaggerated running motion focusing on foot push-off.

6. DEPTH JUMPS

1. The subjects were made to stand on box with toes close to the edge, foot was kept at shoulder width apart.

2. Step off (do not jump off) box and landed on both feet. Immediately jumped up as high as possible and reached up with both. The hands towards. The jump was vertical with no horizontal movements.

4. Ground contact time was shortened, Landing was done soft.

Note: Started with a box height of 30 cm (12inches). Intensity was increased by gradually increasing the box height to a maximum of 107 cm (42inches) but this was done only for experienced athletes with a substantial strength training background.

7. MEDICINE BALL CHEST PASS

The subjects were asked to stand in two parallel lines facing each other with sufficient distance to push the medicine ball. Keeping feet together, hands behind medicine ball and elbows out, the subject was asked to step forward and push the ball upwards and towards the partner standing before him. The ball was again pushed back by the subject standing opposite and thus, the chest pass.

8. BOX DRILL WITH RINGS

1. The subjects were made to stand with feet slightly wider than hip-width apart with the body facing the first ring.
2. The subjects hop forward using both feet and landed in first ring.
3. They hop to the left and landed in the ring to the side, jump backward to land in ring behind. Finished by jumping to the right to land in final ring.
4. After rest, it was repeated. Remembered to keep the ground contact time between bounds to a minimum.

9. MEDICINE BALL OVERHEAD THROW

Subjects were asked to place one foot 50 cm behind the other foot, took the ball back, ensure hands were high, shoulders stretched and chest out. Stepped forward and throw the ball to the partner keeping the arms straight.

10, LATERAL HURDLE JUMPS

1. The subjects were made to stand beside an object to be cleared.
2. Knees were brought up and jump vertically but also laterally off ground and over the barrier.
3. The subjects were instructed to land on both the foot and immediately jumped the other direction over barrier.

4. They were instructed not to pause between jumps or sunk down into a squat position.

3.8 ADMINISTRATION OF TESTS

3.8.1 SPEED (50 METERS DASH)

Purpose

The aim of this test was to determine acceleration and speed.

Equipment Required

Measuring tape and stopwatches.

Procedure

The test involved running a single maximum sprint over 50 meters with the time recorded. The subjects were warm up including some practice starts and accelerations. The subject started from a stationary standing position with one foot in front of the other. The front foot was kept behind the start line. Once the subject was ready and motionless, the starter gave the instructions "set" and "go.", The tester provided hints for maximizing speed (such as keeping low, driving hard with the arms and legs) and the subjects were encouraged not to slow down before crossing the finish line.

Scores

Two trials were given and the best time was recorded to the nearest to one tenth of a second. The timing started from the first movement and stopped when the subject's chest crossed the finish line.

3.8.2 AGILITY (SHUTTLE RUN TEST)**Purpose**

The purpose of the test was to measure agility of the subjects.

Equipment Required

Wooden blocks, marker cones, measurement tape and stopwatches.

Procedure

This test required the subject to run back and forth between two parallel lines as fast as possible. On the track draw two parallel lines 10 feet apart from each other, Two blocks of woods were placed behind one of the lines opposite to the start line. The subjects were stood on the line. On the signal "Ready and Go!" was given by the starters. The stop watch was started. The subjects ran to the other line and picked up one wooden block and returned back to the start line and placed the wooden block behind start line. The subjects ran back to pick up the second wooden block. They picked the second block and returned to the start line and ran acrossed the start line. The stop watch was

stopped as soon as the subject crossed the start line. Each time two subjects were tested.

Scoring

Two trails were given and the best time was recorded. The time was recorded to the nearest one tenth of a second.

3.8.3 FLEXIBILITY (Sit and Reach Test)

Purpose

To measure the flexibility of the subjects.

Equipments

Meterstick and measuring steel tape

Procedure

Place the meter stick on the floor and put a 45 cm piece of tape across the 35 cm mark on the meter stick. The tape should secure the meter stick to the floor. The subject sits with the zero end of the meter stick between the legs. The subject heel should almost touch the tape at the 35 cm mark and be about 35 centimeter apart with the legs held straight. The subject bends forward slowly and reaches with parallel hand as far as possible and touches the meter stick. The subject should hold this reach long enough for the distance to be recorded.

Scoring

Perform three trials. The best score recorded in centimeters.

3.8.4 CARDIO RESPIRATORY ENDURANCE (Cooper's 12 Minutes Run or Walk Test)**Purpose**

To measure the cardio respiratory endurance.

Equipment

Whistle, stopwatch and 400 meters track.

Procedure

Subjects assemble behind the starting line .at the starting signal, they, run or walk as far as possible with in the 12 minutes time limit. An experienced pacer should accompany performers around the running area during the actual test. At the signal 'to stop 'performers should remain where they finished long enough for test administrators to record the distance covered. Ample time should be given for stretching and warm-up as well as cool down.

Scoring

The distance in meters covered in 12 minutes.

3.8.5 EXPLOSIVE POWER (VERTICAL JUMP TEST (SARGENT JUMP))

Purpose

The aim of this test was to determine the leg explosive power.

Equipment Required

Measuring tape, score sheets and jump mat.

Procedure

The subject stood side of a wall and reached up fully with the hand closer to the wall. Keeping the feet together flat on the ground, the point of the fingertips were marked or recorded. This was called as standing reach height. The subject stood away from the wall and leaped vertically as high as possible using both arms and legs to assist in projecting the body upwards. The jumping technique was a counter movement. The subject touched the wall at the highest point of the jump with his middle finger. The mark was noted and measured to a nearest centimeter. The difference in distance between the standing reach height and the jump height was the score. The best of three attempts was recorded.

Scoring

The score was the difference between the highest point of the jump and the standing reach higher or work score.

3.8.6 LONG KICK

Purpose

To assess the kicking accuracy over a long distance.

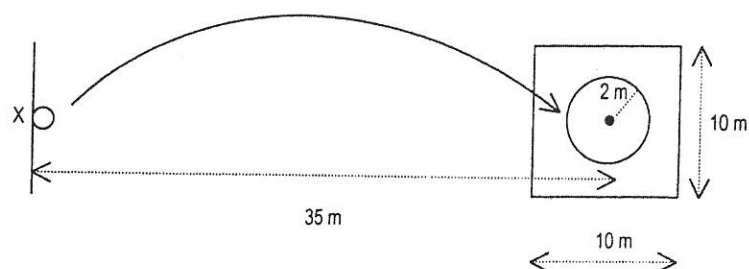
Equipment Used

Football

Marking

Marking is given in Figure 1, below:

FIGURE 1
FLOOR MARKING FOR LONG KICK



Procedure

The subject kicked the ball from its dead position on the line into a circle of 2 meters radius marked on the floor in the middle of a square target area of 10 x 10 meters. The distance between the line and the centre of the circle was 35 meters. The subject had a trial attempt first. Three kicks were given continuously.

Scoring

When the ball landed inside the circle or on its circumference 3 points were awarded. When the ball landed elsewhere inside the square one point was awarded. The total of three kicks was the final scored. (Worthington, 1980).

3.8.7 FOOT RECEIVING AND PASSING

Purpose

To assess the foot receiving and passing ability.

Equipments Used

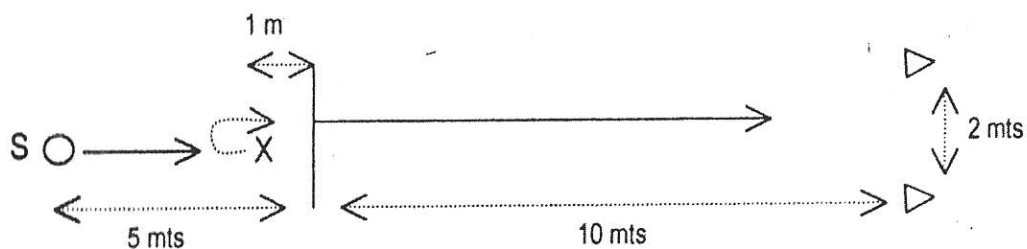
Football and cones.

Marking

Marking is given in the Figure 2, below:-

FIGURE 2

FLOOR MARKING FOR FOOT RECEIVING AND PASSING



Procedure

The subject received an incoming ball along the ground by foot, passed by a server. Then the subject passed the ball to a passage in between the cones. The subject passed the ball immediately after receiving with a turn and not crossed the line before passing the ball. When the ball was not served properly, the attempt was repeated. Three attempts were given continuously.

Scoring

The tester judged the perfection of receiving. Two points were awarded when the subject received and passed the ball perfectly. One point was awarded when the subject performed any one perfectly. (Worthington, 1980)

3.8.8 ZIGZAGS DRIBBLING

Purpose

To assess the dribbling ability with speed and perfection.

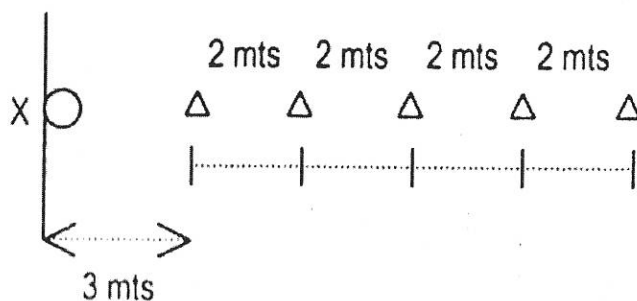
Equipments Used

Football, cones, stopwatch and whistle.

Marking

Marking is given in Figure 3, below:-

FIGURE 3
FLOOR MARKING FOR ZIG-ZAG DRIBBLING



Procedure

The subject dribbled the ball from the starting point in forward direction and continued the zig-zag dribbling still the last cone and returned back to the starting point in the same way. Three attempts were given with adequate rest in between.

Scoring

The time taken to complete the course was recorded to the nearest seconds. The best of three attempts was the final score. (Worthington, 1980).

3.8.9 HEADING TO SCORE

Purpose

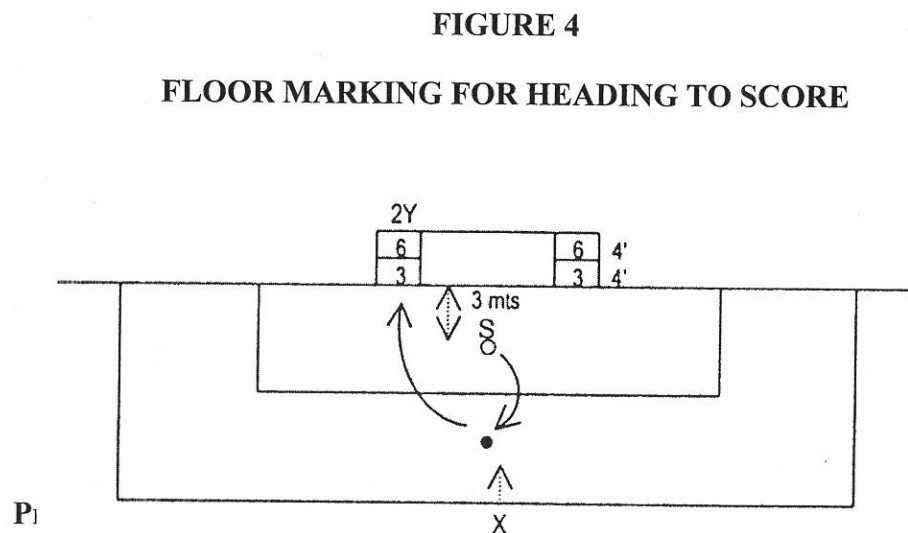
To assess the heading ability with accuracy.

Equipments Used

Football goal post and football

Marking

Marking is given in Figure 4 below:-



The server stood 3 meters in front of the middle of the goal post and threw the ball to the penalty spot. The subject heads the ball from the penalty spot by approaching the ball from the top of the penalty area into the goal which is divided into 5 segments with the help of rope. When the ball was not served properly the attempt was repeated. Three attempts were given continuously.

Scoring

Six points were awarded when the ball entered into the top right or left segments. Three points were awarded when the ball entered into the bottom left or right segments. One point was awarded when the ball hits the crossbar or the goal posts of right or left segments. The total of three attempts was the final score. (Worthington, 1980).

3.8.10 SHOOTING**Purpose**

To assess the ability of shooting a moving ball with accuracy.

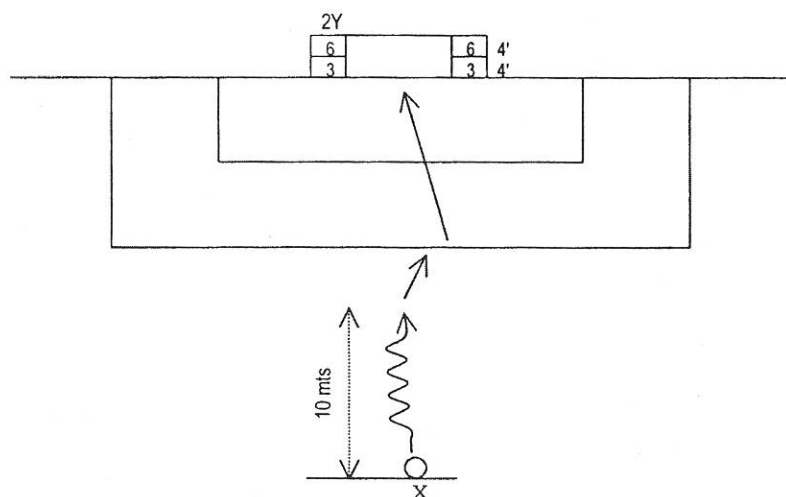
Equipments Used

Football goalpost and football.

Marking

Marking is given in Figure 5, below;-

FIGURE 5
FLOOR MARKING FOR SHOOTING



Procedure

The subject dribbled the ball towards the middle of the penalty arc and pushed the ball forward and took a shot on the goal which was divided into 5 segments with rope. The subject kicked the ball before crossing the line of the top of the penalty box. Three attempts were given continuously.

Scoring

Six points were awarded when the ball entered into the top left or right segments. Three points were given when the ball entered into the bottom right or left segments. One point was awarded, when the ball entered into the middle segment or hits the crossbar or the goal posts. The sum of three attempts was the final score. (Worthington, 1980).

3.9 STATISTICAL TECHNIQUE

The data obtained were analysed by analysis of variance (ANOVA) and analysis of covariance (ANCOVA). The analysis of variance was used to assess the significance of difference between the pre-test and post-test, for each of the variables on the PNF stretching and high intensity plyometric exercises groups separately.

Analysis of covariance (ANCOVA) was computed for any number of experimental groups, the final means were adjusted for differences in the means were tested for significance. The analysis of variance was first computed to find out the difference between the initial and final means. The Analysis of Covariance was computed from the same population and was devoid of sampling bias. The obtained 'F' ratio compared with critical F value for significance will provide confidence that the critical samples came from the same population and are devoid of sampling bias.

When the F ratio was found to be significant, Scheffe's post hoc test was used to find out the paired mean significant difference. (Thirumalaisamy, 1998).

Scheffe post hoc test has the greatest power and is the most conservation with respect to Type 1 error: this method loads to the smallest number of significance differences. The difference between two means would be significant if it exceed Scheffe F. In order to be significant, F' must equal $(k - 1) (F_{.05} \text{ or } F_{.01})$. Thus, the necessary F' ratios for the difference between paired adjusted mean $(k-1)$ would be computed and compared for significance.