CHAPTER IV

RESULTS AND DISSUSSIONS

4.1 OVERVIEW

This chapter deals with the analysis of data collected from the samples under study. The purpose of the study was to analyze the influence of cardio-respiratory endurance training, resistance training and core strength training on selected physical and physiological variables among college athletes. To achieve the purpose of this study 100 men athletes from various colleges affiliated to Bharathiar University, Coimbatore who had participated inter collegiate athletic competition were selected as subjects. The subjects were selected in the age group of 18 to 22 years and they were randomly assigned into five equal groups of 20 each. Experimental group-I was given the packages of cardio-respiratory endurance training, experimental group-II was given the packages of resistance training, experimental group-III was given the packages of core strength training, experimental group-IV was given combined cardio-respiratory endurance, resistance and core strength training and group-V was acted as control.

The following physical fitness components namely speed, explosive power, muscular strength, flexibility and cardio respiratory endurance and physiological parameters such as resting pulse rate, systolic blood pressure, diastolic blood pressure, vital capacity and Vo_2max were selected as dependent variables for the study. The data collected from the experimental and control groups on selected dependent variables was statistically analyzed by paired 't' test to find out the significant differences if any between the pre and post test. Further, percentage of changes was calculated to find out the chances in selected dependent variables due to the impact of experimental treatment. In order to nullify the initial mean differences the data collected from the five groups prior to and post experimentation on selected dependent variables were statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). The pre test means of the selected dependent variables was used as a covariate. Since five groups were involved, whenever the obtained 'F' ratio value was found to be significant for adjusted post test means, the Scheffe's test was applied as post hoc test to determine the paired mean differences, if any. In all the cases the level of confidence was fixed at 0.05 level for significance.

4.2 TEST OF SIGNIFICANCE

This is the vital portion of dissertation achieving the conclusion by examining the hypotheses. The procedure of testing the hypothesis was either by accepting the hypothesis or rejecting the same in accordance with the results obtained in relation to the level of confidence.

The test was usually called the test of significance, since we test whether the differences between five groups' pre test and post test scores were significant or not. In this study, if the obtained F value were equal to or greater than the table value, the research hypothesis was accepted; if the obtained table F value were less than the table value, the research hypothesis was rejected.

4.3 LEVEL OF SIGNIFICANCE

The pre and post test scores of the cardio-respiratory endurance training group, resistance training group, core strength training group, combined training group and control group were analyzed to find out the difference on the improvement on selected physical fitness components namely speed, explosive power, muscular strength ,flexibility and cardiprespiratory endurance and on the selected physiological variables namely resting heart rate ,systolic blood pressure, diastolic blood pressure ,vital capacity and Vo_2 max among men athletes.

The analysis of covariance (ANCOVA) was used to find out significant difference if any, among the groups on selected criterion variables separately. In all the cases, 0.05 level of confidence which was considered as appropriate.

4.4 COMPUTATION OF CORRELATED 't' RATIO, COVARIANCE AND POST HOC TEST FOR PHYSICAL FITNESS VARIABLES

The influence of cardio-respiratory endurance training, resistance training, and core strength training on selected physical and physiological variables was statistically analyzed and the results are presented below.

4.4.1 RESULTS OF SPEED

The descriptive analysis of the data showing mean and standard deviation, range, mean differences, 't' ratio and percentage of improvement on speed of experimental and control groups are presented in table-VIII.

Table – VIII

DESCRIPTIVE ANALYSIS OF THE PRE AND POST TEST DATA AND‘t’ RATIO ON SPEED OF EXPERIMENTAL AND CONTROL GROUPS

Group	Test	Mean	Standard Deviation	Range	Mean Differences	‘t’ ratio	Percentage of Changes
Cardio-Respiratory Endurance Training	Pre test	7.83	0.37	1.00	0.22	3.85*	2.81%
	Posttest	7.61	0.26	0.89			
Resistance Training	Pre test	7.81	0.38	1.10	0.37	6.84*	4.74%
	Posttest	7.44	0.22	0.89			
Core Strength Training	Pre test	7.93	0.27	1.17	0.48	7.83*	6.05%
	Posttest	7.45	0.36	1.14			
Combined Training	Pre test	7.88	0.21	0.67	0.50	13.69*	6.35%
	Posttest	7.38	0.24	0.92			
Control Grtoup	Pre test	7.91	0.26	0.86	0.07	2.26*	0.88%
	Posttest	7.84	0.26	1.00			

Table t-ratio at 0.05 level of confidence for 19 (df) =2.09

*Significant

Table- VIII shows that the mean, standard deviation, range and mean difference values of the pre and post test data collected from the experimental and control groups on speed. Further, the collected data was statistically analyzed by paired ‘t’ test to find out the significant differences if any between the pre and post data. The obtained ‘t’ values of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 3.85, 6.84, 7.83, 13.69 and 2.26 respectively which was greater than the required table value of

2.09 for significance at 0.05 level for 19 degrees of freedom. It revealed that significant differences exist between the pre and post test means of experimental and control groups on speed.

The result of the study also produced 2.81 percentage of changes in speed due to cardio-respiratory endurance training, 4.74% of changes due to resistance training, 6.05% of changes due to core strength training, 6.35% of changes due to combined training and 0.88% of changes in control group.

The pre and post test data collected from the experimental and control groups on speed was statistically analyzed by using analysis of covariance and the results are presented in table–IX.

Table – IX

ANALYSIS OF COVARIANCE ON SPEED OF EXPERIMENTAL AND CONTROL GROUPS

	CRETGroup	RTGroup	CSTGroup	CTGroup	ControlGroup	SOV	Sum ofSquares	df	Meansquares	'F' ratio
Pre test Mean	7.83	7.81	7.93	7.88	7.91	B	0.208	4	0.052	0.56
SD	0.37	0.38	0.27	0.21	0.26	W	8.841	95	0.093	
Post test Mean	7.61	7.44	7.45	7.38	7.84	B	2.712	4	0.678	9.30*
SD	0.26	0.22	0.36	0.24	0.26	W	6.927	95	0.073	
Adjusted Post test Mean	7.63	7.48	7.42	7.39	7.82	B	2.548	4	0.637	17.14*
						W	3.493	94	0.037	

Table F-ratio at 0.05 level of confidence for 4 and 95 (df) = 2.46, 4 and 94 (df) = 2.47

*Significant

Table-IX shows that the pre-test means and standard deviation on speed of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 7.83 ± 0.37, 7.81 ± 0.38, 7.93 ± 0.27, 7.88 + 0.21 and 7.91 ± 0.26 respectively. The obtained 'F' value 0.56 of speed was lesser than the required table value of 2.46 at 4, 95 df at 0.05 level of confidence, which proved that the random assignment of the subjects were successful and their scores on speed before the training were equal and there was no significant differences.

The post-test means and standard deviation on speed of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 7.61 ± 0.26, 7.44 ± 0.22, 7.45 ± 0.36, 7.38 ± 0.24 and 7.84± 0.26 respectively. The obtained 'F' value of 9.30 on speed was greater than the required table value of 2.46 at 4, 95df at 0.05 level of confidence. It implied that significant differences exist between the five groups during the post test on speed.

The adjusted post-test means on speed of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 7.63, 7.48, 7.42, 7.39 and 7.82 respectively. The obtained 'F' value of 17.14 on speed was greater than the required table value of 2.47 of 4, 94df at 0.05 level of confidence. Hence, it was concluded that significant differences exist between the adjusted post test means of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on speed.

Since, the obtained 'F' value in the adjusted post test means was found to be significant, the Scheffe's test was applied as post hoc test to find out the paired mean difference, and it is presented in table-X.

Table -X

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCES AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON SPEED

Cardio Respiratory Endurance Training	Resistance Training	Core Strength Training	Combined Training	Control Group	Mean Difference	Confidence Interval
7.63	7.48				0.15	0.19
7.63		7.42			0.21*	0.19
7.63			7.39		0.24*	0.19
7.63				7.82	0.19*	0.19
	7.48	7.42			0.06	0.19
	7.48		7.39		0.09	0.19
	7.48			7.82	0.34*	0.19
		7.42	7.39		0.03	0.19
		7.42		7.82	0.40*	0.19
			7.39	7.82	0.43*	0.19

*Significant at 0 .05 level

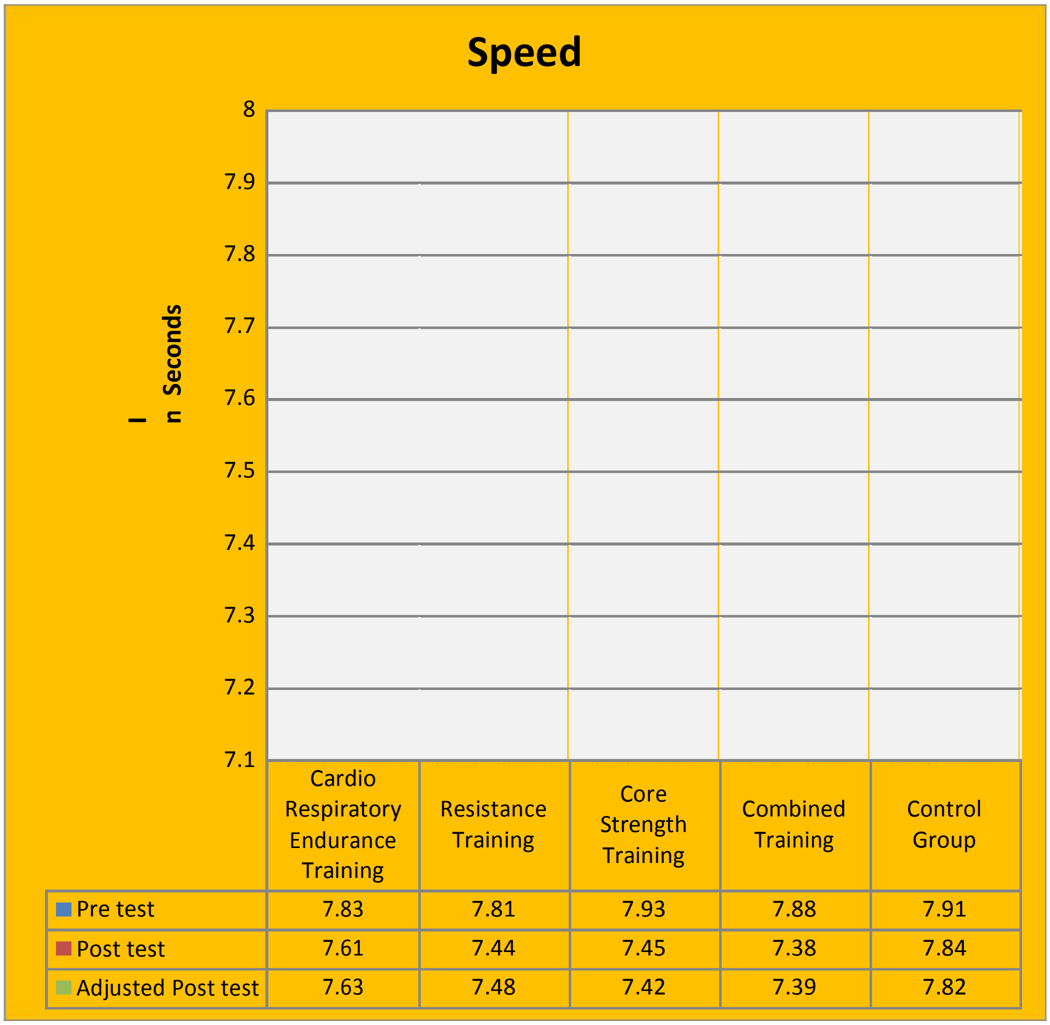
As shown in table-X the Scheffe's post hoc analysis proved that significant mean differences existed between cardio-respiratory endurance training and core strength training groups, cardio-respiratory endurance training and combined training groups, cardio-respiratory endurance training and control groups, resistance training and control groups, core strength training and control groups, combined training and control groups on speed. Since, the mean differences 0.21, 0.24, 0.19, 0.34, 0.40 and 0.43 were higher than the confident interval value of 0.19 at 0.05 level of significance.

However, there was no significant difference between cardio-respiratory endurance training and resistance training, resistance training and core strength training, resistance training and combined training groups, core strength training and combined training groups, since, the mean differences 0.15, 0.06, 0.09 and 0.03 were lesser than the confident interval value of 0.19 at 0 .05 level.

Hence, it was concluded that due to the effect of cardio-respiratory endurance training, resistance training, core strength training, combined training the speed of the subjects was significantly improved. It was also concluded that combined training and core strength training were better than cardio-respiratory endurance training on improving speed however, there was no significant differences found between cardio-respiratory endurance training and resistance training, resistance training and core strength training, resistance training and combined training, core strength training and combined training. The pre, post and adjusted post test mean values of experimental and control groups on speed is graphically represented in figure-1.

Figure - 1

BAR DIAGRAM SHOWING THE MEAN VALUES ON SPEED OF EXPERIMENTAL AND CONTROL GROUPS



	Cardio Respiratory Endurance Training	Resistance Training	Core Strength Training	Combined Training	Control Group
Pre test	7.83	7.81	7.93	7.88	7.91
Post test	7.61	7.44	7.45	7.38	7.84
Adjusted Post test	7.63	7.48	7.42	7.39	7.82

4.4.2 RESULTS OF EXPLOSIVE POWER

The descriptive analysis of the pre and post test data showing mean, standard deviation, range, mean differences, ‘t’ ratio and percentage of improvement on explosive power of experimental and control groups are presented in table-XI.

Table – XI
DESCRIPTIVE ANALYSIS OF THE PRE AND POST TEST DATA AND 'ṭ' RATIO ON EXPLOSIVE POWER OF EXPERIMENTAL AND CONTROL GROUPS

Group	Test	Mean	Standard Deviation	Range	Mean Differences	't' ratio	Percentage of changes
Cardio-Respiratory Endurance Training	Pre test	32.75	2.86	9.00	3.90	13.08	11.91%
	Posttest	36.65	3.50	9.00			
Resistance Training	Pre test	35.05	3.50	13.00	8.20	21.52	23.40%
	Posttest	43.25	2.97	11.00			
Core Strength Training	Pre test	32.95	2.37	9.00	7.75	3.64	23.52%
	Posttest	40.70	9.29	27.00			
Combined Training	Pre test	34.10	3.39	11.00	5.40	16.90	15.84%
	Posttest	39.50	3.32	12.00			
Control Group	Pre test	33.25	4.17	16.00	0.20	0.46	0.60%
	Posttest	33.45	4.14	14.00			

Table t-ratio at 0.05 level of confidence for 19 (df) =2.09

*Significant

Table-XI shows that the mean, standard deviation, range and mean difference values of the pre and post test data collected from the experimental and control groups on explosive power. Further, the collected data was statistically analyzed by paired 't' test to find out the significant differences if any between the pre and post data. The obtained 't' values of cardio-respiratory endurance training, resistance training, core strength training and combined training groups were 13.08, 21.52, 3.64 and 16.90 respectively which was greater than the required table value of 2.09 for significance at 0.05 level for 19 degrees of freedom. However, obtained 't' value 0.46 of control group was lesser than the required table value. It revealed that significant differences existed between the pre and post test means of experimental groups however, no significant difference was found in control group on explosive power.

It was also observed that percentage of changes in explosive power of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups are 11.91 %, 23.40 %, 23.52 %, 15.84 % and 0.60 % respectively.

The pre and post test data collected from the experimental and control groups on explosive power was statistically analyzed by using analysis of covariance and the results are presented in table–XII.

Table – XII
ANALYSIS OF COVARIANCE ON EXPLOSIVE POWER OF EXPERIMENTAL AND CONTROL GROUPS

	CRETGroup	RTGroup	CSTGroup	CTGroup	ControlGroup	SOV	Sum ofSquares	Df	Meansquares	'F' ratio
Pre test Mean SD	32.75	35.05	32.95	34.10	33.25	B	72.36	4	18.09	1.65
	2.86	3.50	2.37	3.39	4.17	W	1043.2	95	10.98	
Post test Mean SD	36.65	43.25	40.70	39.50	33.45	B	1142.14	4	285.54	10.99*.
	2.60	2.97	9.29	3.32	4.14	W	2468.45	95	25.98	
Adjusted Post test Mean	37.31	42.16	41.21	39.13	33.73	B	886.04	4	221.51	11.18*
						W	1861.91	94	19.81	

Table F-ratio at 0.05 level of confidence for 4 and 95 (df) = 2.46, 4 and 94 (df) = 2.47

*Significant

Table-XII shows that the pre-test means and standard deviation on explosive power of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 32.75 ± 2.86, 35.05 ± 3.50, 32.95 + 2.37, 34.10 ± 3.39 and 33.25 ± 4.17 respectively. The obtained 'F' value 1.65 of explosive power was lesser than the required table value of 2.46 for the degrees of freedom 4 and 95 at 0.05 level of confidence, which proved that the random assignment of the subjects were successful and their scores on explosive power before the training were equal and there was no significant differences.

The post-test means and standard deviation on explosive power of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups are 36.65 $\pm$ 2.60, 43.25 $\pm$ 2.97, 40.70 $\pm$ 9.29, 39.50 $\pm$ 3.32 and 33.45 $\pm$ 4.14 respectively. The obtained 'F' value 10.99 of explosive power is greater than the required table value of 2.46 for the degrees of freedom 4 and 95at 0.05 level of confidence. It implies that significant differences existed between the five groups during the post test period on explosive power.

The adjusted post-test means on explosive power of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 37.31, 42.16, 41.21, 39.13 and 33.73 respectively. The obtained 'F' value 11.18 of explosive power was greater than the required table value of 2.47 for the degrees of freedom 4 and 94 at 0.05 level of confidence. Hence, it was concluded that significant differences exist between the adjusted post test means of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on explosive power.

Since, the obtained 'F' value in the adjusted post test means was found to be significant, the Scheffe's test was applied as post hoc test to find out the paired mean difference, and it is presented in table-XIII.

Table -XIII

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCES AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON EXPLOSIVE POWER

Cardio Respiratory Endurance Training	Resistance Training	Core Strength Training	Combined Training	Control Group	Mean Difference	Confidence Interval
37.31	42.16				4.85*	4.42
37.31		41.21			3.90	4.42
37.31			39.13		1.82	4.42
37.31				33.73	3.58	4.42
	42.16	41.21			0.95	4.42
	42.16		39.13		3.03	4.42
	42.16			33.73	8.43*	4.42
		41.21	39.13		2.08	4.42
		41.21		33.73	7.48*	4.42
			39.13	33.73	5.40*	4.42

*Significant at 0.05 level

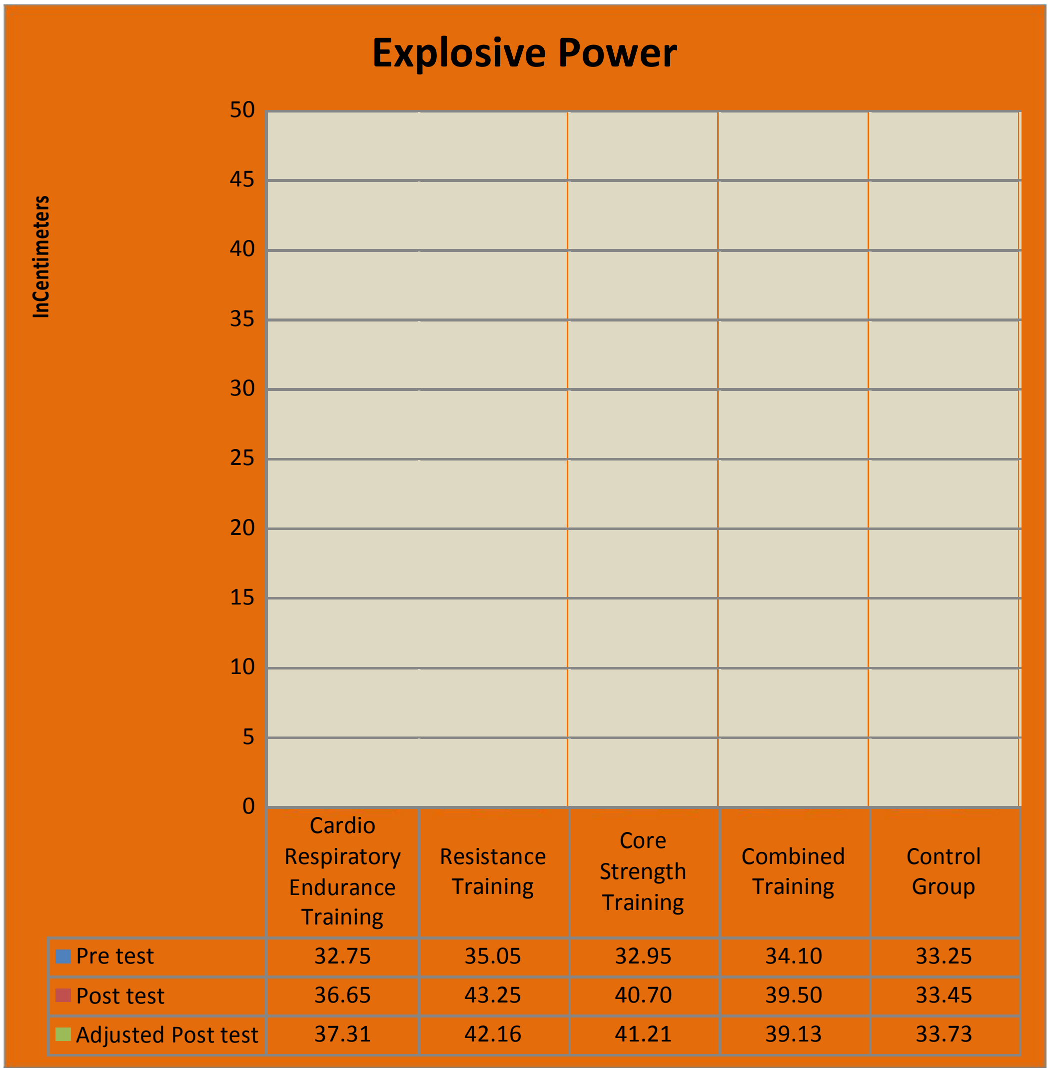
As shown in table-XIII the Scheffe's post hoc analysis proved that significant mean differences existed between cardio-respiratory endurance training and resistance training, resistance training and control groups, core strength training and control groups, combined training and control groups on explosive power. Since, the mean differences 4.85, 8.43, 7.48 and 5.40 are higher than the confident interval value of 4.42 at 0.05 level of significance. However, there was no significant difference between cardio-respiratory endurance training and core strength training, cardio-respiratory endurance training and combined training, cardio-respiratory endurance training and control groups, resistance training and core strength training, resistance training and combined training groups, core strength training and combined training groups since, the mean differences 3.90, 1.82, 3.58, 0.95, 3.03 and 2.08 were lesser than the confident interval value of 4.42 at .05 level of significance.

Hence, it was concluded that due to the effect of resistance training, core strength training, combined training the explosive power of the subjects were significantly improved however, no significant improvements was found due to cardio-respiratory endurance training. It is also concluded that resistance training was significantly better than cardio-respiratory endurance training in improving explosive power however, no statistical significant difference were found between other experimental groups in improving explosive power.

The pre, post and adjusted post test mean values of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on explosive power is graphically represented in figure-2.

Figure - 2

BAR DIAGRAM SHOWING THE MEAN VALUES ON EXPLOSIVE POWER OF EXPERIMENTAL AND CONTROL GROUPS



4.4.3 RESULTS OF MUSCULAR STRENGTH

The descriptive analysis of the pre and post test data showing mean and standard deviation, range, mean differences, 't' ratio and percentage of improvement on muscular strength of experimental and control groups are presented in table-XIV.

Table – XIV

DESCRIPTIVE ANALYSIS OF THE PRE AND POST TEST DATA AND 't' RATIO ON MUSCULAR STRENGTH OF EXPERIMENTAL AND CONTROL GROUPS

Group	Test	Mean	Standard Deviation	Range	Mean Differences	't' ratio	Percentage of changes
Cardio-Respiratory Endurance Training	Pre test	28.75	3.73	13.00	4.10	12.67*	14.26%
	Posttest	32.85	3.83	14.00			
Resistance Training	Pre test	30.30	2.00	8.00	5.35	7.44*	17.66%
	Posttest	35.65	3.05	10.00			
Core Strength Training	Pre test	28.90	2.67	9.00	8.80	12.74*	30.45%
	Posttest	37.70	2.52	10.00			
Combined Training	Pre test	29.50	2.48	10.00	5.30	7.23*	17.97%
	Posttest	34.80	2.84	10.00			
Control Group	Pre test	29.70	2.58	9.00	0.10	0.28	0.34%
	Posttest	29.60	1.96	8.00			

Table t-ratio at 0.05 level of confidence for 19 (df) =2.09

*Significant

Table-XIV showed that the mean, standard deviation, range and mean difference values of the pre and post test data collected from the experimental and control groups on muscular strength. Further, the collected data was statistically analyzed by paired 't' test to find out the significant differences if any between the pre and posttest data. The obtained 't' values of cardio-respiratory endurance training, resistance training, core strength training and combined training groups were 12.67, 7.44, 12.74 and 7.23 respectively which was greater than the required table value of 2.09 for significance at 0.05 level for 19 degrees of freedom. However, obtained 't' value 0.28 of control group was lesser than the required table value. It revealed that significant differences exist between the pre and post test means of experimental groups however, no significant difference was found in control group on muscular strength.

It was also observed that percentage of changes in muscular strength of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 14.26 %, 17.66 %, 30.45 %, 17.97 % and 0.34 % respectively.

The pre and post test data collected from the experimental and control groups on muscular strength was statistically analyzed by using analysis of covariance and the results are presented in table–XV.

Table – XV

ANALYSIS OF COVARIANCE ON MUSCULAR STRENGTH OF EXPERIMENTAL AND CONTROL GROUPS

	CRETGroup	RTGroup	CSTGroup	CTGroup	ControlGroup	SOV	Sum ofSquares	df	Meansquares	'F' ratio
Pre test Mean SD	28.75	30.30	28.90	29.50	29.70	B	31.56	4	7.89	1.04
	3.73	2.00	2.67	2.48	2.58	W	718.95	95	7.57	
Post test Mean SD	32.85	35.65	37.70	34.80	29.60	B	753.26	4	188.32	22.33*
	3.83	3.05	2.52	2.84	1.96	W	801.30	95	8.44	
Adjusted Post test Mean	33.25	35.14	38.01	34.76	29.44	B	783.19	4	195.80	33.41*
						W	550.83	94	5.86	

Table F-ratio at 0.05 level of confidence for 4 and 95 (df) = 2.46, 4 and 94 (df) = 2.47

*Significant

Table-XV showed that the pre-test means and standard deviation on muscular strength of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups are 28.75 ± 3.73, 30.30 ± 2.00, 28.90 ±

2.67, 29.50 ± 2.48 and 29.70 ± 2.58 respectively. The obtained 'F' value 1.04 of muscular strength was lesser than the required table value of 2.46 for the degrees of freedom 4 and 95 at 0.05 level of confidence, which proved that the random assignment of the subjects were successful and their scores in muscular strength before the training were equal and there was no significant differences.

The post-test means and standard deviation on muscular strength of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups are 32.85 ± 3.83, 35.65 ± 3.05, 37.70 ± 2.52, 34.80 ± 2.84 and 29.60 ± 1.96 respectively. The obtained 'F' value 22.33 of muscular strength was greater than the required table value of 2.46 for the degrees of freedom 4 and 95at 0.05 level of confidence. It implies that significant differences existed between the five groups during the post test period on muscular strength.

The adjusted post-test means on muscular strength of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups are 33.25, 35.14, 38.01, 34.76 and 29.44 respectively. The obtained 'F' value 33.41 of muscular strength was greater than the required table value of 2.47 for the degrees of freedom 4 and 94 at 0.05 level of confidence. Hence, it was concluded that significant differences existed between the adjusted post test means of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on muscular strength.

Since, the obtained 'F' value in the adjusted post test means was found to be significant, the Scheffe's test is applied as post hoc test to find out the paired mean difference, and it is presented in table-XVI.

Table -XVI

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCES AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON MUSCULAR STRENGTH

Cardio Respiratory Endurance Training	Resistance Training	Core Strength Training	Combined Training	Control Group	Mean Difference	Confidence Interval
33.25	35.14				1.89	2.41
33.25		38.01			4.76*	2.41
33.25			34.76		1.51	2.41
33.25				29.44	3.81*	2.41
	35.14	38.01			2.87	2.41
	35.14		34.76		0.38	2.41
	35.14			29.44	5.70*	2.41
		38.01	34.76		3.25*	2.41
		38.01		29.44	8.57*	2.41
			34.76	29.44	5.32*	2.41

*Significant at 0 .05 level

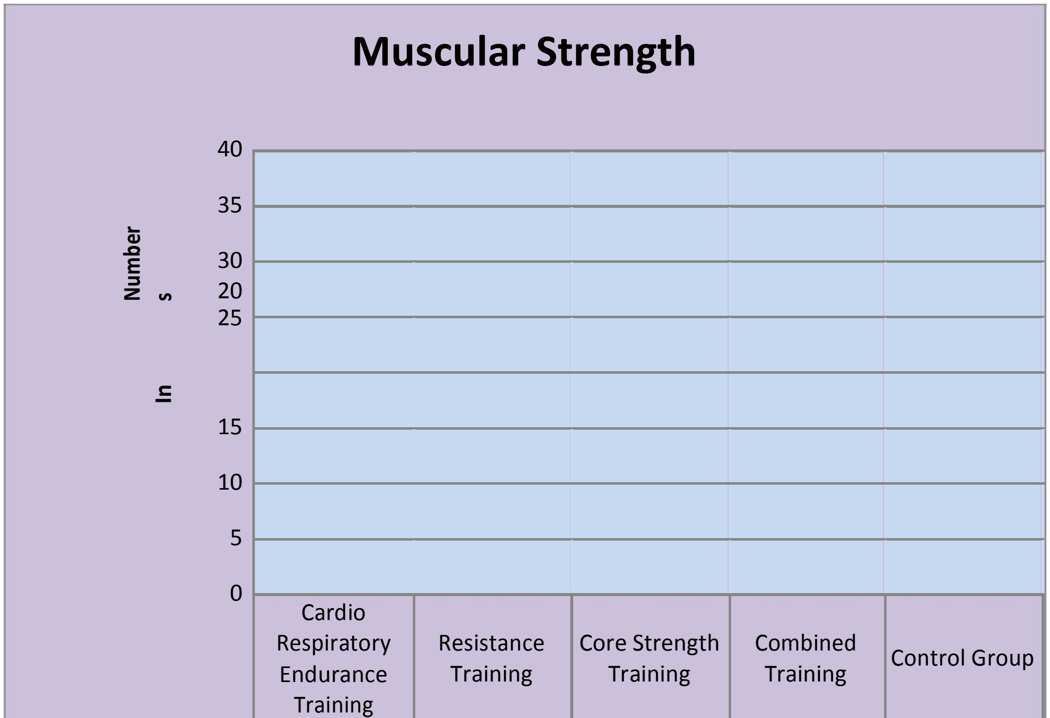
As shown in table-XVI the Scheffe's post hoc analysis proved that significant mean differences existed between cardio-respiratory endurance training and core strength training groups, cardio-respiratory endurance training and control groups, resistance training and control groups, core strength training and combined training groups, core strength training and control groups, combined training and control groups on muscular strength. Since, the mean differences 4.76, 3.81, 5.70, 3.25, 8.57 and 5.32 were higher than the confidence interval value of 2.41 at 0.05 level of significance. However, there was no significant difference between cardio-respiratory endurance training and resistance training, cardio-respiratory endurance training and combined training groups, resistance training and core strength training, resistance training and combined training groups since, the mean differences 1.89, 1.51, 2.87 and 0.38 were lesser than the confidence interval value of 2.41 at 0.05 level of significance.

Hence, it was concluded that due to the effect of cardio-respiratory endurance training, resistance training, core strength training, combined training the muscular strength of the subjects were significantly improved. It was also concluded that core strength training was significantly better than combined training and cardio-respiratory endurance training in improving muscular strength however, statistically no significant differences was found between cardio-respiratory endurance training and resistance training, cardio-respiratory endurance training and combined training, resistance training and core strength training, resistance training and combined training groups in improving muscular strength.

The pre, post and adjusted post test mean values of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on muscular strength is graphically represented in figure-3.

Figure - 3

DIAGRAM SHOWING THE MEAN VALUES ON MUSCULAR STRENGTH OF CARDIO-RESPIRATORY ENDURANCE TRAINING RESISTANCE TRAINING CORE STRENGTH TRAINING COMBINED TRAINING AND CONTROL GROUPS



	Cardio Respiratory Endurance Training	Resistance Training	Core Strength Training	Combined Training	Control Group
Pre test	28.75	30.30	28.90	29.50	29.70
Post test	32.85	35.65	37.70	34.80	29.60
Adjusted Post test	33.25	35.14	38.01	34.76	29.44

4.4.4 RESULTS OF FLEXIBILITY

The descriptive analysis of the pre and post test data showing mean and standard deviation, range, mean differences, 't' ratio and percentage of improvement on flexibility of experimental and control groups are presented in table-XVII.

Table – XVII

DESCRIPTIVE ANALYSIS OF THE PRE AND POST TEST DATA AND ‘t’ RATIO ON FLEXIBILITY OF EXPERIMENTAL AND CONTROL GROUPS

Group	Test	Mean	Standard Deviation	Range	Mean Differences	‘t’ ratio	Percentage of changes
Cardio-Respiratory Endurance Training	Pre test	27.90	3.57	14.00	3.05	8.87*	10.93%
	Posttest	30.95	3.93	17.00			
Resistance Training	Pre test	28.20	4.53	15.00	3.65	4.48*	12.94%
	Posttest	31.85	4.15	14.00			
Core Strength Training	Pre test	28.45	4.37	16.00	8.75	15.59*	30.76%
	Posttest	37.20	3.98	16.00			
Combined Training	Pre test	30.15	3.99	14.00	4.35	14.86*	14.43%
	Posttest	34.50	4.16	15.00			
Control Group	Pre test	27.85	4.18	15.00	0.30	1.06	1.08%
	Posttest	28.15	3.90	15.00			

Table t-ratio at 0.05 level of confidence for 19 (df) =2.09

*Significant

Table-XVII showed that the mean, standard deviation, range and mean difference values of the pre and post test data collected from the experimental and control groups on flexibility. Further, the collected data was statistically analyzed by paired ‘t’ test to find out the significant differences if any between the pre and post data. The obtained ‘t’ values of cardio-respiratory endurance training, resistance training, core strength training and combined training groups were 8.87, 4.48, 15.59

and 14.86 respectively which was greater than the required table value of 2.09 for significance at 0.05 level for 19 degrees of freedom. However, obtained 't' value 1.06 of control group was less than the required table value. It revealed that significant differences existed between the pre and post test means of experimental groups however, no significant difference was found in control group on flexibility.

It was also observed that percentage of changes in flexibility of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 10.93 %, 12.94 %, 30.76 %, 14.43 % and 1.08 % respectively.

The pre and post test data collected from the experimental and control groups on flexibility was statistically analyzed by using analysis of covariance and the results are presented in table–XVIII.

Table –XVIII

ANALYSIS OF COVARIANCE ON FLEXIBILITY OF EXPERIMENTAL AND CONTROL GROUPS

						V S O		**df**		**ratio 'F'**
Pre test Mean SD	27.90	28.20	28.45	30.15	27.85	B	71.94	4	17.99	1.05
	3.57	4.53	4.37	3.99	4.18	W	1629.05	95	17.15	
Post test Mean SD	30.95	31.85	37.20	34.50	28.15	B	956.66	4	239.17	14.77*
	3.93	4.15	3.98	4.16	3.90	W	1538.25	95	16.19	
Adjusted Post test Mean	31.45	32.11	37.25	33.15	28.69	B	770.27	4	192.57	42.10*
						W	430.00	94	4.57	

Table F-ratio at 0.05 level of confidence for 4 and 95 (df) = 2.46, 4 and 94 (df) = 2.47

*Significant

Table-XVIII showed that the pre-test means and standard deviation on flexibility of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 27.90 ± 3.57, 28.20 ± 4.53, 28.45 + 4.37, 30.15 ± 3.99 and 27.85 ± 4.18 respectively. The obtained 'F' value 1.05 of flexibility was lesser than the required table value of 2.46 for the degrees of freedom 4 and 95 at 0.05 level of confidence, which proved that the random assignment of the subjects were successful and their scores in flexibility before the training were equal and there was no significant differences.

The post-test means and standard deviation on flexibility of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups are 30.95 ± 3.93, 31.85 ± 4.15, 37.20 ± 3.98, 34.50 ± 4.16 and 28.15 ± 3.90 respectively. The obtained 'F' value 14.77 of flexibility was greater than the required table value of 2.46 for the degrees of freedom 4 and 95at 0.05 level of confidence. It implied that significant differences existed between the five groups during the post test period on flexibility.

The adjusted post-test means on flexibility of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 31.45, 32.11, 37.25, 33.15 and 28.69 respectively. The obtained 'F' value 42.10 on flexibility was greater than the required table value of 2.47 for the degrees of freedom 4 and 94 at 0.05 level of confidence. Hence, it was concluded that significant differences existed between the adjusted post test means of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on flexibility.

Since, the obtained 'F' ratio value in the adjusted post test means was found to be significant, the Scheffe's test was applied as post hoc test to find out the paired mean difference, and it is presented in table-XIX.

Table -XIX

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCES AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON FLEXIBILITY

Cardio Respiratory Endurance Training	Resistance Training	Core Strength Training	Combined Training	Control Group	Mean Difference	Confidence Interval
31.45	32.11				0.66	2.12
31.45		37.25			5.80*	2.12
31.45			33.15		1.70	2.12
31.45				28.69	2.76*	2.12
	32.11	37.25			5.14*	2.12
	32.11		33.15		1.04	2.12
	32.11			28.69	3.42*	2.12
		37.25	33.15		4.10*	2.12
		37.25		28.69	8.56*	2.12
			33.15	28.69	4.46*	2.12

*Significant at 0 .05 level

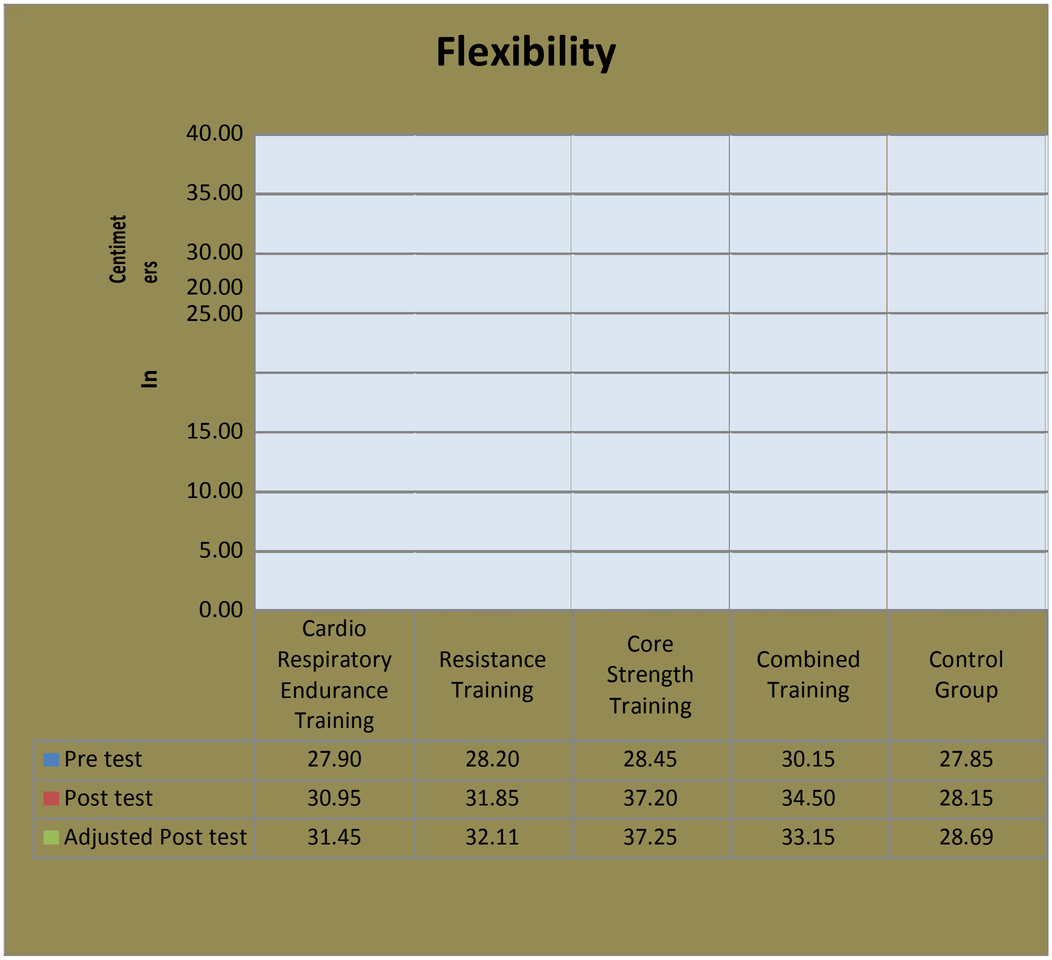
As shown in table-XIX the Scheffe's post hoc analysis proved that significant mean differences existed between cardio-respiratory endurance training and core strength training groups, cardio-respiratory endurance training and control groups, resistance training and core strength training groups, resistance training and control groups, core strength training and combined training groups, core strength training and control groups, combined training and control groups on flexibility. Since, the mean differences 5.80, 2.76, 5.14, 3.42, 4.10, 8.56 and 4.46 were higher than the confident interval value of 2.12 at .05 level of significance. However, there was no significant difference between cardio-respiratory endurance training and resistance training, cardio-respiratory endurance training and combined training groups, resistance training and combined training groups, since, the mean differences 0.66, 1.70 and 1.04 was lesser than the confident interval value of 2.12 at 0 .05 level of significance.

Hence, it was concluded that due to the effect of cardio-respiratory endurance training, resistance training, core strength training and combined training the flexibility of the subjects was significantly improved. It was also concluded that core strength training was significantly better than combined training, resistance training and cardio-respiratory endurance training in improving flexibility however, no significant differences was found between cardio-respiratory endurance training and resistance training, cardio-respiratory endurance training and combined training groups, resistance training and combined training groups in improving flexibility.

The pre, post and adjusted post test mean values of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on flexibility is graphically represented in figure-4.

Figure - 4

DIAGRAM SHOWING THE MEAN VALUES ON FLEXIBILITY OF CARDIO-RESPIRATORY ENDURANCE TRAINING, RESISTANCE TRAINING, CORE STRENGTH TRAINING COMBINED TRAINING AND CONTROL GROUPS



4.4.5 RESULTS OF CARDIO RESPIRATORY ENDURANCE

The descriptive analysis of the pre and post test data showing mean and standard deviation, range, mean differences, ‘t’ ratio and percentage of improvement on cardio respiratory endurance of experimental and control groups are presented in table-XX.

Table – XX

DESCRIPTIVE ANALYSIS OF THE PRE AND POST TEST DATA AND 'ť' RATIO ON CARDIO RESPIRATORY ENDURANCE OF EXPERIMENTAL AND CONTROL GROUPS

Group	Test	Mean	Standard Deviation	Range	Mean Differences	't' ratio	Percentage of changes
Cardio-Respiratory Endurance Training	Pre test	2139.5	144.97	144.97	138.00	9.50*	6.45%
	Posttest	2277.5	133.10	133.10			
Resistance Training	Pre test	2124.5	184.32	184.32	43.00	5.16*	2.02%
	Posttest	2167.5	166.03	166.03			
Core Strength Training	Pre test	2088.0	122.11	122.11	53.00	5.03*	2.54%
	Posttest	2141.0	117.42	117.42			
Combined Training	Pre test	2158.0	139.65	139.65	238.50	17.67*	11.05%
	Posttest	2396.5	112.22	112.22			
Control Group	Pre test	2061.5	176.20	176.20	20.00	1.02	0.97%
	Posttest	2081.5	205.87	205.87			

Table t-ratio at 0.05 level of confidence for 19 (df) =2.09

*Significant

Table-XX showed that the mean, standard deviation, range and mean difference values of the pre and post test data collected from the experimental and control groups on cardio respiratory endurance. Further, the collected data was statistically analyzed by paired 't' test to find out the significant differences if any between the pre and post test data. The obtained 't' values of cardio-respiratory endurance training, resistance training, core strength training and combined training groups were 9.50, 5.16, 5.03 and 17.67 respectively which was greater than the required table value of 2.09 for significance at 0.05 level for 19 degrees of freedom.

However, obtained 't' value 1.02 of control group was lesser than the required table value. It revealed that significant differences existed between the pre and post test means of experimental groups however, no significant difference was found in control group on cardio respiratory endurance.

It was also observed that percentage of changes in cardio respiratory endurance of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 6.45 %, 2.02 %, 2.54%, 11.05 % and 0.97 % respectively.

The pre and post test data collected from the experimental and control groups on cardio respiratory endurance was statistically analyzed by using analysis of covariance and the results are presented in table–XXI.

Table – XXI

ANALYSIS OF COVARIANCE ON CARDIO RESPIRATORY ENDURANCE OF EXPERIMENTAL AND CONTROL GROUPS

	CRETGroup	RTGroup	CSTGroup	CTGroup	ControlGroup	SoV	Sum ofSquares	Df	Mean squares	'F' ratio
Pre test Mean SD	2139.5	2124.5	2088.0	2158.0	2061.5	B	122566.0	4	30641.5	1.27
	144.97	184.32	122.11	139.65	176.20	W	2288485	95	24089.32	
Post test Mean SD	2277.5	2167.5	2141.0	2396.5	2081.5	B	1247576	4	311894.0	13.67*
	133.10	166.03	117.42	112.22	205.87	W	2166840	95	22808.84	
Adjusted Post test Mean	2255.0	2158.0	2165.0	2357.0	2129.0	B	675278.4	4	168819.6	46.84*
						W	338784.7	94	3604.09	

Table F-ratio at 0.05 level of confidence for 4 and 95 (df) = 2.46, 4 and 94 (df) = 2.47

*Significant

As shown in Table-XXI the pre-test means and standard deviation on cardio respiratory endurance of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups are 2139.50 ± 144.97, 2124.50 ± 184.32, 2088.00 ± 122.11, 2158.00 ± 139.65 and 2061.50 ± 176.20 respectively. The obtained 'F' value of 1.27 on cardio respiratory endurance was lesser than the required table value of 2.46 for the degrees of freedom 4 and 95 at 0.05 level of confidence, which proved that the random assignment of the subjects were successful and their scores in cardio respiratory endurance before the training were equal and there was no significant differences.

The post-test means and standard deviation on cardio respiratory endurance of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 2277.50 ± 133.10, 2167.50 ± 166.03, 2141.00 ± 117.42, 2396.50 ± 112.22 and 2081.50 ± 205.87 respectively. The obtained 'F' value 13.67 of cardio respiratory endurance was greater than the required table value of 2.46 for the degrees of freedom 4 and 95at 0.05 level of confidence. It implied that significant differences existed between the five groups during the post test period on cardio respiratory endurance.

The adjusted post-test means on cardio respiratory endurance of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 2255.00, 2158.00, 2165.00, 2357.00 and 2129.00 respectively. The obtained 'F' value 46.84 of cardio respiratory endurance was greater than the required table value of 2.47 for the degrees of freedom 4 and 94 at 0.05 level of confidence. Hence, it was concluded that significant differences exist between the adjusted post test means of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on cardio respiratory endurance. Since, the obtained 'F' value in the adjusted post test means was found to be significant, the Scheffe's test was applied as post hoc test to find out the paired mean difference, and it is presented in table-XXII.

Table -XXII

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCES AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON CARDIO RESPIRATORY ENDURANCE

Cardio Respiratory Endurance Training	Resistance Training	Core Strength Training	Combined Training	Control Group	Mean Difference	Confidence Interval
2255.00	2158.00				97.00*	59.67
2255.00		2165.00			90.00*	59.67
2255.00			2357.00		102.00*	59.67
2255.00				2129.00	126.00*	59.67
	2158.00	2165.00			7.00	59.67
	2158.00		2357.00		199.00*	59.67
	2158.00			2129.00	29.00	59.67
		2165.00	2357.00		192.00*	59.67
		2165.00		2129.00	36.00	59.67
			2357.00	2129.00	228.00*	59.67

*Significant at 0.05 level

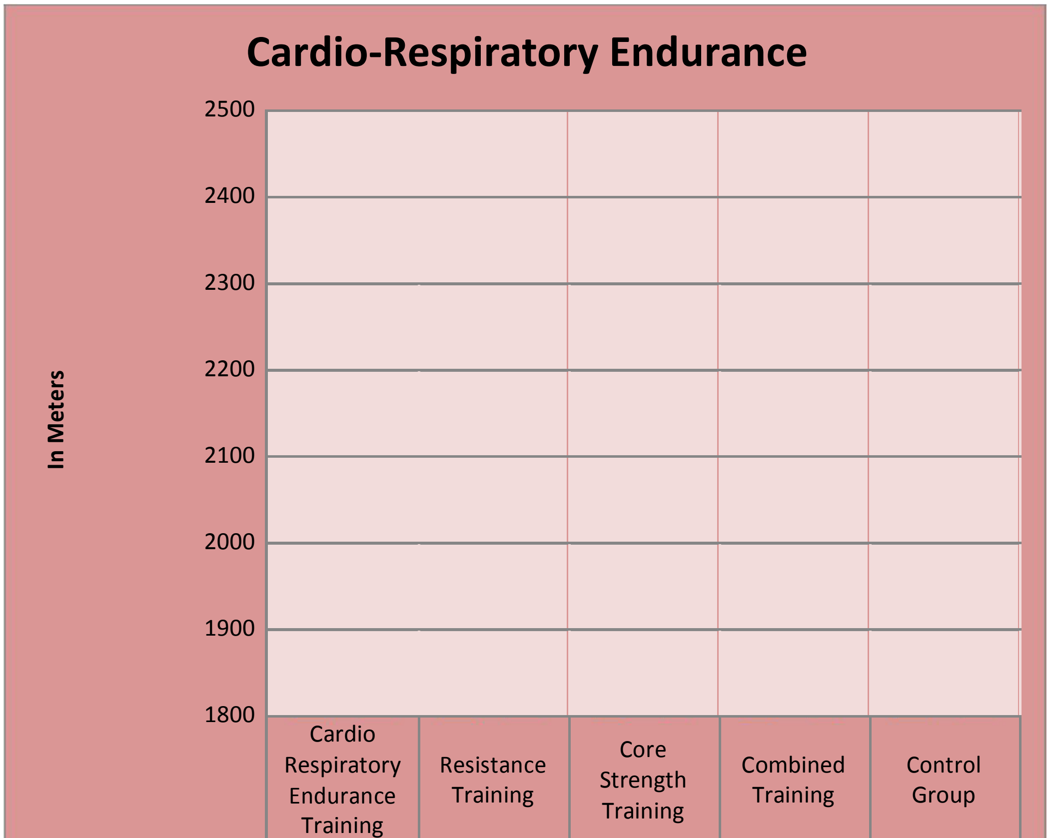
As shown in table-XXII the Scheffe's post hoc analysis proved that significant mean differences existed between cardio-respiratory endurance training and resistance training groups, cardio-respiratory endurance training and core strength training groups, cardio-respiratory endurance training and combined training groups, cardio-respiratory endurance training and control groups, resistance training and combined training groups, core strength training and combined training groups, combined training and control groups on cardio respiratory endurance. Since, the mean differences 97.00, 90.00, 102.00, 126.00, 199.00, 192.00 and 228.00 are higher than the confident interval value of 59.67 at 0 .05 level of significance. However, there was no significant difference between resistance training and core strength training groups, resistance training and control groups, core strength training and control groups since, the mean differences 7.00, 29.00 and 36.00 were lesser than the confident interval value of 59.67 at 0 .05 level of significance.

Hence, it was concluded that due to the effect of cardio-respiratory endurance training and combined training the cardio respiratory endurance of the subjects were significantly improved however no significant improvement was found due to resistance training and core strength training. It is also concluded that combined training was significantly better than cardio-respiratory endurance training, core strength training and resistance training groups in improving cardio respiratory endurance however, no significant differences was found between resistance training and core strength training groups in improving cardio respiratory endurance.

The pre, post and adjusted post test mean values of cardio respiratory endurance of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on cardio respiratory endurance is graphically represented in figure-5.

Figure - 5

DIAGRAM SHOWING THE MEAN VALUES ON CARDIO RESPIRATORY ENDURANCE OF EXPERIMENTAL AND CONTROL GROUPS



	Cardio Respiratory Endurance Training	Resistance Training	Core Strength Training	Combined Training	Control Group
Pre test	2139.5	2124.5	2088.0	2158.0	2061.5
Post test	2277.5	2167.5	2141.0	2396.5	2081.5
Adjusted Post test	2255.0	2158.0	2165.0	2357.0	2129.0

4.5 COMPUTATION OF CORRELATED ‘t’ RATIO, COVARIANCE AND POST HOC TEST FOR PHYSIOLOGICAL VARIABLES

4.5.1 RESULTS OF RESTING PULSE RATE

The descriptive analysis of the pre and post test data showing mean and standard deviation, range, mean differences, ‘t’ ratio and percentage of improvement on resting pulse rate of experimental and control groups are presented in table-XXIII.

Table – XXIII

DESCRIPTIVE ANALYSIS OF THE PRE AND POST TEST DATA AND 't' RATIO ON RESTING PULSE RATE OF EXPERIMENTAL AND CONTROL GROUPS

Group	Test	Mean	Standard Deviation	Range	Mean Differences	't' ratio	Percentage of changes
Cardio-Respiratory Endurance Training	Pre test	71.00	2.13	2.13	8.05	18.37*	11.34%
	Posttest	62.95	2.96	2.96			
Resistance Training	Pre test	70.95	1.61	1.61	3.90	10.56*	5.50%
	Posttest	67.05	2.80	2.80			
Core Strength Training	Pre test	71.10	2.27	2.27	4.50	10.72*	6.33%
	Posttest	66.60	3.65	3.65			
Combined Training	Pre test	70.05	2.37	2.37	6.95	11.25*	9.92%
	Posttest	63.65	4.32	4.02			
Control Group	Pre test	69.65	2.13	2.13	0.40	1.17	0.57%
	Posttest	70.05	1.47	1.47			

Table t-ratio at 0.05 level of confidence for 19 (df) =2.09

*Significant

Table-XXIII showed that the mean, standard deviation, range and mean difference values of the pre and post test data collected from the experimental and control groups on resting pulse rate. Further, the collected data was statistically analyzed by paired 't' test to find out the significant differences if any between the pre and post data. The obtained 't' values of cardio-respiratory endurance training, resistance training, core strength training and combined training groups were 18.37, 10.56, 10.72 and 11.25 respectively which was greater than the required table value of

2.09 for significance at 0.05 level for 19 degrees of freedom. However, obtained ‘t’ value 1.17 of control group was lesser than the required table value. It revealed that significant differences exist between the pre and post test means of experimental groups however, no significant difference was found in control group on resting pulse rate.

It was also observed that percentage of changes in resting pulse rate of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 11.34 %, 5.50 %, 6.33 %, 9.92 % and 0.57 % respectively.

The pre and post test data collected from the experimental and control groups on resting pulse rate was statistically analyzed by analysis of covariance and the results are presented in table–XXIV.

Table – XXIV

ANALYSIS OF COVARIANCE ON RESTING PULSE RATE OF EXPERIMENTAL AND CONTROL GROUPS

	CRETGroup	RTGroup	CSTGroup	CTGroup	ControlGroup	SOV	Sum ofSquares	df	MeanSquares	‘F’ ratio
Pre test Mean SD	71.00	70.95	71.10	70.05	69.65	B	34.50	4	8.63	1.92
	2.13	1.61	2.27	2.37	2.13	W	426.25	95	4.49	
Post test Mean SD	62.95	67.05	66.60	63.65	70.05	B	711.30	4	177.83	18.41*
	2.96	2.80	3.65	4.32	1.47	W	917.45	95	9.66	
Adjusted Post test Mean	62.44	66.60	65.98	63.66	71.07	B	862.75	4	215.69	54.15*
						W	374.44	94	3.98	

Table F-ratio at 0.05 level of confidence for 4 and 95 (df) = 2.46, 4 and 94 (df) = 2.47

*Significant

As shown in Table-XXIV showed that the pre-test means and standard deviation on resting pulse rate of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 71.00 ± 2.13, 70.95 ± 1.61, 71.10 ± 2.27, 70.05 ± 2.37 and 69.65 ± 2.13 respectively. The obtained 'F' value 1.92 on resting pulse rate was lesser than the required table value of 2.46 for the degrees of freedom 4 and 95 at 0.05 level of confidence, which proved that the random assignment of the subjects were successful and their scores on resting pulse rate before the training were equal and there was no significant differences.

The post-test means and standard deviation on resting pulse rate of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 62.95 ± 2.96, 67.05 ± 2.80, 66.60 ± 3.65, 63.65 ± 4.32 and 70.05 ± 1.47 respectively. The obtained 'F' value 18.41 of resting pulse rate was greater than the required table value of 2.46 for the degrees of freedom 4 and 95at 0.05 level of confidence. It implied that significant differences existed between the five groups during the post test period on resting pulse rate.

The adjusted post-test means on resting pulse rate of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups are 62.44, 66.60, 65.98, 63.66 and 71.07 respectively. The obtained 'F' value 54.15 of resting pulse rate was greater than the required table value of 2.47 for the degrees of freedom 4 and 94 at 0.05 level of confidence. Hence, it was concluded that significant differences exist between the adjusted post test means of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on resting pulse rate.

Since, the obtained 'F' value in the adjusted post test means was found to be significant, the Scheffe's test was applied as post hoc test to find out the paired mean difference, and it is presented in table-XXV.

Table -XXV

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCES AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON RESTING PULSE RATE

Cardio Respiratory Endurance Training	Resistance Training	Core Strength Training	Combined Training	Control Group	Mean Difference	Confidence Interval
62.44	66.60				4.16*	1.98
62.44		65.98			3.54*	1.98
62.44			63.66		1.22	1.98
62.44				71.07	8.63*	1.98
	66.60	65.98			0.62	1.98
	66.60		63.66		2.94*	1.98
	66.60			71.07	4.47*	1.98
		65.98	63.66		2.32*	1.98
		65.98		71.07	5.09*	1.98
			63.66	71.07	7.41*	1.98

*Significant at 0.05 level

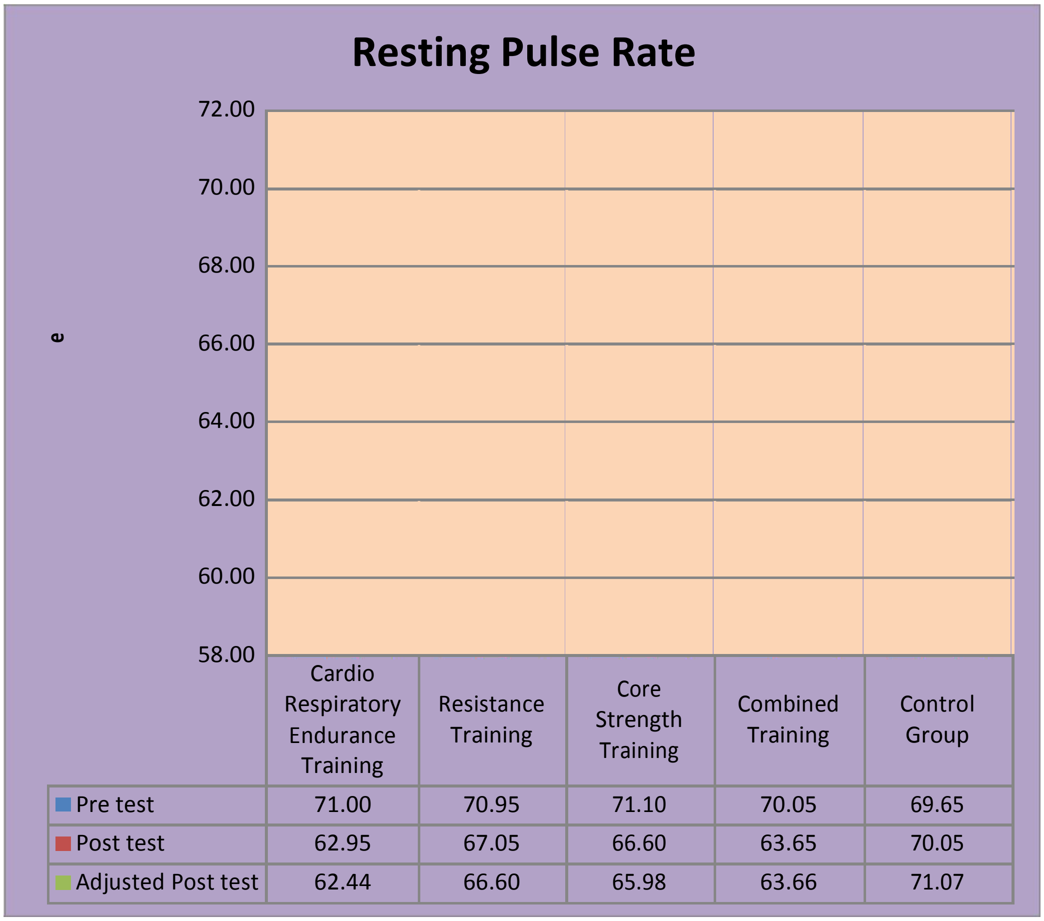
From table-XXV the Scheffe's post hoc analysis proved that significant mean differences existed between cardio-respiratory endurance training and resistance training groups, cardio-respiratory endurance training and core strength training groups, cardio-respiratory endurance training and control groups, resistance training and combined training groups, resistance training and control groups, core strength training and combined training groups, core strength training and control groups, combined training and control groups on resting pulse rate. Since, the mean differences 4.16, 3.54, 8.63, 2.94, 4.47, 2.32, 5.09 and 7.41were higher than the confident interval value of 1.98 at 0.05 level of significance. However, there was no significant difference between cardio-respiratory endurance training and combined training groups, resistance training and core strength training groups, since, the mean differences 1.22 and 0.62 was lesser than the confident interval value of 1.98 at 0.05 level of significance.

Hence, it was concluded that due to the effect of cardio-respiratory endurance training, resistance training, core strength training, combined training the resting pulse rate of the subjects was significantly decreased. It was also concluded that cardio-respiratory endurance training and combined training were significantly better than resistance training and core strength training in alteringing resting pulse rate however, no significant differences was found between cardio-respiratory endurance training and combined training, resistance training and core strength training groups in decreasing resting pulse rate.

The pre, post and adjusted post test mean values of cardio respiratory endurance of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on resting pulse rate is graphically represented in figure-6.

Figure - 6

BAR DIAGRAM SHOWING THE MEAN VALUES ON RESTING PULSE RATE OF EXPERIMENTAL AND CONTROL GROUPS



4.5.2 RESULTS OF SYSTOLIC BLOOD PRESSURE

The descriptive analysis of the pre and post test data showing mean and standard deviation, range, mean differences, 't' ratio and percentage of improvement on systolic blood pressure of experimental and control groups are presented in table-XXVI.

Table – XXVI

DESCRIPTIVE ANALYSIS OF THE PRE AND POST TEST DATA AND 't' RATIO ON SYSTOLIC BLOOD PRESSURE OF EXPERIMENTAL AND CONTROL GROUPS

Group	Test	Mean	Standard Deviation	Range	Mean Differences	't' ratio	Percentage of changes
Cardio-Respiratory Endurance Training	Pre test	125.10	2.49	11.00	5.05	12.41*	4.04%
	Posttest	120.05	1.67	6.00			
Resistance Training	Pre test	126.25	2.88	10.00	3.80	11.54*	3.01%
	Posttest	122.45	2.54	9.00			
Core Strength Training	Pre test	125.70	2.64	10.00	2.85	10.40*	2.27%
	Posttest	122.85	2.64	10.00			
Combined Training	Pre test	125.55	3.20	10.00	6.25	12.20*	4.98%
	Posttest	119.30	1.72	6.00			
Control Group	Pre test	126.90	3.08	11.00	0.25	0.72	0.20%
	Posttest	127.15	3.75	12.00			

Table t-ratio at 0.05 level of confidence for 19 (df) =2.09

*Significant

Table-XXVI shows that the mean, standard deviation, range and mean difference values of the pre and post test data collected from the experimental and control groups on systolic blood pressure. Further, the collected data was statistically analyzed by paired 't' test to find out the significant differences if any between the pre and post data. The obtained 't' values of cardio-respiratory endurance training, resistance training, core strength training and combined training groups were 12.41, 11.54, 10.40 and 12.20 respectively which was greater than the required table value of 2.09 for significance at 0.05 level for 19 degrees of freedom. However, obtained 't' value 0.72 of control group was lesser than the required table value. It revealed that significant differences existed between the pre and post test means of experimental groups however, no significant difference was found in control group on systolic blood pressure.

It was also observed that percentage of changes in systolic blood pressure of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 4.04 %, 3.01 %, 2.27 %, 4.98 % and 0.20 % respectively.

The pre and post test data collected from the experimental and control groups on systolic blood pressure was statistically analyzed by analysis of covariance and the results are presented in table–XXVII.

Table – XXVII

ANALYSIS OF COVARIANCE ON SYSTOLIC BLOOD PRESSURE OF EXPERIMENTAL AND CONTROL GROUPS

	CRETGroup	RTGroup	CSTGroup	CTGroup	ControlGroup	SOV	Sum ofSquares	df	Meansquares	'F' ratio
Pre test Mean SD	125.10	126.25	125.70	125.55	126.90	B	38.50	4	9.63	1.17
	2.49	2.88	2.64	3.20	3.08	W	782.50	95	8.24	
Post test Mean SD	120.05	122.45	122.85	119.30	127.15	B	757.84	4	189.46	28.52*
	1.67	2.54	2.64	1.72	3.75	W	631.20	95	6.64	
Adjusted Post test Mean	120.60	122.20	123.00	119.60	126.40	B	537.30	4	134.33	57.59*
						W	219.26	94	2.33	

Table F-ratio at 0.05 level of confidence for 4 and 95 (df) = 2.46, 4 and 94 (df) = 2.47

*Significant

Table-XXVII shows that the pre-test means and standard deviation on systolic blood pressure of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 125.10 ± 2.49, 126.25 ± 2.88, 125.70 ± 2.64, 125.55 ± 3.20 and 126.90 ± 3.08 respectively. The obtained 'F' value 1.17 of systolic blood pressure was lesser than the required table value of 2.46 for the degrees of freedom 4 and 95 at 0.05 level of confidence, which proved that the random assignment of the subjects were successful and their scores in systolic blood pressure before the training were equal and there was no significant differences.

The post-test means and standard deviation on systolic blood pressure of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 120.05 ± 1.67, 122.45 ± 2.54, 122.85 ± 2.64, 119.30 ± 1.72 and 127.15 ± 3.75 respectively. The obtained 'F' value 28.52 of systolic blood pressure was greater than the required table value of 2.46 for the degrees of freedom 4 and 95 at 0.05 level of confidence. It implied that significant differences existed between the five groups during the post test period on systolic blood pressure.

The adjusted post-test means on systolic blood pressure of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 120.60, 122.20, 123.00, 119.60 and 126.40 respectively. The obtained 'F' value 57.59 of systolic blood pressure was greater than the required table value of 2.47 for the degrees of freedom 4 and 94 at 0.05 level of confidence. Hence, it was concluded that significant differences existed between the adjusted post test means of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on systolic blood pressure.

Since, the obtained 'F' value in the adjusted post test means was found to be significant, the Scheffe's test was applied as post hoc test to find out the paired mean difference, and it is presented in table-XXVIII.

Table -XXVIII

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCES AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON SYSTOLIC BLOOD PRESSURE

Cardio Respiratory Endurance Training	Resistance Training	Core Strength Training	Combined Training	Control Group	Mean Difference	Confidence Interval
120.60	122.20				1.60*	1.52
120.60		123.00			2.40*	1.52
120.60			119.60		2.20*	1.52
120.60				126.40	5.80*	1.52
	122.20	123.00			0.80	1.52
	122.20		119.60		2.60*	1.52
	122.20			126.40	4.20*	1.52
		123.00	119.60		3.40*	1.52
		123.00		126.40	3.40*	1.52
			119.60	126.40	6.80*	1.52

*Significant at 0 .05 level

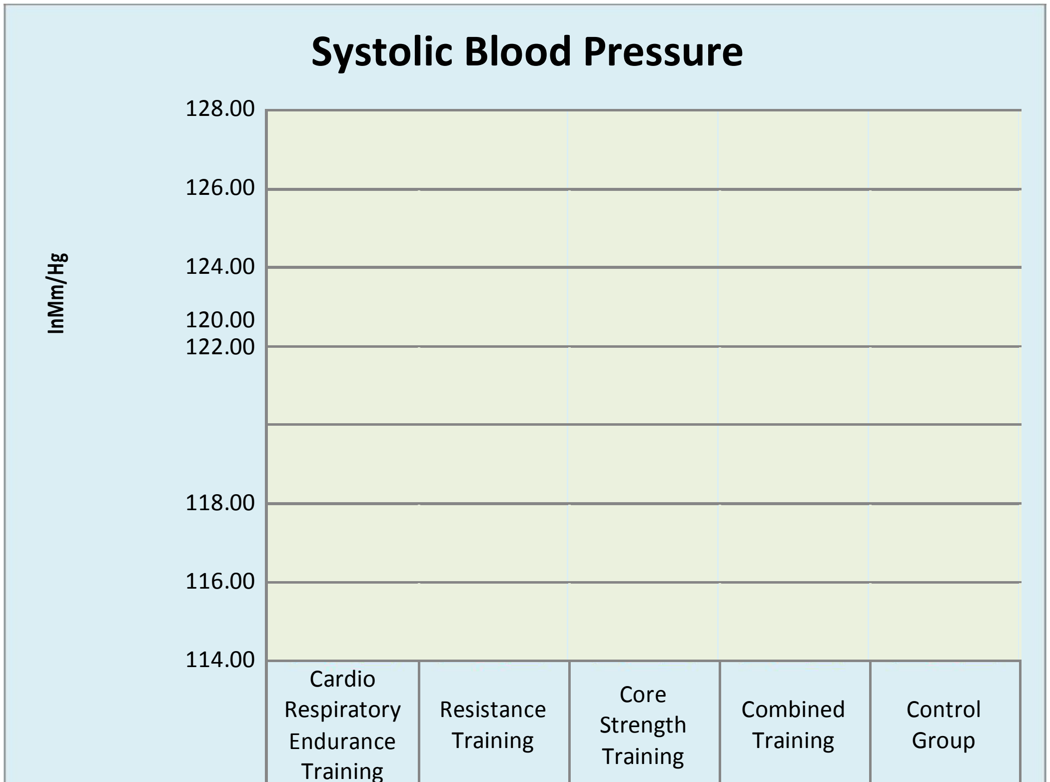
From table-XXVIII the Scheffe's post hoc analysis proved that significant mean differences existed between cardio-respiratory endurance training and resistance training groups, cardio-respiratory endurance training and core strength training groups, cardio-respiratory endurance training and combined training groups, cardio-respiratory endurance training and control groups, resistance training and combined training groups, resistance training and control groups, core strength training and combined training groups, core strength training and control groups, combined training and control groups on systolic blood pressure. Since, the mean differences 1.60, 2.40, 2.20, 5.80, 2.60, 4.20, 3.40, 3.40 and 6.80 were higher than the confident interval value of 1.52 at 0.05 level of significance. However, there was no significant difference between resistance training and core strength training groups, since, the mean differences 0.80 is lesser than the confident interval value of 1.52 at 0.05 level of significance.

Hence, it was concluded that due to the effect of cardio-respiratory endurance training, resistance training, core strength training, combined training the systolic blood pressure of the subjects was significantly decreased. It was also concluded that combined training was significantly better than cardio-respiratory endurance training, resistance training and core strength training and cardio-respiratory endurance training was significantly better than resistance training and core strength training however, no significant differences was found between resistance training and core strength training in decreasing systolic blood pressure.

The pre, post and adjusted post test mean values of cardio respiratory endurance of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on systolic blood pressure is graphically represented in figure-7.

Figure - 7

BAR DIAGRAM SHOWING THE MEAN VALUES ON SYSTOLIC BLOOD PRESSURE OF EXPERIMENTAL AND CONTROL GROUPS



	Cardio Respiratory Endurance Training	Resistance Training	Core Strength Training	Combined Training	Control Group
Pre test	125.10	126.25	125.70	125.55	126.90
Post test	120.05	122.45	122.85	119.30	127.15
Adjusted Post test	120.60	122.20	123.00	119.60	126.40

4.5.3 RESULTS OF DIASTOLIC BLOOD PRESSURE

The descriptive analysis of the pre and post test data showing mean and standard deviation, range, mean differences, 't' ratio and percentage of improvement on diastolic blood pressure of experimental and control groups are presented in table-XXIX.

Table – XXIX

DESCRIPTIVE ANALYSIS OF THE PRE AND POST TEST DATA AND 't' RATIO ON DIASTOLIC BLOOD PRESSURE OF EXPERIMENTAL AND CONTROL GROUPS

Group	Test	Mean	Standard Deviation	Range	Mean Differences	't' ratio	Percentage
Cardio-Respiratory Endurance Training	Pre test	81.40	2.82	10.00	2.45	14.43*	3.01%
	Posttest	78.95	2.48	8.00			
Resistance Training	Pre test	81.60	2.44	8.00	2.35	7.38*	2.88%
	Posttest	79.25	2.17	8.00			
Core Strength Training	Pre test	80.95	2.58	10.00	1.85	6.75*	2.29%
	Posttest	79.10	2.05	7.00			
Combined Training	Pre test	82.00	2.80	10.00	3.10	15.20*	3.78%
	Posttest	78.90	2.29	8.00			
Control Group	Pre test	82.05	2.48	9.00	0.10	0.30	0.12%
	Posttest	81.95	2.76	9.00			

Table t-ratio at 0.05 level of confidence for 19 (df) =2.09

*Significant

Table-XXIX shows that the mean, standard deviation, range and mean difference values of the pre and post test data collected from the experimental and control groups on diastolic blood pressure. Further, the collected data was statistically analyzed by paired 't' test to find out the significant differences if any between the pre and post data. The obtained 't' values of cardio-respiratory endurance training, resistance training, core strength training and combined training groups were 14.43, 7.38, 6.75 and 15.20 respectively which was greater than the required table value of

2.09 for significance at 0.05 level for 19 degrees of freedom. However, obtained ‘t’ value 0.30 of control group was lesser than the required table value. It revealed that significant differences existed between the pre and post test means of experimental groups however, no significant difference was found in control group on diastolic blood pressure.

It was also observed that percentage of changes in diastolic blood pressure of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 3.01 %, 2.88 %, 2.29 %, 3.78 % and 0.12 % respectively.

The pre and post test data collected from the experimental and control groups on diastolic blood pressure was statistically analyzed by analysis of covariance and the results are presented in table–XXX.

Table – XXX

ANALYSIS OF COVARIANCE ON DIASTOLIC BLOOD PRESSURE OF EXPERIMENTAL AND CONTROL GROUPS

	CRETGroup	RTGroup	CSTGroup	CTGroup	Control Group	SOV	Sum ofSquares	df	Meansquares	‘F’ ratio
Pre test Mean	81.40	81.60	80.95	82.00	82.05	B	16.50	4	4.13	0.60
SD	2.82	2.44	2.58	2.80	2.48	W	657.50	95	6.92	
Post test Mean	78.95	79.25	79.10	78.90	81.95	B	136.06	4	34.02	6.08*
SD	2.48	2.17	2.05	2.29	2.76	W	531.25	95	5.59	
Adjusted Post test Mean	79.11	79.25	79.62	78.58	81.59	B	107.00	4	26.75	22.62*
						W	111.17	94	1.18	

Table F-ratio at 0.05 level of confidence for 4 and 95 (df) = 2.46, 4 and 94 (df) = 2.47

*Significant

Table-XXX shows that the pre-test means and standard deviation on diastolic blood pressure of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 81.40 $\pm$ 2.82, 81.60 $\pm$ 2.44, 80.95 $\pm$ 2.58, 82.00 $\pm$ 2.80 and 82.05 $\pm$ 2.48 respectively. The obtained 'F' value 0.60 of diastolic blood pressure was lesser than the required table value of 2.46 for the degrees of freedom 4 and 95 at 0.05 level of confidence, which proved that the random assignment of the subjects were successful and their scores in diastolic blood pressure before the training were equal and there was no significant differences.

The post-test means and standard deviation on diastolic blood pressure of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 78.95 $\pm$ 2.48, 79.25 $\pm$ 2.17, 79.10 $\pm$ 2.05, 78.90 $\pm$ 2.29 and 81.95 $\pm$ 2.76 respectively. The obtained 'F' value 6.08 of diastolic blood pressure was greater than the required table value of 2.46 for the degrees of freedom 4 and 95 at 0.05 level of confidence. It implied that significant differences existed between the five groups during the post test period on diastolic blood pressure.

The adjusted post-test means on diastolic blood pressure of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 79.11, 79.25, 79.62, 78.58 and 81.59 respectively. The obtained 'F' value 22.62 of diastolic blood pressure was greater than the required table value of 2.47 for the degrees of freedom 4 and 94 at 0.05 level of confidence. Hence, it was concluded that significant differences existed between the adjusted post test means of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on diastolic blood pressure.

Since, the obtained 'F' value in the adjusted post test means was found to be significant, the Scheffe's test was applied as post hoc test to find out the paired mean difference, and it is presented in table-XXXI.

Table -XXXI

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCES AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON DIASTOLIC BLOOD PRESSURE

Cardio Respiratory Endurance Training	Resistance Training	Core Strength Training	Combined Training	Control Group	Mean Difference	Confidence Interval
79.11	79.25				0.14	1.08
79.11		79.62			0.51	1.08
79.11			78.58		0.53	1.08
79.11				81.59	2.48*	1.08
	79.25	79.62			0.37	1.08
	79.25		78.58		0.67	1.08
	79.25			81.59	2.34*	1.08
		79.62	78.58		1.04	1.08
		79.62		81.59	1.97*	1.08
			78.58	81.59	3.01*	1.08

*Significant at 0.05 level

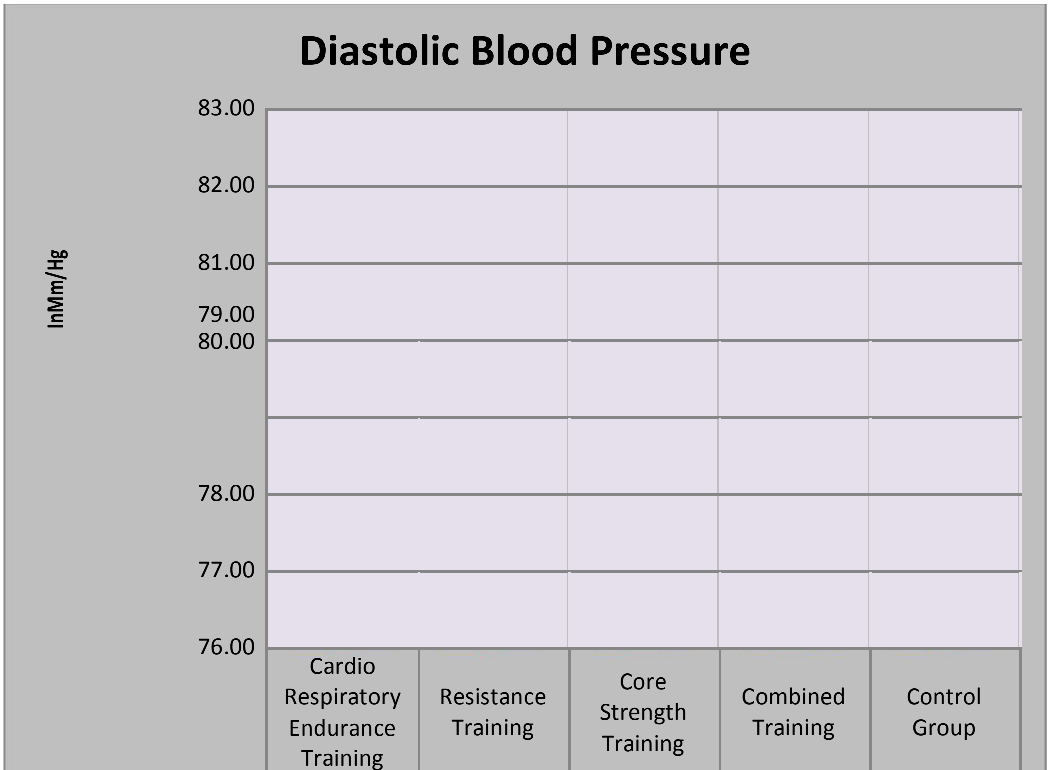
From table-XXXI the Scheffe's post hoc analysis proved that significant mean differences exist between cardio-respiratory endurance training and control group, resistance training and control groups, core strength training and control groups, combined training and control groups on diastolic blood pressure. Since, the mean differences 2.48, 2.34, 1.97 and 3.01 was higher than the confident interval value of 1.08 at 0.05 level of significance. However, there was no significant difference between cardio-respiratory endurance training and resistance training, cardio-respiratory endurance training and core strength training, cardio-respiratory endurance training and combined training, resistance training and core strength training, resistance training and combined training group, core training and combined training group, since, the mean differences 0.14, 0.51, 0.53, 0.37, 0.67 and 1.04 was lesser than the confident interval value of 1.08 at 0.05 level of significance.

Hence, it was concluded that due to the effect of cardio-respiratory endurance training, resistance training, core strength training, combined training the diastolic blood pressure of the subjects was significantly decreased. It was also concluded that no significant differences was found between the experimental treatment in altering the diastolic blood pressure.

The pre, post and adjusted post test mean values of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on diastolic blood pressure is graphically represented in figure-8.

Figure - 8

BAR DIAGRAM SHOWING THE MEAN VALUES ON DIASTOLIC BLOOD PRESSURE OF EXPERIMENTAL AND CONTROL GROUPS



	Cardio Respiratory Endurance Training	Resistance Training	Core Strength Training	Combined Training	Control Group
Pre test	81.40	81.60	80.95	82.00	82.05
Post test	78.95	79.25	79.10	78.90	81.95
Adjusted Post test	79.11	79.25	79.62	78.58	81.59

4.5.4 RESULTS OF VITAL CAPACITY

The descriptive analysis of the pre and post test data showing mean and standard deviation, range, mean differences, ‘t’ ratio and percentage of improvement on vital capacity of experimental and control groups are presented in table-XXXII.

Table – XXXII

DESCRIPTIVE ANALYSIS OF THE PRE AND POST TEST DATA AND 't' RATIO ON VITAL CAPACITY OF EXPERIMENTAL AND CONTROL GROUPS

Group	Test	Mean	Standard Deviation	Range	Mean Differences	't' ratio	Percentage
Cardio-Respiratory Endurance Training	Pre test	2887.2	54.95	230.0	233.70	12.68	8.09%
	Posttest	3121.0	85.28	295.0			
Resistance Training	Pre test	2875.6	65.72	249.0	202.90	7.36	7.06%
	Posttest	3078.5	80.49	240.0			
Core Strength Training	Pre test	2884.2	53.00	220.0	184.20	9.11	6.39%
	Posttest	3068.5	100.97	425.0			
Combined Training	Pre test	2866.5	81.23	290.0	238.50	8.10	8.32%
	Posttest	3105.0	110.96	335.0			
Control Group	Pre test	2870.5	68.29	240.0	5.75	0.58	0.20%
	Posttest	2876.2	50.10	190.0			

Table t-ratio at 0.05 level of confidence for 19 (df) =2.09

*Significant

Table-XXXII shows that the mean, standard deviation, range and mean difference values of the pre and post test data collected from the experimental and control groups on vital capacity. Further, the collected data was statistically analyzed by paired 't' test to find out the significant differences if any between the pre and post data. The obtained 't' ratio values of cardio-respiratory endurance training, resistance training, core strength training and combined training groups were 12.68, 7.36, 9.11 and 8.10 respectively which was greater than the required table value of 2.09 for significance at 0.05 level for 19 degrees of freedom. However, obtained 't' value 0.58 of control group was lesser than the required table value. It revealed that significant differences exist between the pre and post test means of experimental groups however, no significant difference was found in control group on vital capacity.

It was also observed that percentage of changes in vital capacity of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 8.09 %, 7.06 %, 6.39 %, 8.32 % and 0.20 % respectively.

The pre and post test data collected from the experimental and control groups on vital capacity was statistically analyzed by analysis of covariance and the results are presented in table–XXXIII.

Table – XXXIII

ANALYSIS OF COVARIANCE ON VITAL CAPACITY OF EXPERIMENTAL AND CONTROL GROUPS

	CRETGroup	RTGroup	CSTGroup	CTGroup	ControlGroup	SOV	Sum of Squares	df	Mean squares	'F' ratio
Pre test Mean	2887.2	2875.6	2884.2	2866.5	2870.5	B	6240.9	4	1560.24	0.36
SD	54.95	65.72	53.00	81.23	68.29	W	406752.5	95	4281.61	
Post test Mean	3121.0	3078.5	3068.5	3105.0	2876.2	B	788189.0	4	197047.3	25.41*
SD	85.28	80.49	100.97	110.96	50.10	W	736633.8	95	7754.04	
Adjusted Post test Mean	3118.0	3079.0	3067.0	3108.0	2878.0	B	773220.2	4	193305.1	25.55*
						W	711157.5	94	7565.51	

Table F-ratio at 0.05 level of confidence for 4 and 95 (df) = 2.46, 4 and 94 (df) = 2.47

*Significant

Table-XXXIII shows that the pre-test means and standard deviation on vital capacity of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 2887.20 ± 54.95, 2875.60 ± 65.72, 2884.20 ± 53.00, 2866.50 ± 81.23 and 2870.50 ± 68.29 respectively. The obtained 'F' value 0.36 of vital capacity was lesser than the required table value of 2.46 for the degrees of freedom 4 and 95 at 0.05 level of confidence, which proved that the random assignment of the subjects were successful and their scores in vital capacity before the training were equal and there was no significant differences.

The post-test means and standard deviation on vital capacity of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 3121.00 ± 85.28, 3078.50 ± 80.49, 3068.50 ± 100.97, 3105.00 ± 110.96 and 2876.20 ± 50.10 respectively. The obtained 'F' value 25.41 of vital capacity was greater than the required table value of 2.46 for the degrees of freedom 4 and 95 at 0.05 level of confidence. It implied that significant differences existed between the five groups during the post test period on vital capacity.

The adjusted post-test means on vital capacity of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 3118.00, 3079.00, 3067.00, 3108.00 and 2878.00 respectively. The obtained 'F' value 25.55 of vital capacity was greater than the required table value of 2.47 for the degrees of freedom 4 and 94 at 0.05 level of confidence. Hence, it was concluded that significant differences exist between the adjusted post test means of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on vital capacity.

Since, the obtained 'F' value in the adjusted post test means was found to be significant, the Scheffe's test was applied as post hoc test to find out the paired mean difference, and it is presented in table-XXXIV.

Table –XXXIV

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCES AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON VITAL CAPACITY

Cardio Respiratory Endurance Training	Resistance Training	Core Strength Training	Combined Training	Control Group	Mean Difference	Confidence Interval
3118.00	3079.00				39.00	86.46
3118.00		3067.00			51.00	86.46
3118.00			3108.00		10.00	86.46
3118.00				2878.00	240.00*	86.46
	3079.00	3067.00			12.00	86.46
	3079.00		3108.00		29.00	86.46
	3079.00			2878.00	201.00*	86.46
		3067.00	3108.00		41.00	86.46
		3067.00		2878.00	189.00*	86.46
			3108.00	2878.00	230.00*	86.46

*Significant at 0.05 level

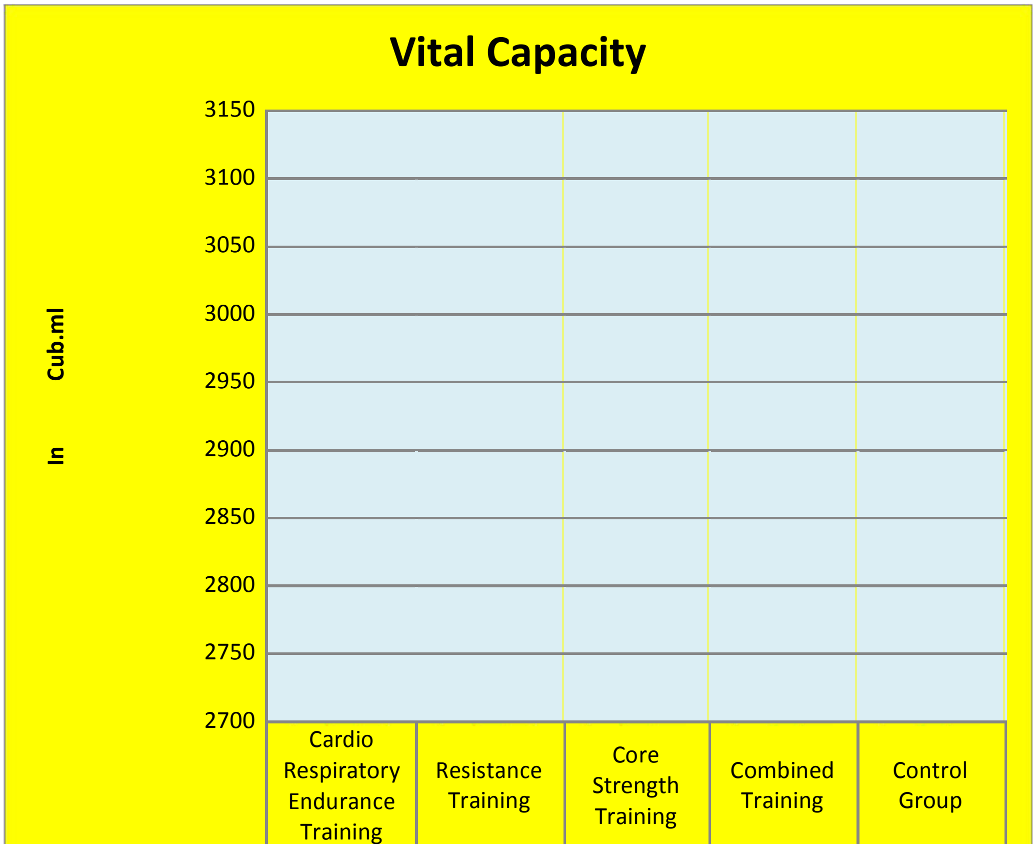
From table-XXXIV the Scheffe's post hoc analysis proved that significant mean differences exist between cardio-respiratory endurance training and control group, resistance training and control groups, core strength training and control groups, combined training and control groups on vital capacity. Since, the mean differences 240.00, 201.00, 189.00 and 230.00 was higher than the confident interval value of 86.46 at 0.05 level of significance. However, there was no significant difference between cardio-respiratory endurance training and resistance training, cardio-respiratory endurance training and core strength training, cardio-respiratory endurance training and combined training, resistance training and core strength training, resistance training and combined training, core strength training and combined training, since, the mean differences 39.00, 51.00, 10.00, 12.00, 29.00 and 41.00 was lesser than the confident interval value of 86.46 at 0.05 level of significance.

Hence, it was concluded that due to the effect of cardio-respiratory endurance training, resistance training, core strength training, combined training the vital capacity of the subjects was significantly improved. It was also concluded that in improving vital capacity no statistical significant difference was found between the experimental groups.

The pre, post and adjusted post test mean values of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on vital capacity is graphically represented in figure-9.

Figure - 9

BAR DIAGRAM SHOWING THE MEAN VALUES ON VITAL CAPACITY OF EXPERIMENTAL AND CONTROL GROUPS



	Cardio Respiratory Endurance Training	Resistance Training	Core Strength Training	Combined Training	Control Group
Pre test	2887.2	2875.6	2884.2	2866.5	2870.5
Post test	3121.0	3078.5	3068.5	3105.0	2876.2
Adjusted Post test	3118.0	3079.0	3067.0	3108.0	2878.0

4.5.5 RESULTS OF MAXIMUM OXYGEN CONSUMPTION (Vo_2max)

The descriptive analysis of the pre and post test data showing mean and standard deviation, range, mean differences, ‘t’ ratio and percentage of improvement on maximum oxygen consumption of experimental and control groups are presented in table-XXXV.

Table – XXXV

DESCRIPTIVE ANALYSIS OF THE PRE AND POST TEST DATA AND 't' RATIO ON MAXIMUM OXYGEN CONSUMPTION OF EXPERIMENTAL AND CONTROL GROUPS

Group	Test	Mean	Standard Deviation	Range	Mean Differences	't' ratio	Percentage
Cardio-Respiratory Endurance Training	Pre test	3.01	0.13	0.48	0.38	7.55	12.62%
	Posttest	3.39	0.16	0.76			
Resistance Training	Pre test	2.99	0.13	0.47	0.20	11.90	6.69%
	Posttest	3.19	0.16	0.60			
Core Strength Training	Pre test	2.97	0.11	0.38	0.19	13.76	6.40%
	Posttest	3.16	0.11	0.40			
Combined Training	Pre test	2.93	0.22	0.66	0.46	5.98	15.70%
	Posttest	3.39	0.25	0.86			
Control Group	Pre test	3.00	0.15	0.55	0.04	2.47	1.33%
	Posttest	3.04	0.13	0.48			

Table t-ratio at 0.05 level of confidence for 19 (df) =2.09
*Significant

Table-XXXV shows that the mean, standard deviation, range and mean difference values of the pre and post test data collected from the experimental and control groups on maximum oxygen consumption. Further, the collected data was statistically analyzed by paired 't' test to find out the significant differences if any between the pre and post data. The obtained 't' values of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 7.55, 11.90, 13.76, 5.98 and 2.47 respectively which was greater than the required table value of 2.09 for significance at 0.05 level for 19 degrees of freedom. It revealed that significant differences existed between the pre and post test means of experimental and control groups on maximum oxygen consumption.

It was also observed that percentage of changes in maximum oxygen consumption of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 12.62 %, 6.69 %, 6.40%, 15.70 % and 1.33 % respectively.

The pre and post test data collected from the experimental and control groups on maximum oxygen consumption was statistically analyzed by analysis of covariance and the results are presented in table–XXXVI.

Table – XXXVI

ANALYSIS OF COVARIANCE ON MAXIMUM OXYGEN CONSUMPTION OF EXPERIMENTAL AND CONTROL GROUPS

	CRETGroup	RTGroup	CSTGroup	CTGroup	ControlGroup	SOV	Sum ofSquares	df	Means quares	'F' ratio
Pre test Mean SD	3.01	2.99	2.97	2.93	3.00	B	0.80	4	0.020	0.83
	0.13	0.13	0.11	0.22	0.15	W	2.28	95	0.024	
Post test Mean SD	3.39	3.19	3.16	3.39	3.04	B	1.936	4	0.484	16.67*
	0.16	0.16	0.11	0.25	0.13	W	2.758	95	0.029	
Adjusted Post test Mean	3.38	3.18	3.17	3.41	3.03	B	2.017	4	0.504	19.05*
						W	2.488	94	0.026	

Table F-ratio at 0.05 level of confidence for 4 and 95 (df) = 2.46, 4 and 94 (df) = 2.47

*Significant

Table-XXXVI shows that the pre-test means and standard deviation on maximum oxygen consumption of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 3.01 ± 0.13, 2.99 ± 0.13, 2.97 ± 0.11, 2.93 ± 0.22 and 3.00 ± 0.15 respectively. The obtained

'F' value 0.83 of maximum oxygen consumption was lesser than the required table value of 2.46 for the degrees of freedom 4 and 95 at 0.05 level of confidence, which proved that the random assignment of the subjects were successful and their scores in maximum oxygen consumption before the training were equal and there was no significant differences.

The post-test means and standard deviation on maximum oxygen consumption of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 3.39 $\pm$ 0.16, 3.19 $\pm$ 0.16, 3.16 $\pm$ 0.11, 3.39 $\pm$ 0.25 and 3.04 $\pm$ 0.13 respectively. The obtained 'F' value 16.67 of maximum oxygen consumption was greater than the required table value of 2.46 for the degrees of freedom 4 and 95 at 0.05 level of confidence. It implied that significant differences existed between the five groups during the post test period on maximum oxygen consumption.

The adjusted post-test means on maximum oxygen consumption of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups were 3.38, 3.18, 3.17, 3.41 and 3.03 respectively. The obtained 'F' value 19.05 of maximum oxygen consumption was greater than the required table value of 2.47 for the degrees of freedom 4 and 94 at 0.05 level of confidence. Hence, it was concluded that significant differences exist between the adjusted post test means of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on maximum oxygen consumption.

Since, the obtained 'F' value in the adjusted post test means was found to be significant, the Scheffe's test was applied as post hoc test to find out the paired mean difference, and it is presented in table-XXXVII.

Table -XXXVII

SCHEFFE'S POST HOC TEST FOR THE DIFFERENCES AMONG PAIRED MEANS OF EXPERIMENTAL AND CONTROL GROUPS ON MAXIMUM OXYGEN CONSUMPTION

Cardio Respiratory Endurance Training	Resistance Training	Core Strength Training	Combined Training	Control Group	Mean Difference	Confidence Interval
3.38	3.18				0.20*	0.16
3.38		3.17			0.21*	0.16
3.38			3.41		0.03	0.16
3.38				3.03	0.35*	0.16
	3.18	3.17			0.01	0.16
	3.18		3.41		0.23*	0.16
	3.18			3.03	0.15	0.16
		3.17	3.41		0.24*	0.16
		3.17		3.03	0.14	0.16
			3.41	3.03	0.38*	0.16

*Significant at 0.05 level

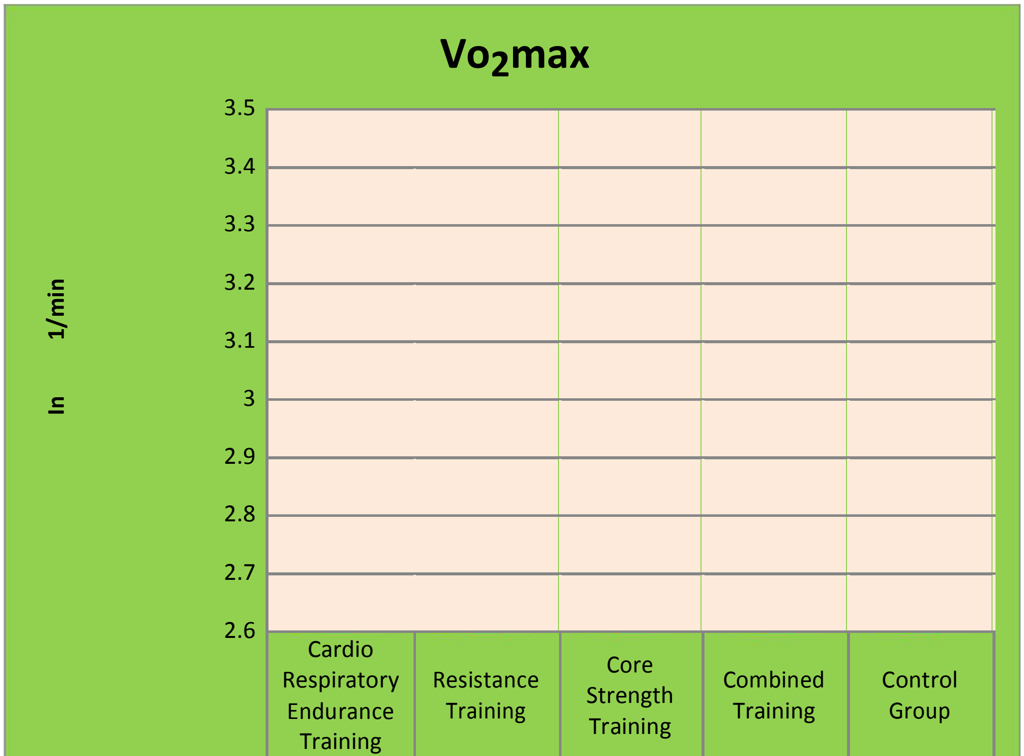
From table-XXXVII the Scheffe's post hoc analysis proved that significant mean differences exist between cardio-respiratory endurance training and resistance training groups, cardio-respiratory endurance training and core strength training groups, cardio-respiratory endurance training and control groups, resistance training and combined training groups, core strength training and combined training groups, combined training and control groups on maximum oxygen consumption. Since, the mean differences 0.20, 0.21, 0.35, 0.23, 0.24 and 0.38 was higher than the confident interval value of 0.16 at 0.05 level of significance. However, there was no significant difference between cardio-respiratory endurance training and combined training groups, resistance training and core strength training groups, resistance training and control groups, core strength training and control groups since, the mean differences 0.03,, 0.01, 0.15 and 0.14 was lesser than the confident interval value of 0.16 at 0.05 level of significance.

Hence, it was concluded that due to the effect of cardio-respiratory endurance training and combined training the maximum oxygen consumption of the subjects was significantly improved however no significant improvement was found due to resistance training and core strength training. It was also concluded that combined training and cardio-respiratory endurance training were significantly better than core strength training and resistance training however, no significant differences was found between cardio-respiratory endurance training and combined training groups, resistance training and core strength training groups, resistance training and control groups, core strength training and control groups in improving maximum oxygen consumption.

The pre, post and adjusted post test mean values of cardio-respiratory endurance training, resistance training, core strength training, combined training and control groups on maximum oxygen consumption is graphically represented in figure-10.

Figure - 10

BAR DIAGRAM SHOWING THE MEAN VALUES ON MAXIMUM OXYGEN CONSUMPTION OF EXPERIMENTAL AND CONTROL GROUPS



	Cardio Respiratory Endurance Training	Resistance Training	Core Strength Training	Combined Training	Control Group
Pre test	3.01	2.99	2.97	2.93	3.00
Post test	3.39	3.19	3.16	3.39	3.04
Adjusted Post test	3.38	3.18	3.17	3.41	3.03

4.6 DISCUSSION ON FINDINGS

The results of this study suggested that twelve weeks of cardio respiratory endurance training, resistance training, core strength training and combined training have a detrimental effect on selected physical and physiological parameters of college athletes. The above findings can be substantiated by observations made by following renowned experts.

4.6.1 DISCUSSION ON FINDINGS OF CARDIO-RESPIRATORY ENDURANCE TRAINING RESPONSES

The results of the present study were also in conformity with the findings of the previous research studies. Several physical and physiological variables improve as a result of cardio respiratory endurance training to maintain homeostasis and muscular work. The respiratory system also responds when challenged with the stress of exercise. Increased aerobic fitness was also indicated by a lower heart rate at matched submaximal work rates (McInnis & Balady, 1994).

Respiratory muscle training improves endurance exercise performance in healthy individuals with greater improvements in less fit individuals and in sports of longer durations (Illi, Held, Frank & Spengler, 2012). Short-term daily conditioning protocol of aerobic exercise program induces significant improvements in both aerobic capabilities and anaerobic performance (Sartorio et al., 2003). When high-intensity interval training incorporates P(max) as the interval intensity and 60% of T(max) as the interval duration, already highly trained cyclists can significantly improve their 40-km time trial performance (Laursen et al., 2002).

Edge et al*.,* (2005) concluded that when total work is matched, high intensity interval training results in greater improvements in repeated sprint ability than moderate intensity continuous training. The intermittent aerobic exercise produced an acute interference effect on leg strength endurance. Maximum strength was not affected by the aerobic exercise mode (DeSouza et al., 2007).

In response to an endurance training program, Type I and II muscle fibers have been shown to remain the same (Bell, 2000; McCarthy, 2002) increase (Nelson, 1990) and decrease in size (Kraemer, 1995). More consistent and well documented adaptations to endurance training include increases in capillary and mitochondrial densities (Crenshaw, 1991) as well as oxidative enzyme activity (Bell, 2000; Nelson, 1990) all of which contribute to the enhanced delivery, extraction, and utilization of oxygen by skeletal muscle. Sale (1990) suggested that maximal contractile forces of the heart occur at approximately 75% VO_2max, and consequently the optimal training stimu1us for enhancing the cardiopulmonary system would be at intensity slightly below anaerobic threshold. Maximum oxygen uptake was markedly greater in male endurance-trained athletes than in strength-trained athletes and sedentary healthy men sedentary control (Otsuki et al., 2006)

The endurance training increased peak aerobic power by 12% decreased the heart rate and increased all heart rate variability indices at absolute submaximal exercise intensities, but not at rest (Martinmaki et al*.,* (2008). Aerobic exercise training produces significant reduction of systolic and diastolic blood pressure and also significant decrease in the heart rate was registered after the 6-week follow-up cardiovascular rehabilitation, while heart rate was significantly lower in this group compared to group with sedentary lifestyle (Tatjana Ilic et al*.,* (2007*).*

Honka et al., (2011) recommended that regular aerobic exercise is a treatment for elevated blood pressure. Cardiac vagal outflow is attenuated and vasomotor sympathetic activity elevated during exciting sports events and blood pressure dynamics differ from those occurring during physical exercise at equal heart rates (Piira et al., 2010).Perini et al., (2002) evaluated the effects of an intense 8-wk aerobic training program on cardiovascular responses at rest and during exercise. They concluded that at rest heart rate and heart rate variability parameters were unchanged, whereas blood pressures decreased, and oxygen consumption increased by 18%, but no change in maximal heart rate and blood pressures. During submaximal loads heart rate was unchanged at the same metabolic demand, whereas systolic blood pressures and diastolic blood pressures were lower than before at low loads whereas pulse pressure was unchanged.

VO_2max is considered the best estimate of a person's cardio respiratory fitness or aerobic power (Jorgensen et al., 1977). Increase in VO_2max generally range from 15 to 20 percent following a 6-month training period (Wilmore & Costill, 1994). A six-week training period can result in increases in VO_{2max} in participants undergoing high intensity (Hickson et al., 1981), lower intensity (Cunningham & Cantu, 1990) and endurance training. Aerobic fitness level influences the effects of prior supramaximal exercise on VO_2 response during moderate-intensity exercise (Figueira et al., 2009). McMillan et al., (2005) suggested that performing high intensity 4 min intervals dribbling a soccer ball around a specially designed track together with regular soccer training is effective for improving the Vo_{2max} of soccer players, with no negative interference effects on strength, jumping ability, and sprinting performance.

It has been observed that, regularly performed endurance training results in significant improvements in exercise capacity. The development of peak exercise performance, as typified by competitive endurance athletes, is dependent upon several months to years of endurance training. The physiological adaptations associated with these improvements in both maximal exercise performance, as reflected by increases in maximal oxygen uptake, and submaximal exercise endurance includes increases in both cardiovascular function and skeletal muscle oxidative capacity. Endurance training leads to significant cardiovascular and respiratory changes at both submaximal and maximal rates of work. The magnitude of these adaptations may be due to the person's initial fitness level, intensity, duration, and frequency of exercise; and on the length of training. Thus, in analyzing such dominance of endurance training in the development of physiological parameters both in the scientific and logical aspects, it was found that the findings were based on its scientific structure. Therefore, in order for exercise physiologists and trainers to create successful training protocols for athletes, a more complete understanding of physical and physiological benefits of endurance exercise is essential.

4.6.2 DISCUSSION ON FINDINGS OF RESISTANCE TRAINING RESPONSES

The results of this study suggested that twelve weeks of resistance training have a beneficial effect on selected physical and physiological parameters. Research on the effect of resistance training on health and fitness determinants revealed that weight training, like other types of exercise, positively affects physical performance and body composition and a number of health parameters (Miller, et al., 1984; Stone, 1991; Toth, et al., 1995). Almost every study revealed an increase in muscular strength, whereas the effect on aerobic power is inconsistent. However, the study by Reid et al*.,* (2003) observed that weight training produced significant increases in strength and endurance. Falk et al*.,* (2002) documented that resistance training has been shown to be effective in enhancing muscle strength among pre pubertal and adolescent boys. Many studies have reported significant increases in maximum voluntary contraction in humans after resistance training (Cannon & Cafarelli 1987, Davies et al., 1985, Garfinkel & Cafarelli 1992, Hakkinen et al., 1992, Narici et al., 1989).

Coutts et al., (2004) observed that 12 weeks of direct supervision of resistance training in young athletes results in greater training adherence and increased muscular strength, power, and running speed than unsupervised training. Heavy-resistance training in moderately trained men greater rate of training load increase and magnitude which resulted in greater maximal strength gains compared with unsupervised training (Mazzetti et al., 2000). Similarly, Dorgo et al., (2009) found significant improvements in muscular strength and muscular endurance of the manual resistance training and weight resistance training groups. Resistance training is an effective intervention to improve the physical function by increasing strength and physical performance (Yamada et al., (2011), muscle power without adverse effects on joint laxity (Bieler & Sobol, 2014), mobility and muscle strength (Krist, Dimeo and Keil, 2013).

Periodized resistance training intervention improved different aspects of health and fitness in untrained men (Zavanela et al., 2012). Krist, Dimeo and Keil (2013) determined that resistance training twice a week over 2 months seemed to considerably improve mobility and muscle strength. High-resistance circuit training promoted a similar strength-mass adaptation as traditional strength training while using shorter training session duration (Alcaraz and et al., 2011). Whole-body resistance training regimen is as effective for muscular hypertrophy and strength gain (Tanimoto et al., 2008). Resistance-trained women increased muscular strength and fat-free mass (1.3 kg), maximum aerobic capacity (18%) when measured subsequent to the endurance or resistance training programs (Poehlman et al., 2002).

Though resistance training can stimulate the cardiovascular system, many exercise physiologists, based on their observation of maximal oxygen uptake, argue that aerobics training is a better cardiovascular stimulus.Resistance training increased exercise capacity, and improved vagal modulation of heart rate at submaximal exercise intensities. These changes may have favourable cardiovascular health implications for sedentary men during normal daily activities (Hu et al., 2009). Low resistance circuit weight training with moderately hard heart rate level has effects comparable to an equal amount of endurance training on the cardiovascular fitness of sedentary adults (Kaikkonen et al., 2000). High eccentric strength training performed by healthy older men increases peak torque and reduces systolic blood pressure (Melo et al., 2008). One bout of resistance exercise acutely decreases central arterial compliance, but this effect is sustained for <60 min after the completion of resistance exercise (DeVan et al., 2005).

Many improvements in physical function and athletic performance are associated with the increases in muscle strength, power, endurance, and hypertrophy observed during resistance training. Its potential benefits on health and performance are numerous. It has been observed that proper program design, which uses progressive overload, variation, and specificity, is essential to maximize the benefits associated with weight training. The rest interval between sets is an important variable that should receive more attention in resistance exercise prescription. When prescribed appropriately with other important prescriptive variables (volume & intensity), the amount of rest between sets can influence the efficiency, safety and ultimate effectiveness of a resistance training programme. This could be the possible reason for the beneficial changes occurred in physical and physiological parameters of inter collegiate athletes.

4.6.3 DISCUSSION ON FINDINGS OF CORE STRENGTH TRAINING RESPONSES

Training of the trunk or core muscles for enhanced health, rehabilitation, and athletic performance has received renewed emphasis. In recent years, fitness practitioners have increasingly recommended core stability exercises in sports conditioning programs. Greater core stability may benefit sports performance by providing a foundation for greater force production in the upper and lower extremities. The changes of physical and physiological parameters in the core strength training group are also similar to the magnitude of change reported by earlier investigators. Reed, Ford, Myer and Hewett (2012) employed systematic search to capture all articles related to athletic performance and core stability training. As such, many studies saw improvements in skills of general strengths such as maximum squat load and vertical leap. Surprisingly, not all studies reported measurable increases in specific core strength and stability measures following training. Additionally, investigations that targeted the core as the primary goal for improved outcome of training had mixed results.

Core strength training may be an effective training method for improving performance in runners (Sato & Mokha, 2009). Nine-week strategic core strengthening exercise program increases trunk stability and in turn improves vertical jump parameter in volleyball players (Sharma, Geovinson & Singh, 2012). Core strength training is widely used in the strength and conditioning, health and fitness, and rehabilitation industries with claims of improving performance and reducing the risk of injuries (McGill, SM. (2001); Olmsted, LC et al., (2002). Martuscello et al., (2013) suggested that strength and conditioning specialists should focus on implementing core-specific exercises, to adequately train the core muscles in their athletes and clients.

Willardson (2007) recommended that balance board and stability disc exercises, performed in conjunction with plyometric exercises, to improve proprioceptive and reactive capabilities, which may reduce the likelihood of lower extremity injuries. Swiss ball training may positively affect core stability without concomitant improvements in physical performance in young athletes (Stanton, Reaburn & Humphries, 2004). Early adaptations in a short-term core exercise program using the physioball resulted in greater gains in torso balance and EMG neuronal activity in previously untrained women when compared to performing exercises on the floor (Cosio-Lima et al., 2003)

Upper limb exercises performed in the standing position are effective for activating core muscles. Bilateral and unilateral shoulder extension and unilateral shoulder horizontal abduction and adduction with the pelvis fixed elicited the greatest activity of the core muscles (Tarnanen et al., 2012). Simple therapeutic exercises are effective in activating both abdominal and paraspinal muscles. By changing limb and trunk positions or unbalancing trunk movements, it is possible to increase trunk muscle activities. Women were better able to activate their stabilizing trunk muscles than men; but it is also possible that men, having a much higher degree of strength on maximal contraction, only need to activate a smaller amount of that maximum to perform a similar activity (Arokoski et al., 2001)

Squats and dead lifts performed with loads of approximately 50, 70, 90, and 100% of one-repetition maximum (1RM) are recommended for increasing strength and hypertrophy of the back extensors (Nuzzo et al., 2008). Advanced Swiss ball exercise providing a significant whole-body stimulus, the practical difficulty and risks of performing these more complicated Swiss ball exercises may outweigh potential benefits (Marshall & Desai, 2010). Muscle activity was greater when exercises were performed on a Swiss ball in comparison to a stable surface (Duncan, 2009). Instability resistance exercises can play an important role in periodization and rehabilitation and as alternative exercises for the recreationally active individual with less interest or access to ground-based free-weight exercises. Based on the relatively high proportion of type I fibers, the core musculature might respond well to multiple sets with high repetitions however, a particular sport may necessitate fewer repetitions (Behm, Drinkwater, Willardson & Cowley, 2010)

Training programs must prepare athletes for a wide variety of postures and external forces, and should include exercises with a destabilizing component. While core strength training have been shown to be effective in decreasing the incidence of low back pain, they are recommended as the primary exercises for hypertrophy, absolute strength, or power, especially in trained athletes. For athletes, core strength training forms the foundation of exercises to train the core musculature. Core strength training differs from many traditional weight training routines by working both the lower back and abdominals in unison. All athletic movements incorporate the core in some way. The stronger and more correctly balanced the core muscles are, the less the uneven strain on the spine. To build strong core athletes need to exercise a variety of muscles from hips to shoulders. When these muscles contract, they stabilize the spine, pelvis and shoulder girdle and create a solid base of support. When this happens, they are able to generate powerful movements of the extremities. Hence, Core conditioning exercise programs need to target all these muscle groups to be effective.

It is believed among fitness professionals, to improve athletic performance and prevent risk of injury, core strength training is one of the vital components in the strength and conditioning field. Despite the strong belief in these purported positive effects, limited scientific studies have shown direct relationship between stronger core muscles and better athletic performance. Significant improvement in core strength has been documented as a result of core strength training, but the same research has failed to show significant changes in the athletic performance from core strength training. This type of research indicates that core strength training is a useful tool for strengthening core muscles, but the carryover to mechanics and performance needs further investigation.

4.6.4 DISCUSSION ON FINDINGS OF COMBINED TRAINING RESPONSES

The results obtained due to twelve weeks of combined training programme on selected physical and physiological parameters of the college athletes are inconformity with the following findings.

Combined training is more effective in improving body composition, strength, and some indicators of cardiovascular fitness (Marzolini, Oh & Brooks, 2012). Combination exercise gave greater benefits for weight loss, fat loss and cardio-respiratory fitness than aerobic and resistance training modalities (Ho, Dhaliwal, Hills & Pal, 2012). Long-term combined training program is more effective than an aerobic training program alone in producing changes in body composition (Santa-Clara et al., 2003) and muscle strength (Loimaala et al., 2009). Resistance training adds to the effects of aerobic training in cardiac rehabilitation patients improving muscular strength, increasing lean body mass, and reducing body fat (Pierson et al., 2001). However, a meta-analysis found that, though aerobic training is an effective therapy, combined aerobic and strength training is effective (Haykowsky et al., 2007). Toumi et al., (2004) observed combined training presented a significant increase in muscle power during the countermovement jump for the players and improving physical fitness (Sillanpaa et al., 2009)

Hausswirth et al., (2010) examined the endurance and strength training effects on physiological and muscular parameters during prolonged cycling. The results showed that the maximum strength and the isometric maximal voluntary contraction after training were significantly higher and lower than those before training, in endurance-strength training group and endurance-only group. The combination of strength and endurance training brought results as half-squat one repetition maximum increased 51.7%, 10-m sprint time also improved by 0.06, counter movement jump improved 3.0cm (Helgerud et al., 2011), increases physical fitness, muscle mass and decreases subcutaneous fat decrease risks (Hakkinen et al., 2005) increased leg, back, and shoulder 5RM scores; and improved AAHPERD flexibility, coordination, and cardiovascular endurance scores (Wood et al., 2001).

Combined resistance and running speed programme provides better results than the conventional resistance training, regarding the power performance (Kotzamanids et al., 2005). Newberry and flowers (1999) found that high repetition strength training added to sprint training, increased muscular endurance. Christou et al., (2006) suggested that the combination of soccer and resistance training could be used for an overall development of the physical capacities.

Concurrent training improves endurance performance, both with trained cyclists (Paton & Hopkins, 2005) and other trained athletes (Hoff et al., 1999; Johnston et al., 1997; Millet et al., 2002; Paavolainen et al., 1999). Paton and Hopkins (2005) found increased 1- and 4-km time trial performance as a result of high intensity interval training being employed in addition to resistance training. It has been well documented by Senthil et al., (2011) that the effects of concurrent strength and endurance training significantly improved the Cardio-respiratory endurance. Circuit training immediately after individualized endurance training in the same session (endurance + strength) produced greater improvement in the 4 km time trial and aerobic capacity than the opposite order or each of the training programmes performed separately (Chtara et al.,2005)

The result of the study indicates that the resting heart rate of the combined training group decreased significantly by undergoing the twelve weeks of combined cardio-respiratory endurance, resistance, core strength training programme. These results are in conformity with the following findings. Senthil et al., (2011) findings indicated that the effects of concurrent strength and endurance training significantly reduced resting pulse rate when compared with control group. Davis et al., (2008) evaluated the effects of concurrent strength and aerobic endurance training and observed that serial concurrent exercise reduced resting heart rate. Wood et al., (2001) conducted a study on concurrent cardiovascular and resistance training in healthy older adults, their result revealed lower resting heart rate.

According to the NSCA (2000) including strength training in an endurance training program can improve the ability of the heart, lungs and circulatory system to perform under conditions of high pressure and force production. Figueroa et al., (2011) documented that combined resistance and endurance exercise training, resulted in decreased arterial pressure. Davis et al., (2008) evaluated the effects of concurrent strength and aerobic endurance training, and found that serial concurrent exercise reduced systolic and diastolic blood pressure.

Figueroa et al., (2011) conducted a study on the effect of combined resistance and endurance exercise training on arterial stiffness, blood pressure, and muscle strength in postmenopausal women. Their study showed the results as arterial pressure decreased, dynamic leg strength and isometric handgrip strength increased for the combined exercise training group. Davis et al., (2008) evaluated the effects of concurrent strength and aerobic endurance training on cardiovascular and cardiorespiratory adaptations in college athletes and compared two concurrent exercise protocols. Women showed that serial concurrent exercise discernibly reduced systolic and diastolic blood pressure, increased estimated Vo_2max, and reduced resting heart rate. Concurrent strength and endurance training resulted in an increase in the resting left ventricular diastolic cavity area, end systolic myocardial area and left ventricular mass DuManoir et al., (2007). The combined strength and endurance training increases decrease risks of cardiovascular diseases in women with rheumatoid arthritis (Hakkinen et al., 2005) lower resting heart rate and rate-pressure product; lower exercise diastolic blood pressure and rating of perceived exertion (Wood et al*.,* 2001). Maximal oxygen consumption improved significantly due to long-term endurance and strength training (Loimaala et al., 2009; Helgerud et al., 2011 Schjerve et al*.,* 2008).

4.7 DISCUSSION ON HYPOTHESES

In the first hypothesis it was stated that there would be significant changes on selected physical variables due to the impact of cardio-respiratory endurance training, resistance training, core strength training and combined training between control group and experimental group. The result of the study revealed that there was a significant difference between control group and cardio-respiratory endurance training, resistance training, core strength training, combined training on speed, muscular strength and flexibility. Further it was found that there was a significant difference between control group and experimental groups on explosive power except cardio respiratory endurance training group. And, there was a significant difference between control group and cardio-respiratory endurance training group, combined training group on cardio-respiratory endurance except resistance training and core strength training. Hence, the first hypothesis was accepted for the variables speed, muscular strength and flexibility.

In the second hypothesis it was stated that there would be significant differences between control group and experimental group due to cardio-respiratory endurance training, resistance training, core strength training, combined training groups on the selected physiological variables. The result of the study showed that there was a significant difference between control group and experimental groups on resting pulse rate, blood pressure and vital capacity. Further it was found that there was a significant difference between combined training group, cardio-respiratory endurance training group and control group on maximum oxygen consumption. However there was no significant difference between control group and resistance training, core strength training groups on maximum oxygen consumption. Hence, the second hypothesis was accepted for the variables resting pulse rate, systolic blood pressure, diastolic blood pressure and vital capacity.

In the third hypothesis it was stated that the combined cardio-respiratory endurance, resistance and core strength training would be better than isolated cardio-respiratory endurance training, resistance training and core strength training in improving the selected physical and physiological variables of college athletes. The result of the study proved that combined training group was significantly better than other experimental groups in some cases like speed, cardio respiratory endurance, systolic blood pressure and in maximal oxygen consumption. Whereas, in other cases, isolated groups were better than combined training group. Hence, the researcher's third hypothesis was accepted for speed, cardio respiratory endurance, systolic blood pressure and Vo_2 max.