CHAPTER – III

METHODOLOGY

In this chapter, procedures and methods applied in the selection of subjects, selection of variables, selection of tests, reliability of instruments, reliability of data, competency of the tester, pilot study, orientation to the subjects, training programme, collection of data, administering the tests, experimental design and statistical procedure employed in analyzing the data are presented.

3.1. SELECTION OF SUBJECTS

The purpose of the study was to compare the effect of SAQ training, Jumping ABC training associated with speed training on selected speed and power parameters among Engineering College Gamesmen. To achieve the purpose of the study, from the population of 100 College students from Erode District Engineering Colleges only forty five (45) students participated in the inter collegiate tournament for their respective colleges, affiliated to Anna University, Chennai, Tamil Nadu, India during the year 2011 – 2012 were selected as subjects. The age of the subjects ranged from 18 to 25 years.

In which, forty five (45) College students were randomly selected and they randomly assigned into three groups of fifteen (15) subjects each (n = 15). Group I underwent SAQ (Speed Agility Quickness) Training Associated with Speed Training (SAQAST), group II underwent Jumping ABC Training Associated with Speed

Training (JABCAST), and group III acted as Control Group (CG), they were not assigned any specific training, but they were done their regular curricular activities.

The experimental groups namely SAQ Training associated with Speed Training (SAQAST) and Jumping ABC Training Associated with Speed Training (JABCAST) underwent their respective training programs for the duration of 12 weeks of 36 morning sessions in addition to their regular programme in their curriculum design. While the subjects were novice to the particular specialized training, to make aware of them three classes were taken on the need and importance of research work, the nature of the training procedure, pro and concussion of the training programme were explained to the subjects. The subjects filled out consent form given in the research based information. Several doubts were raised by the subjects and it was clarified by the researcher, and also informed to the subjects that if they feel any discomfort during training and testing period, they are free to withdraw from during the training programme, but there were no dropouts in the training programme. They were also given adequate rest/relief on and before their training sessions. The attendance of the participants was taken at each training sessions of their respective experimental groups and also the percentage of the attendance of the participants was presented in Table I.

TABLE - I

PARTICIPANT'S ATTENDANCE

Name of the Training Group	Percentage
SAQAST	98.0%
JABCAST	97.0%
CG	98.0%

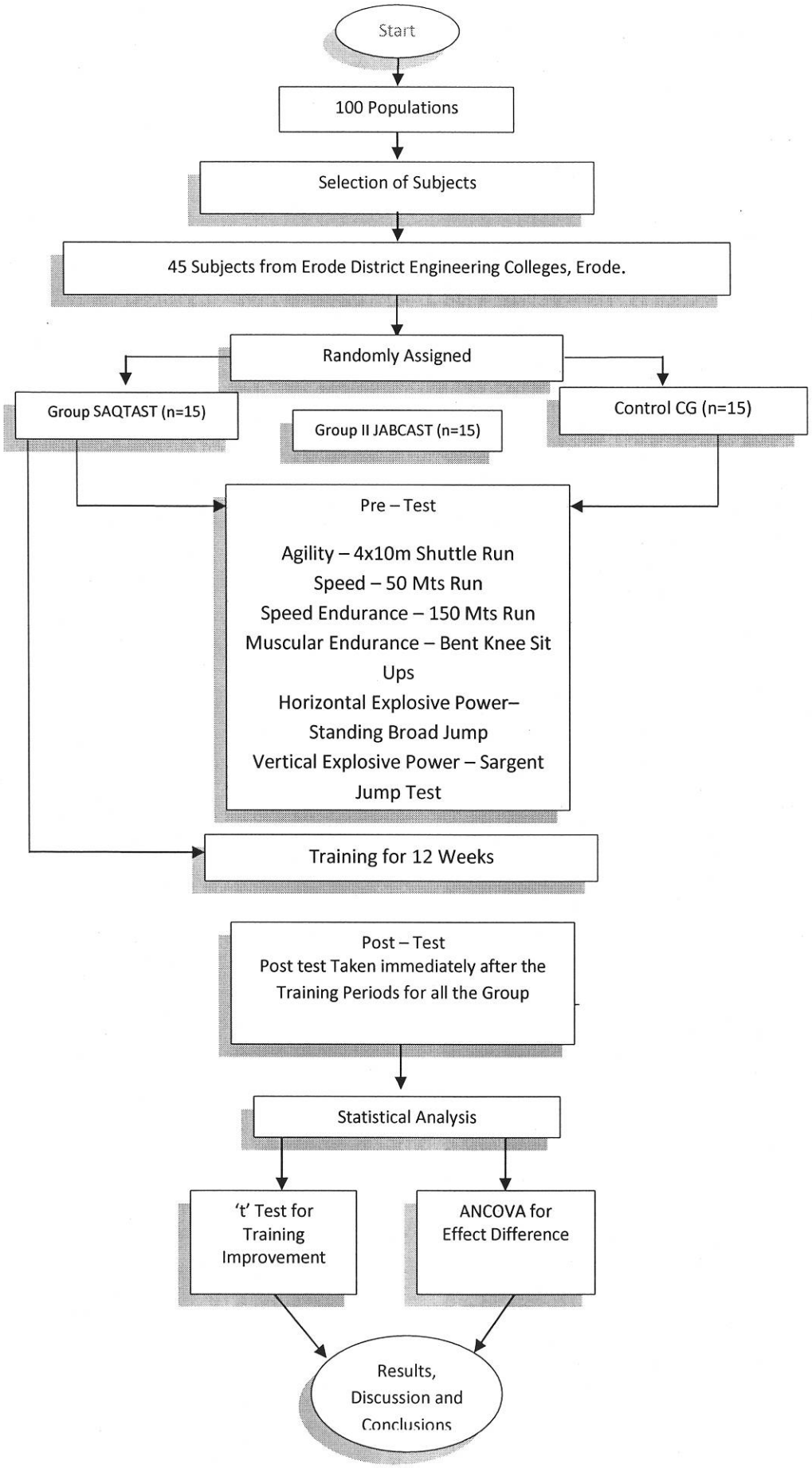

Figure – 1 : Research Flow Chart

3.2. SELECTION VARIABLES

3.2.1. INDEPENDENT VARIABLES

1) Speed Agility and Quickness Training

2) Jumping ABC Training

3) Speed Training

3.2.1.1. SPEED AGILITY AND QUICKNESS TRAINING

Speed, Agility and Quickness (SAQ) has become a popular way to train athletes with the continuously increasing need to promote athletic ability, this type of training has proven to enhance the practical field abilities of participant in a wide variety of speed. It is practiced in addition to conventional resistance training in the gym and selves assist in the transfer of the strength gained there to performance in the area of play. Nearly every sport requires fast movements of either the arms or legs, and speed, agility, and quickness training can improve skills in precisely there areas. Hence, all athletes can benefit when speed, agility, and quickness training is integral into their training program.

3.2.1.2. JUMPING ABC TRAINING

Jumping ABC drills are fundamental skill to develop the whole parts of the body. The fundamental jumping techniques are the base for the development of jumping ability and it also influenced the performance of the players. The basic fundamental movements of the jumping ABC techniques are the basic requirement for all the sports and games for the development of the performance.

3.2.1.3. SPEED TRAINING

Speed is an excellent quality to develop all types of techniques in all sports, without assistance of speed, the sports persons cannot achieve the higher performance and also cannot maintain their performance. Speed has the special quality, because speed consists of other sub qualities like reaction ability, movement speed, acceleration and speed endurance. If the sports person develops speed and power parameters they may also develop all other sub qualities, for that reason, the research scholar include as an assistive training for both experimental groups namely SAQ Training and jumping ABC Training. SAQ Training Groups had done their SAQ training after completion of their SAQ training immediately they go for the speed training. In the same way, Jumping ABC Training groups had done their Jumping ABC training after completion of their Jumping ABC training immediately they go for the speed training. So, speed includes as an assistive training for both experimental groups, for that reason speed training also selected as independent variables.

3.2.2. DEPENDENT VARIABLES

The following dependent variables were selected for this study as,

1) Agility

2) Speed

3) Speed endurance

4) Muscular endurance

5) Horizontal explosive power

6) Vertical explosive power

3.2.2.1. SPEED AND POWER PARAMETERS

Agility is the ability with speed in changing body positions or in changing directions. It is most essential physical fitness quality to apply all types of sports and games. Agility requires speed and quickness to do any movement, this situation prevails in various situations in all sports and games.

The optimal combination of speed and strength to produce movement is to be explosive power. Explosive Power is an essential component for successful performance in many sports. Explosive power represents the amount of work a muscle can produce per unit of time an increased in power gives the athlete the possibility of improved performance in sports in which the improvement of the speed. Strength relationship in required, explosive power, the ability to perform an explosive movement in the shortest time possible, result from the integration of maximum strength and speed.

Speed endurance is the ability to maintain high speed sprinting. It has two metabolic facets, alactic speed endurance and lactic (glycolytic) speed endurance. These metabolic processes are not absolutely separable, and training the lactic system certainly trains the alactic system. The alactic system, or short speed endurance, predominates in exercise through the 200 m. The lactic system, long speed endurance, begins contributing to intense exercise after about 5 seconds, however and probably becomes the dominant system between 10-20 seconds of activity.

Muscular Endurance is the measure of how well muscles can repeatedly generate force, and the amount of time taken to maintain activity. Muscular endurance is necessary for everyday activities, which typically involves low impact movement. It is crucial for every fitness activity, which typically involves low impact movement. It is

crucial for every fitness activity, from the mostly anaerobic weight lifting repetitions to the intense aerobic activities like jogging. Muscular endurance combines both aerobic and anaerobic energy and training for endurance not only involves repeatedly generating force, but the speed of recovery in a muscle.

Speed of execution is fundamental goals of any athletic movement and are, of course, interrelated speed is the ability to achieve high velocity. It is a manifestation of explosive force applied to a specific task but it often incorrectly perceived as independent strength. Speed ability should not be equated with mechanical speed which is equal to the distance covered per unit of time. In several sport actions no distance is covered at all. Speed ability primarily signifies the ability to execute motor movements with high speed.

For that purpose the following physical fitness variables were selected as dependent variables for this study as

1. Agility
2. Speed
3. Speed Endurance
4. Muscular Endurance
5. Horizontal Explosive Power
6. Vertical Explosive Power

3.3. SELECTION OF TESTS

The present study was undertaken primarily to compare the effect of SAQ training, jumping ABC training associated with speed training on selected speed and power parameters among Engineering College Gamesmen from 18 to 25 years of age.

As per the available literature, the following standardized tests were used to collect relevant data on the selected dependent variables were presented in the Table II.

TABLE - II

TEST SELECTION

S. No	Criterion Variables	Test Items	Unit of Measurement
1.	Agility	4 x 10 meters Shuttle Run	In Seconds
2.	Speed	50 meters Run	In Seconds
3.	Speed Endurance	150 meters Run	In Seconds
4.	Muscular Endurance	Bent Knee Sit Ups	In Numbers
5.	Horizontal Explosive Power	Standing Broad Jump Test	In Centimeters
6.	Vertical Explosive Power	Vertical Jump Test	In Centimeters

3.4. RELIABILITY OF INSTRUMENTS

Stop watches, measuring tape, clapper and score card were used for the purpose of the study. All these instruments were brought from Surya Engineering College, Erode, Tamil Nadu, India. The above instruments were purchased from reliable standard scientific companies; their calibrations were tested and found to be accurate enough to serve the purpose of the study.

3.5. RELIABILITY OF THE DATA

Test and retest method was followed in order to establish the reliability of data by using ten subjects which was tested on selected dependent variables. All the dependent variables selected in the present study were tested twice for the subjects by some personal under similar conditions. The intra class co – efficient of correlation was used to find out the reliability of the data and the results are presented in Table III.

TABLE – III

INTRA CLASS CO – EFFICIENT OF CORRELATION ON SELECTED DEPENDENT VARIABLES

S. No	Criterion Variables	'R' Value
1	Agility	0.87*
2.	Speed	0.88*
3.	Speed Endurance	0.89*
4.	Muscular Endurance	0.85*
5.	Horizontal Explosive Power	0.84*
6.	Vertical Explosive Power	0.85*

**Significant at 0.01 level of confidence. (The table value required for significance at 0.01 level of confidence is 0.77).*

Since, the obtained 'R' values were much higher than the required value; the data were accepted as reliable in terms of instruments, the tester and the participants.

3.6. COMPETENCY OF TESTER

The operation of aforesaid instruments was taught by the research supervisor and the researcher learnt the procedure and methods to handle and operate the instruments in order to administer the test. Measurement was taken by the investigator with the assistance of physical education teachers nearby Colleges and Schools, Erode, Tamil Nadu, India.

3.7. PILOT STUDY

Prior to the formal study sessions, a pilot study was conducted to validate the research procedure and to know the initial capacity of the participants to fix the load and also to design the training programme. For the purpose of SAQ training associated with speed training five participants (n=5) were selected and they perform the selected SAQ training exercises associated with speed training, depending up on their

performance level the research scholar has fixed the initial load for the SAQ training associated with speed training groups. Before the initiation of the training programs, the participants of the SAQ training associated with speed training group were instructed about the proper execution of techniques and safety precaution to be followed during the training period for SAQ training associated with speed training. After fixing the load, the training program design for SAQ training associated with speed training were designed based on the principles of SAQ training associated with Speed training.

For the purpose of jumping ABC Training associated with speed training five participants (n=5) were selected and they perform the selected jumping ABC training associated with speed training, depending up on their performance level the research scholar has fixed the initial load for the jumping ABC training associated with speed training group. Before the initiation of the training programs, the participants of the jumping ABC training associated with speed training group were instructed about the proper execution of the exercise techniques and safety precaution to be followed during the training period for jumping ABC training associated with speed training. After fixing the load, the training program design for the jumping ABC training associated with speed training were designed based on the principles of jumping ABC training associated with speed training.

After fixing the initial load, prior to the start of the respective training programs, ten participants (n=10) were selected at random, and they were divided into two groups of five participants each. Group A (n=5) underwent SAQ training associated with speed training, Group B (n=5) underwent jumping ABC training associated with speed training for five sessions under the supervision of the researcher. The initial loads of the participants were fixed and the training programme for SAQ training associated with speed training and jumping ABC training associated with speed training were designed

separately based on the performance in the pilot study. The training programmes were designed by the research scholar based on the principles of sports training. During the construction of the training programme, the individual differences were also considered and general training (Specificity, Overload, Recovery and Adaptation) principles were followed.

3.8. ORIENTATION TO THE PARTICIPANTS

The researcher explained the purpose of the study to the participants and their part in the study. For the collection of data, the researcher explained the procedure of testing on selected dependent variables and gave instructions about the procedure to be adopted by them for measuring. Five sessions were spent to familiarizing the subjects with the technique involved to execute the SAQ training associated with speed training and jumping ABC training associated with speed training. It helped them to perform the training perfectly and avoid injuries. The participants of all the groups were sufficiently motivated to perform their maximal level during testing and training periods.

3.9. TRAINING PROGRAMME

The experimental groups were required to perform three sessions per week on alternative days (Monday, Wednesday and Friday for SAQ Training associated with Speed Training and Tuesday, Thursday and Saturday for jumping ABC Training associated with Speed Training) for 12 weeks. Thus, the program entailed 36 training workouts session. However, the duration of each training session is 90 minutes, same for two groups and the training began with a standardized warm – up routine consisting of running, calisthenics, and stretching was used. Before the ignition of the training programs, the participants of two groups were instructed about the proper execution of the exercises and safety body and trunk exercises. The selection of exercises employed

in experimental group namely, SAQ training associated with speed training and jumping ABC Training associated with Speed training are out lined in Appendix II & III. In creating the SAQ training associated with speed training program, it was adhered to the principle that load during the phase I and II should be 75% to 80% of the maximum and 90% during the phase III and IV from the initial load of the participants which is fixed at the pilot study (Appendix II). In creating the jumping ABC training associated with speed training program, we adhered to the principles that load during the phase I and II should be 75% to 80% of the maximum and 90% during the phase III and IV from the initial load of the participant which is fixed at the pilot study (Appendix III).

3.10. COLLECTION OF DATA

The data on agility, speed, speed endurance, muscular endurance, horizontal explosive power, vertical explosive power were collected by using 4 x 10 mts shuttle run, 50 m run, 150 m run, bent knee sit-ups, standing broad jump, vertical jump test. Pre – test were collected two days before the training programme and post – test data were collected two days after the training programme. In both the cases the data were collected for the duration of two days as the dependent variables were more in number. All the tests were conducted during the morning sessions.

3.11. ADMINISTRATION OF TEST

3.11.1. AGILITY (4 x 10 Meters Shuttle Run)

Purpose

To measure the agility of the performer in running and changing direction.

Equipment

Marking tape, stop watch and two blocks of wood

Procedure

The performer starts behind the starting line on the signal "Go" and runs to the blocks, picks up one, returns to the starting line and places blocks behind the line; he then repeats the process with the second block. Allow some rest between the two trials.

Scoring

The score for each performer is the length of time required to complete the course. Recorded only the best trial. (**Johnson &Nelson, 1969**)

3.11.2. SPEED (50 mts Run)

Purpose

To measure speed.

Equipment

Two stop watches with a split-second timer were used. A suitable running area to allow the 50 meters run plus extension for stopping was also made ready.

Procedure

It was advised that two subjects run at the same time. Both start from a starting point. The commands, "Are you ready?" and "Go!" are given. At the command to go the starter drops his arm so that the timer at the finish line started the timing. The subjects run as fast as possible across the finish line.

Scoring

The elapsed time from the starting signal until the runner crosses the finish line was measured to the nearest 10^{th} of a second. (**Johnson &Nelson, 1969**)

3.11.3. MUSCULAR ENDURANCE (Bent Knee Sit Ups)

Purpose

To measure the endurance of the abdominal muscles.

Equipment

A Floor was used for this test. The stop watch and the score card needed to do this test.

Procedure

The subject lies flat on the back with knees bent and feet on the floor with the heels no more than 1 foot from the buttocks. The knee angle should stretch not less than 90 degrees. The fingers were interlocked and placed on the chest. The subjects then curls up to a sitting position and return to the original position. This exercise was repeated as many times as possible in the time requirement

Scoring

One point was scored for each correct sit-up. The score was the maximum number of sit - ups completed in 1 minute (**Barrow, McGee & Tritschler, 1979**).

3.11.4. HORIZONTAL EXPLOSIVE POWER (Standing Broad Jump)

Purpose

To measure the athletic power of the legs in jumping forward.

Equipment

A mat was used for this test. Marking material is needed for the starting line along with a tape measure to mark off increments of distance along the landing area.

Procedure

With the feet parallel to each other and behind the starting mark, the performer bends the knees and swings the arms and jumps as forward as possible.

Scoring

The number of inches between the starting line and the nearest heel upon landing was the score. Three trials were permitted, and then best trial was recorded as the score. (**Johnson & Nelson, 1969**)

3.11.5. VERTICAL EXPLOSIVE POWER (Sergeant Vertical Jump Test)

Purpose

To measure power of the legs in jumping vertically upward

Equipment

A jump board marked off in centimeters and chalk dust were used for the test. The subject dressed in shorts, light shirt, and no shoes.

Procedure

The subject was asked to assume a standing position facing sideways to the jump board, the preferred arm behind the back, and the other arm raised vertically with the hand turned outward and fingers extended. Holding the described position, the performer stand as tall as possible on the toes so that the height of the extended middle finger of the raised arm was recorded. Chalk dust was placed on the middle finger, and the performer adopts a full squat position with head and back erect and body in balance.

The performer was then told to jump high as possible and to touch the board at the top of the jump. The tester must watch the disregard jump in which balance or position is lost. The tester recorded the height of the chalk mark on the jump board. Each performer was allowed three trials.

Scoring

Using the measure of the best jump difference between the reaching height and jumping height were taken as the final score (**Johnson &Nelson, 1969**).

3.12. EXPERIMENTAL DESIGN

This study was conducted to determine the possible cause and relative effect of comparative effect of SAQ training associated with speed training and jumping ABC training associated with speed training on speed and power parameters among Engineering College Games men. A pre and post test randomized design was employed as experimental design for this investigation. This study consisted of two experimental groups, Group – I (n = 15) underwent SAQ Training Associated with Speed Training, Group – II (n = 15) underwent Jumping ABC Training Associated with Speed Training and Group III (n = 15) acted as control group. All the subjects were tested prior to and immediately after the experimentation on selected Speed and Power Parameters.

3.13. STATISTICAL PROCEDURES

The data collected from the subjects were analysed with descriptive statistics and paired sample't' test to find out the influence of the selected independent variables on the criterion variable. 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 post test means for significant differences, the analysis of covariance (ANCOVA) was used. The Scheffe's test was used as Post – hoc test to determine which of the paired means

differed significantly where the differences in adjusted post test means resided in univariate ANCOVA among the groups. All the above statistical analysis tests were computed at 0.05 level of significance ($P<0.05$).

3.14. JUSTIFICATION FOR USING ONE – WAY ANCOVA

One – way univariate analysis of covariance (ANCOVA) was used to determine how each dependent variable was influenced by independent variable while controlling for a covariate (pre test). The analysis of Covariance adjusts the mean of each dependent variable to what they would be if all groups started out equally on the covariate. In this study, pre test scores of selected variables have been shown to correlate with the post test scores, thus they were considered as appropriate covariates.

ASSUMPTION FOR ANCOVA

A preliminary analysis was conducted to determine whether the prerequisite assumptions of ANCOVA were met before preceding the univariate analysis. Thus, the assumption of equality of variance (homogeneity) and the homogeneity of regression slopes were examined. Levene's test of equality of error variance on selected variables were calculated and presented in Table - IV

TABLE – IV

LEVENE'S TEST OF EQUALITY OF ERROR VARIANCE ON SELECTED VARIABLES AMONG GROUPS

Variables	df 1	df 2	F – Ratio	Sig.
Agility	2	42	0.417	.662
Speed	2	42	2.614	.085
Speed Endurance	2	42	0.284	.754
Muscular Endurance	2	42	0.188	.830
Horizontal Explosive Power	2	42	3.110	.055
Vertical Explosive Power	2	42	2.521	.092

(The Table value required for 0.05 level of significance with df 2 & 42 is 3.23)

Homogeneity of variance is the term that is used to indicate the groups which have the similar variances. Thus, in Levene's test of equality of error variances table, the obtained F – values of the selected dependent variables were less than the confidence interval value of 0.05, which indicates that the variance of each group was not significantly different from one another.

Therefore, the homogeneity of variance of comparing the three groups regardless of the ability level for each of the dependent variables indicate the homogeneity of variance has been met for all the three dependent variables, hence it was concluded that the assumption of homogeneity of variance has been met for computing univariate ANCOVA. The interaction terms was calculated to test the assumption of homogeneity of variance regression and presented in Table – V

TABLE – V

INTERACTION TERM ON SELECTED VARIABLES OF GROUPS AND PRE TEST

Variables	Sources of Variance	SS	Df	MS	F
Agility	Group*Pre	.112	3	.037	2.742
	Error	.531	39	.014	
Speed	Group*Pre	.095	3	.032	2.691
	Error	.460	39	.012	
Speed Endurance	Group*Pre	2.290	3	.763	2.615
	Error	11.388	39	.292	
Muscular Endurance	Group*Pre	3.984	3	1.328	1.773
	Error	29.216	39	.749	
Horizontal Explosive Power	Group*Pre	.003	3	.001	2.828
	Error	.015	39	.000	
Vertical Explosive Power	Group*Pre	57.56	3	19.189	2.807
	Error	266.58	39	6.835	

*Significance at .05 level of Confidence

(The Table value required for 0.05 level of significance with df, 3, 39 is 2.85)

The Table – V shows that the interaction F – ratio of the covariate by dependent variables interaction (Group x Pre test), the effect was not significant then assumption of homogeneity of regression slopes has not been broken, therefore the assumption was met. The test of significance of regression of the post test (dependent variable) on pre test (covariate) were analyzed and presented Table – VI

TABLE – VI

TESTING THE SIGNIFICANCE OF THE REGRESSION OF POST TEST ON PRE TEST OF SELECTED VARIABLES

Variables	Source of Variance	SS	Df	MS	F
Agility	Regression	.096	1	.096	**6.44***
	Residual	.644	43	.015	
Speed	Regression	.481	1	.481	**36.27***
	Residual	.571	43	.013	
Speed Endurance	Regression	1.365	1	1.365	**4.29***
	Residual	13.68	43	.318	
Muscular Endurance	Regression	22.53	1	22.53	**26.88***
	Residual	36.044	43	.838	
Horizontal Explosive Power	Regression	.016	1	.016	**29.36***
	Residual	.023	43	.001	
Vertical Explosive Power	Regression	34.13	1	34.13	**4.22***
	Residual	347.64	43	8.09	

*Significance at .05 level of Confidence

(The Table value required for 0.05 level of significance with df 1, 43 is 4.07)

From the above table it was observed that regression based (ANCOVA) predicts the post test scores significantly well from the pre test scores on all the dependent variables, it shows that the pre and post test scores of selected dependent variables were significantly associated as in regression, it is important that the association between the outcome and the covariate is linear.

After determining the assumptions for computing ANCOVA have been met the pre data analysis, the univariate ANCOVA statistical output was examined. Then, providing the ANCOVA result was statistically significant, the univariate results were examined for each dependent variable. for the significant univariate results, the post hoc comparisons were performed to identify where the differences raised. The pair wise comparisons statistics was used for the post hoc results. The results of the descriptive analysis, paired sample t test, univariate tests, and the pair wise comparisons among the two independent variables and six dependent variables are reported in chapter four. All the calculations were given in the Appendix – II.