CHAPTER III

METHODOLOGY

Research methodology involves a systematic procedure by which the researcher starts from the initial identification of the problem to its final conclusion. The role of methodology is to carryout the research work in a scientific and valid manner. The purpose of the study was to find out the effect of specified training with sign language and vibrator aid on selected psychomotor variables and skills in handball among deaf and dumb college students. In this chapter, selection of subjects, selection of variables, experimental design, selection of tests, pilot study, reliability of data, instruments reliability, orientation to the subjects, training programme, test administration collection of data and statistical technique adapted to analyse the data are presented.

3.1. SELECTION OF SUBJECTS

The purpose of the study was to investigate the effect of specified training using sign language and vibrator aid on selected psychomotor variables namely, reaction time and movement time and skills in handball namely, 9 meter front throw, dominant hand speed pass, overhead pass, accuracy throw, jump and throw, and dribbling among deaf and dumb college students.

For the present study, forty five deaf and dumb men students were selected randomly from Presidency College, Chennai. The age of the subjects ranged between 18 and 25 years and their hearing impaired level is 90%. Selected subjects divided into three equal groups namely Group I (VTG) vibrator aid training group (n=15), Group II (VSTG) combination of vibrator aid & sign language training group and Group III (CG) served as control group (n=15).

All subjects were informed about the nature of the study and their consent was obtained to co-operate till the end of the experiment. For the pilot study and final study experimental groups (namely VTG and SVTG) were trained-up for 12 weeks using selected vibrator training and combined (sign and vibrating) training were given independently. The subjects were free to withdraw their consent, in case they felt any discomfort during the period of their participation but there were no dropouts. A qualified physician examined the subjects medically and declared them fit for the study.

3.2. SELECTION OF VARIABLES

3.2.1. Dependent Variables

Technique is the basis of any team sport. The technique is a skill which is necessary to play a game. The technique is conditioned by motor abilities of players and the frequency of exercise repetitions. The exercise repetitions provide fast and spontaneously in performing the activities. If the players have good technique, they will pay more attention to team work and properly perform tactical tasks during the game. A player is considered to be capable of playing handball if he can run fast and on purpose, change his direction of movement, catch and pass a ball in any direction regardless of the speed, shoot from any situation, free himself from an opponent, move on the court with a ball and co-operate with other players (**Czerwinski and Taborsky, 1997**).

Considering the activities which are performed on the court, handball technique consists of many. They are catching the ball, passing, shooting, dribbling, feinting, offensive and defensive movements, and goalkeeper's technique. This is one of the basic technical elements. A pass must be accurate, fast and tactically

useful. It should be accurate so that a player has no problem when catching the ball. Position of hands while catching a ball, decision to whom a pass should depend on the player's position in a particular situation. A pass should be directed to the player, whose position may menace the opponent. Both right and left hand catching and passing must be practiced (**Czerwinski and Taborsky, 1997**).

Shots are one of the most important elements of handball. They are vital elements that decide the scores. While shooting, the muscles of the lower and upper limbs, pelvic region and trunk are extremely engaged. One can assume that shooting is performed similarly to passing but with a stronger action of the trunk and upper limbs. The shot power is conditioned by the distance and hand action time on a ball. The greater the distance that the hand on the ball covers in the time unit, the stronger the shot will be performed. After receiving the ball and before dribbling, a player holds the ball with both hands. The ball is being dribbled sideways at hip level. Bouncing on the ground is performed by the combined action of the elbow and wrist joints. The angle of the bounced ball depends on the speed that the player is moving with. The faster the run, the more the angle becomes obtuse (**Czerwinski and Taborsky, 1997**).

Measuring throwing accuracy indicated that the percentage of missed throws did not differ between skill levels and throwing techniques. Low-skilled, as well as skilled and high-skilled level players, were able to strike the target frequently, utilizing all throwing techniques. The mean percentage of missed throws ranged from 15% to 26%. These results are in agreement with recent studies in team-handball (**Bayios & Boudolos, 1998; van den Tillaar & Ettema, 2003b; Wagner et al., 2010a**) that found no speed-accuracy trade-off in team-handball

throwing. Both high-skilled and low-skilled players were able to throw accurately, but with different ball release speed that increased with skill level. In the context of this study, it must be mentioned that testing conducted during this study did not reflect numerous situations that are invoked on players during actual team handball competition. To score a goal in competition, team-handball players throw the ball at the side or above the defensive block player to an area of the goal where the goalkeeper is not able to defend the goal area. These playing situations are quite different from the ones that were conducted in this study, where a performer was asked to throw at a target as required by the testing protocol. It is possible that throwing accuracy that is similar between the different skill levels and throwing techniques during testing may be quite different in team-handball competition. This is a limitation of our study that is similar to recent studies reported on team-handball throwing (**Van den Tillaar & Ettema, 2003a, 2003b, 2006; Wagner et al., 2010**). However, author wish to convey that ball release speed in the testing situation is similar to ball release speed in competition. The absence of the speed-accuracy trade-off in the present study that is typical for team-handball throws necessitated another interpretation of movement variability as in goal-orientated throwing tasks like basketball (**Button, et al., 2003**) or dart throwing (**Etnyre, 1998; Gross & Gill, 1982; Müller & Loosch, 1999**). It was not the question of how the differences in movement variability explain the differences in the throwing accuracy. It was the question of how the differences in movement variability explain the ability to throw just as accurately when the ball release speed significantly increases.

Skill-related differences were found in various sporting domains including tennis (**Goulet, Bard, & Fleury, 1989**), badminton (**Abernethy &**

Russell, 1987; Abernethy & Zawi, 2007), volleyball (**Loffing, Schorer, Hagemann, & Baker, 2012**), soccer (**Williams & Burwitz, 1993**), cricket (**Muller, Abernethy, & Farrow, 2006**) and handball (**Canal-Bruland and Williams, 2010**). In team-handball, besides predicting ball flight direction (**Schorer, Loffing, Hagemann, & Baker, 2012**) or detecting whether a shooter is about to make a shot or not (**Cañal-Bruland & Schmidt, 2009; Cañal-Bruland and Williams, 2010**), goalkeepers are also required to identify the type of throw. Based on the above facts the researcher selected the following variables as dependent variables for this study.

1. Reaction time
2. Movement time
3. 9 meters front throw
4. Dominant Hand Speed Pass
5. Overhead Pass
6. Accuracy Throw
7. Jump & Throw, and
8. Dribbling

3.2.2. Independent Variables

Top performance under situation-related conditions demands optimal relationships and development of all functional (cardio-respiratory and energy capacities), motor abilities, technical, tactical skills and knowledge of handballers in the function of their moving with and without the ball both in the actions on defence and attack (**Vulet, et al., 2006).**

Although technical skills, anthropometric characteristics and muscle strength and power are the most important factors for successful participation in elite levels of handball (HB) leagues, (**Gorostiaga, et al., 2005 and Rannou, et al., 2001**) the importance of aerobic capacity should not be underestimated.

Ion, et al., (2014) stated in his study specific driving skill training is important in handball game. Automation of techniques and the correct techniques in the training process must ensure an appropriate workload, resulted in a large number of repetitions for each subject by using the global method of learning, as well as the analytical. Throwing is one of the most important skills in team handball (**Eliasz et a1., 1990; Muijen et al., 1991; Marczinka 1993**). Two basic factors are of importance with regard to the efficiency of shots: accuracy and throwing velocity. Naturally, the faster the ball is thrown at the goal, the less time defenders and goalkeeper have to save the shot.

To achieve the purpose of the present investigation, the following variables were selected as independent variables.

1. Specified training with vibrator aid
2. Specified training with combination of vibrator aid & sign language method.

3.3. EXPERIMENTAL DESIGN

The experimental design used for this study was similar to a random group design involving forty five subjects, who were divided at random into three groups of fifteen each. This study consisted of two experimental groups: Group I - vibrator training (VTG) and Group II – combination of sign language vibrator training (VSTG) and a control group (CG). All the subjects were tested prior to and

after the experimentation on selected dependent variables such as reaction time, movement time, 9 meter front throw, dominant hand speed pass, overhead pass, accuracy throw, jump and throw, and dribbling.

3.4. SELECTION OF TESTS

The following standardized tests were used to collect the relevant data on selected dependent variables and they are presented in Table I.

TABLE I
SELECTION OF TESTS AND UNITS OF MEASUREMENT

Variables	Tests	Units of Measurement
Reaction Time	Nelson Reaction Time Test	In Seconds
Movement Time	Nelson Movement Time Test	In Seconds
9 Meter Front Throw	Zinn Team Handball Skills Battery	In Points
Dominant Hand Speed Pass	Zinn Team Handball Skills Battery	In Seconds
Overhead Pass	Zinn Team Handball Skills Battery	In Points
Accuracy Throw	Bergemann Test	In Points
Jump and Throw	Bergemann Test	In Point
Dribbling	Knox Speed Dribble Test	In Seconds

3.5. PILOT STUDY

A pilot study was conducted to assess the 1 RM and initial capacity of all the subjects in order to fix the load. For this, 10 deaf and dumb college men students were selected at random and divided into two groups of five each, in which group I underwent specified training with vibrator aid, group II performed specified training with combination of vibrator aid & sign language under the supervision of the researcher. However, the individual differences were considered. While constructing

the training programmes, the basic principles of sports training namely progression, over load and specificity were followed.

3.6. RELIABILITY OF THE DATA

Three months before the commencement of the pilot study, the reliability of the data was established by using 10 subjects at random. To ensure reliability, test and re-test method was executed. In between the test and retest one-day rest was given to all the subjects. The researcher using the same equipments under identical conditions tested for all the selected variables twice on the same subjects. The intra class co-efficient of correlation was used to find out the reliability of the data and the results are given in table II.

TABLE II
INTRA CLASS CO-EFFICIENT OF CORRELATION ON SELECTED VARIABLES

S.No.	Variables	'R' value
1	Reaction Time	0.81*
2	Movement Time	0.80*
3	9 Meter Front Throw	0.84*
4	Dominant Hand Speed Pass	0.85*
5	Overhead Pass	0.86*
6	Accuracy Throw	0.84*
7	Jump and Throw	0.83*
8	Dribbling	0.82*

*Significant at 0.01 level.

(Table value required for significance at 0.01 level of confidence is 0.77)

Since the obtained 'R' values are much higher than the required value, the data are accepted as reliable in terms of instrument, tester and the subjects.

3.7. INSTRUMENTS RELIABILITY

Instruments like measuring tape, marking tape, stopwatches, and vibrator aid available in the laboratory of Department of Physical Education, Presidency College, Chennai were all reliable and manufactured by standard companies. Instrument reliability was also established by test-retest method.

3.8. ORIENTATION TO THE SUBJECTS

The investigator explained the purpose of the training programme and also the involvement of the subjects. Before the commencement of the training programme, the vibrator aid training procedure and techniques were taught to group I (VTG) and the combination of vibrator aid and sign language training programme were taught to group II (SVTG). Three one-hour sessions were spent on alternate days (Mondays, Wednesdays and Fridays) to practice the specified training exercises. Two one-hour sessions were spent on alternate days (Tuesdays and Thursdays) to practice handball drill training. This helped them to perform the training exercises and understand the vibrator aid and sign language instructions perfectly. The sign language was taught by Mr. S. Vinoth and Mr. M. Bala, Asst. Professors, Dept. of computer Sci.,(Deaf and dumb), experts in the field of sign language. The used sign language are presented in **Appendix K.**

3.9. TRAINING PROGRAMME

The subjects underwent their respective training programme under strict supervision. The group I (VTG) underwent specified training with vibrator aid, group II (VSTG) underwent specified training with the combination of vibrator aid and sign language but group III (CG) did not participate any training programme during the training period. They treated as control group. The duration of training

period was restricted to 12 weeks and the number of sessions per week was confined to five. Prior to the training period, at the end of the fifth week the subjects' load (1 RM and 100%) was assessed. Each Individual's training load and intensity were fixed according to the training principles. Prior to every training session, subjects underwent 5-10 minutes of warm-up exercise, which included stretching, jogging, striding, parallel squats, and jump and toe touch. All the subjects involved in training programme were questioned about their stature throughout the training period. None of them reported any injuries. However, muscle soreness was reported in the early weeks, but it subsided later.

Specified training with vibrator aid group (VTG) was instructed to "start and stop" for one stimulus, "change of exercise" for two stimuli and "correction/error" for three stimuli. Based on the response of the subjects in the pilot study, the training schedules were constructed and presented in the following tables.

TABLE III
TRAINING SCHEDULE (MONDAY)

Specified Training	Intensity			Sets			Rest
Exercises on Monday	**I Phase 1-4 weeks**	**II Phase 5-8 weeks**	**III Phase 9-12 weeks**	**I Phase 1-4 weeks**	**II Phase 5-8 weeks**	**III Phase 9-12 weeks**	**Between sets**
4 Cone drill	60%	65%	70%	1	2	3	7 -9 min
Single leg jump	60%	65%	70%	1	2	3	7 -9 min
Sit-ups	60%	65%	70%	1	2	3	7 -9 min
Straddle press	60% of 1 RM 8-12 Reps	65% of 1 RM 8-12 Reps	70% of 1 RM 8-12 Reps	1	2	3	7 -9 min
Burpee	60%	65%	70%	1	2	3	7 -9 min
Duration of Vibration	6sec	6sec	4sec	--	--	--	--

TABLE IV
TRAINING SCHEDULE (WEDNESDAY)

Specified Training	Intensity			Sets			Rest
Exercises on Wednesday	**I Phase 1-4 weeks**	**II Phase 5-8 weeks**	**III Phase 9-12 weeks**	**I Phase 1-4 weeks**	**II Phase 5-8 weeks**	**III Phase 9-12 weeks**	**Between sets**
4 Cone drill	60%	65%	70%	1	2	3	7 -9 min
Sprints	60%	65%	70%	1	2	3	7 -9 min
Sit-ups	60%	65%	70%	1	2	3	7 -9 min
Biceps Curl	60% of 1 RM 8-12 Reps	65% of 1 RM 8-12 Reps	70% of 1 RM 8-12 Reps	1	2	3	7 -9 min
Burpee	60%	65%	70%	1	2	3	7 -9 min
Duration of Vibration	6sec	6sec	4sec	--	--	--	--

TABLE V
TRAINING SCHEDULE (FRIDAY)

Specified Training	Intensity			Sets			Rest
Exercises on Friday	**I Phase 1-4 weeks**	**II Phase 5-8 weeks**	**III Phase 9-12 weeks**	**I Phase 1-4 weeks**	**II Phase 5-8 weeks**	**III Phase 9-12 weeks**	**Between sets**
4 Cone drill	60%	65%	70%	1	2	3	7 -9 min
Sit-ups	60%	65%	70%	1	2	3	7 -9 min
Toe Jump	60%	65%	70%	1	2	3	7 -9 min
Triceps Curl	60% of 1 RM 8-12 Reps	65% of 1 RM 8-12 Reps	70% of 1 RM 8-12 Reps	1	2	3	7 -9 min
Burpee	60%	65%	70%	1	2	3	7 -9 min
Duration of Vibration	6sec	6sec	4sec	--	--	--	--

TABLE VI
TRAINING SCHEDULE
(SPECIFIED DRILLS PRACTICED DURING THE TRAINING PROGRAMME)

Drills practiced on Tuesday & Thursday	Distance	Repetition			Sets			Rest between sets
		1-4 weeks	5-8 weeks	9-12 weeks	1-4 weeks	5-8 weeks	9-12 weeks	
Zig-zag dribbling	40 m X 20m	2	4	6	1	2	3	4 -7 min
Two men pass	40 m X 20m	2	6	8	1	2	3	4 -7 min
Three men pass	40 m X 20m	2	6	8	1	2	3	4 -7 min

3.10. TEST ADMINISTRATION

3.10.1. Ruler Drop Test

Objective

To assess the student's reaction time.

Equipment

Metre ruler.

Direction

The ruler is held by the assistant between the outstretched index finger and thumb of the subject's dominant hand, so that the top of the subject's thumb is level with the zero centimetre line on the ruler. The assistant instructs the subject to catch the ruler as soon as possible after it has been released. The assistant releases the ruler and the subject catches the ruler between the index finger and thumb as quickly as possible. The assistant is to record distance between the bottom of the

ruler and the top of the subject's thumb where the ruler has been caught. The test is repeated two more times and the average value was recorded as score. (**Nelson, 1981**).

Scoring

The algorithm to calculate the reaction speed is $d = vt + \frac{1}{2}at^2$ where

d = distance in metres
v = initial velocity = 0
a = acceleration due to gravity = 9.81m/s²
t = time in seconds

As v = 0, then vt = 0 therefore the algorithm is $t = \sqrt{2d / a}$.

3.10.2. Ruler Drop Test

Objective

To assess the subject's movement time.

Equipment

Metre ruler.

Direction

The ruler is held by the assistant between the outstretched palms of the subject's right and left hand, so that the top of the subject's thumb is level with the zero centimetre line on the ruler. The assistant instructs the subject to catch the ruler as soon as possible after it has been released. The assistant releases the ruler and the subject catches the ruler between their palms as quickly as possible. The assistant is to record distance between the bottom of the ruler and the top of the subject's palm where the ruler has been caught. The test is repeated 2 more times and the average value is used in the assessment**.** (**Nelson, 1981**).

Scoring

The algorithm to calculate the reaction speed is $d = vt + \frac{1}{2}at^2$ where

d = distance in metres

v = initial velocity = 0

a = acceleration due to gravity = 9.81m/s²

t = time in seconds

As v = 0, then vt = 0 therefore the algorithm is $t = \sqrt{2d / a}$.

3.10.3. 9 meter front throw

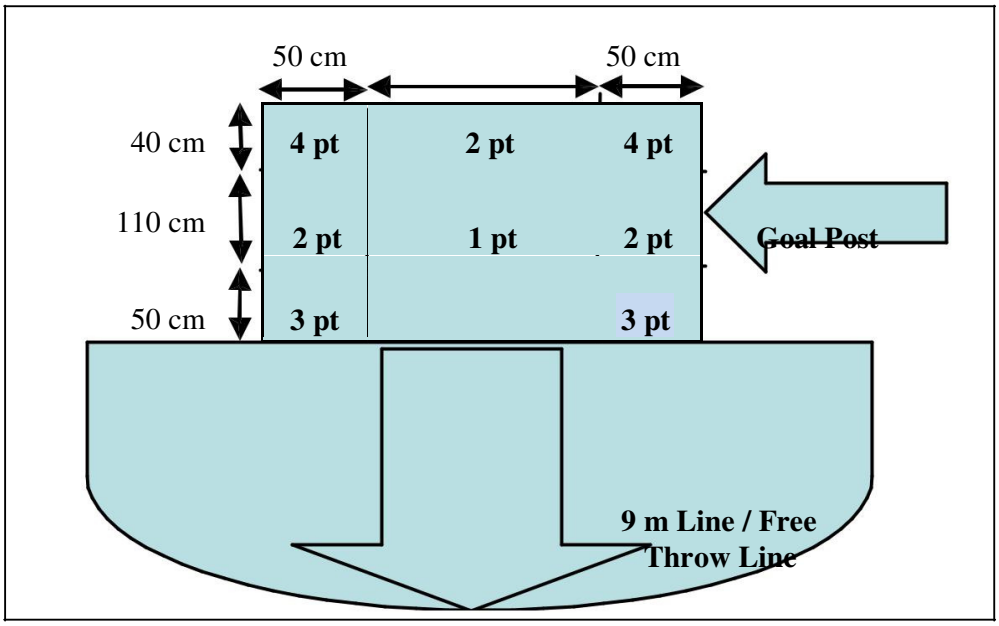
Objective

To evaluate throwing ability of the subjects.

Equipments

Handballs, rope, a measuring tape.

Markings



Direction

The subject gets 10 throws, 5 when executing a jump throw and 5 when executing a set throw. The subject can take three steps before releasing a ball but the last step must be executed outside the free throw line (9 meter line). If a ball hits the court surface before it reaches the goal, no point is scored. (**Zinn, 1981**).

Scoring

The score for 10 trials is the sum of points awarded on each attempt.

3.10.4. Dominant Hand Speed Pass

Objective

To evaluate passing ability of the subjects.

Equipments

Handballs, rope, a measuring tape.

Direction

The subject stands behind the restraining line. Upon the signal 'begin', the subject uses the dominant hand to bounce a ball against the wall as rapidly as possible. He catches the return bounce and repeats until 10 bounces hit the wall. All bounces must come from behind the restraining line and the subject must catch all passes with both hands. A stop watch is started as soon as the ball first contacts the wall and is stopped when the ball hits the wall on the 10^{th} bounce. Two trails are given. (**Zinn, 1981**).

Scoring

Time for the better of two timed trials is the final score. Time is recorded to the nearest $1/10^{th}$ of a second.

3.10.5. Overhead Pass

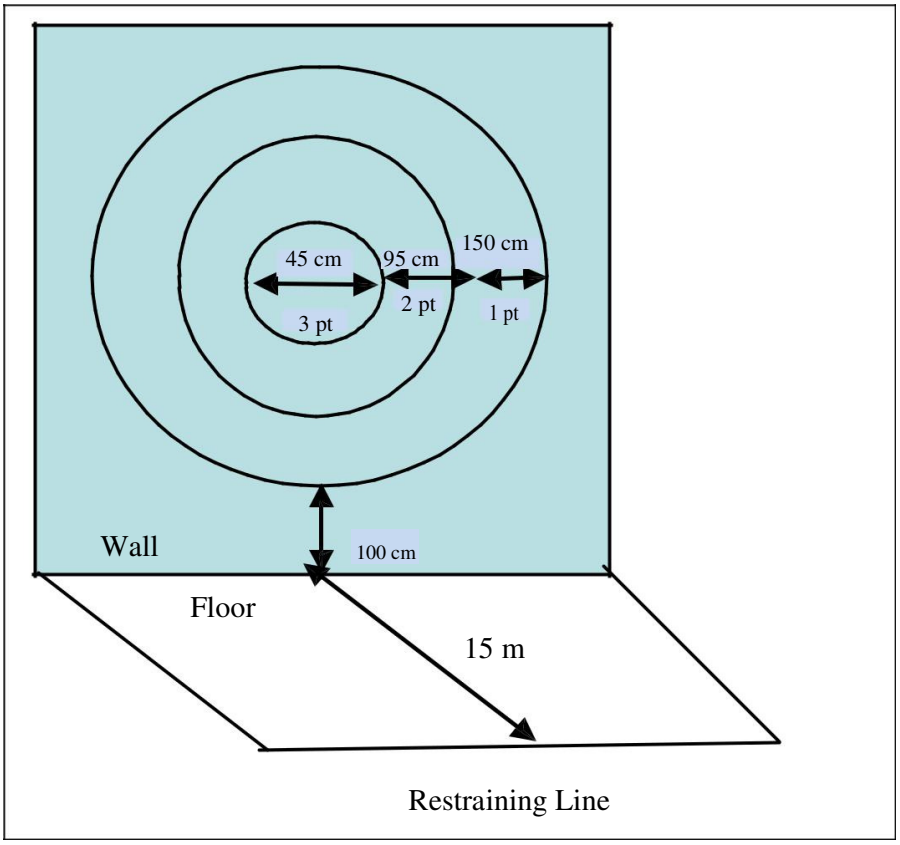
Objective

To evaluate passing ability of the subjects.

Equipments

Handballs, rope, a measuring tape.

Markings



Direction

Subjects are positioned behind the restraining line. Using a one-armed throw, they throw a ball at the target. Ten passes are made and all must be executed from behind the restraining line. Points are awarded for the passes. (**Zinn, 1981**).

Scoring

The score is the total for 10 throws.

3.10.6. Accuracy Throw

Objective

To assess throwing accuracy of the subjects.

Equipments

Automobile tyre, Iorn rope and handball.

Target Marking

A automobile tyre hanging vertically from the regular handball goal post.

Direction

Subjects are advised to use any one method of throw. The subjects stand behind the 7 meter throw line. When the vibrator is stimulated, they throw the handball towards the hanging automobile tyre. If the thrown ball passes through the hanging automobile tyre, 2 points are awarded to the subjects. If the ball touches the hanging automobile tyre, 1 point is awarded to the subjects. (**Bergemann, 2004**).

Scoring

The total of ten trials is the test score.

3.10.7. Jump and Throw

Objective

To assess the subject's jump and throw ability.

Equipments

Volleyball net, Automobile tyre, Iorn rope and handball.

Target Marking

Regular volleyball net is placed on the 7 meter line from the regular handball goal post with the height of 2.44 meter. An automobile tyre hanging vertically from the regular handball post, the bottom of the tyre rested on the floor.

Direction

Subjects are advised to use jump shot method of throw. The subjects stand behind the 7 meter throw line and the volleyball net. When the vibrator is stimulated, they jump and shot the handball (over the net at a height of 2.43 meters) towards the hanging automobile tyre. 10 throws are given to the subjects. Two points are awarded for hitting the tyre or passing throw the center and 1 point is awarded for passing through the goal mouth. (**Bergemann, 2004**).

Scoring

The total of ten trials is the test score.

3.10.8. Dribbling

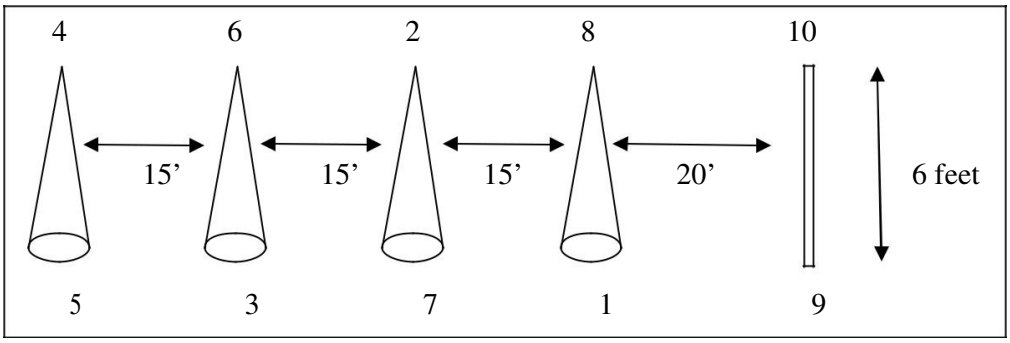
Objective

To assess the subject's dribbling ability.

Equipments

Cone, stop watch and handball.

Target Marking



Direction

The subject places the ball on the starting line and then stands back of it, with hands on knees. When the vibrator is stimulated, they pick up the ball and dribble in a zig-zag manner up and down.

Scoring

Timing is taken from when the vibrator is stimulated to when the subjects returns to the starting line. The score is the time in seconds (**Knox, 1947**).

3.9. COLLECTION OF DATA

The data on selected dependent variables for pre and post tests were collected three days before and after the training programme respectively. Reaction time, movement time and dribbling were tested on the first day. On the second day, 9 meter front throw, dominant hand speed pass and overhead pass were tested, and accuracy throw and jump and throw were tested on the third day.

3.12. STATISTICAL TECHNIQUE

The data was collected from the three groups before and after the experimental period. The collected data were statistically examined for significant different by dependent 't' test. No attempt was made to equate the groups in any manner. Hence, to make adjustments for difference in the initial means and test the adjusted posttest means for significant differences, the analysis of covariance (ANCOVA) was used. Whenever the 'F' ratio was found to be significant, Scheffe's test was used as post-hoc test to determine which of the paired means differed significantly. In all cases, the criterion for statistical significance was set at 0.05 level of confidence ($P<0.05$).

3.12.1. Assumptions for ANCOVA

A preliminary analysis was conducted to determine whether the prerequisite assumptions of one-way univariate **ANCOVA** were met before preceding the univariate analysis. Thus, the assumption of equality of variance (homogeneity), was examined and presented below.

Levene's Test of equality of error variances on selected variables were calculated and presented in table VII.

TABLE VII
LEVENE'S TEST OF EQUALITY OF ERROR VARIANCES ON SELECTED VARIABLES OF VTG, VSTG TRAINING GROUPS AND CONTROL GROUP

Variables	F Ratio	df1	df2
Reaction Time	2.550	2	42
Movement Time	0.827	2	42
9 Meter Front Throw	2.112	2	42
Dominant Hand Speed Pass	1.825	2	42
Overhead Pass	1.395	2	42
Accuracy Throw	1.092	2	42
Jump and Throw	0.718	2	42
Dribbling	0.511	2	42

* significant at 0.05 level

(The table value required for 0.05 level of significance with df 2, 42 is 3.22)

The results from the Levene's Test for homogeneity of variance of comparing the three groups regardless of the ability level for each of the dependent variables indicates that homogeneity of variance has been met for all the eight dependent variables. The 'F' ratio values for all dependent variables are less than the table value of 3.22 against with df 2 and 42 at 0.05 level of confidence. Hence, it is concluded that the assumption of homogeneity of variance has been met.