Chapter IV

ANALYSIS OF THE DATA AND RESULTS OF THE STUDY

The purpose of the study was to find out the effects of SAQ training, circuit resistance training and plyometric training on selected motor fitness variables namely muscular strength, muscular endurance, speed, speed endurance, leg explosive power, agility and cardio respiratory endurance among inter collegiate men football players.. To achieve this purpose of the study, sixty college men students from KLN College of Information Technology, Madurai, Tamil Nadu, India were randomly selected as subjects. The age, height and weight of the selected subjects were ranged from 18 to 24 years, 162 to 175 cm and 51 to 67 kilogram respectively. The selected subjects were divided into four equal groups of fifteen subjects each at random, Group I underwent SAQ training, Group II underwent circuit resistance training, Group III underwent plyometric training and Group IV acted as control. The experimental group namely SAQ training group (Group I), circuit resistance training group (Group II) and plyometric training group (Group III) underwent their respective training programmes for three sessions (days) per week for twelve weeks. And Group IV acted as control group in which they did not undergo any special training programme apart from their regular programme of curriculum.

4.1 ANALYSIS OF THE DATA

The influence of SAQ training, circuit resistance training and plyometric training on each criterion variables were analysed separately and presented below.

4.1.1 Muscular Strength

The analysis of covariance on muscular strength of the pre and post test scores of SAQ training, circuit resistance training, plyometric training and control groups have been analyzed and presented in Table III.

TABLE III

ANALYSIS OF COVARIANCE OF THE DATA ON MUSCULAR STRENGTH OF PRE AND POST TESTS SCORES OF SAQ TRAINING, CIRCUIT RESISTANCE TRAINING, PLYOMETRIC TRAINING AND CONTROL GROUPS

(Scores in numbers)

Test	SAQ Training Group	Circuit Resistance Training Group	Plyometric Training Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre Test									
Mean	31.53	31.40	31.87	31.67	Between	1.78	3	0.59	0.64
S.D.	1.06	0.91	0.83	1.05	Within	52.40	56	0.94	
Post Test									
Mean	35.60	37.33	34.07	31.80	Between	248.33	3	82.78	88.69*
S.D.	0.99	0.98	0.88	1.01	Within	52.27	56	0.93	
Adjusted Post Test									
Mean	35.67	37.52	33.85	31.76	Between	270.29	3	90.10	438.61*
					Within	11.30	55	0.21	

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 3 and 56 and 3 and 55 are 2.776 and 2.78 respectively).

The table III shows that the pre-test mean values on muscular strength of SAQ training, circuit resistance training, plyometric training and control groups are 31.53, 31.40, 31.87 and 31.67 respectively. The obtained 'F' ratio of 0.64 for pre-test scores is less than the table value of 2.776 for df 3 and 56 required for significance at .05 level of confidence on muscular strength.

The post-test mean values on muscular strength of SAQ training, circuit resistance training, plyometric training and control groups are 35.60, 37.33, 34.07 and 31.80 respectively. The obtained "F" ratio of 88.69 for post-test scores is more than the table value of 2.776 for df 3 and 56 required for significance at .05 level of confidence on muscular strength.

The adjusted post-test means on muscular strength of SAQ training, circuit resistance training, plyometric training and control groups are 35.67, 37.52, 33.85 and 31.76 respectively. The obtained "F" ratio of 438.61 for adjusted post-test means is greater than the table value of 2.78 for df 3 and 55 required for significance at .05 level of confidence on muscular strength.

The results of the study indicated that there was a significant difference between the adjusted post-test means of SAQ training, circuit resistance training, plyometric training and control groups on muscular strength.

Since, four groups were compared, whenever the obtained 'F' ratio for adjusted post test was found to be significant, the Scheffe's test to find out the paired mean differences and it was presented in Table III - A.

TABLE III - A

THE SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN PAIRED MEANS ON MUSCULAR STRENGTH

(Scores in numbers)

SAQ Training Group	Circuit Resistance Training Group	Plyometric Training Group	Control Group	Mean Differences	Confidence Interval Value
35.67	37.52	-	-	1.85*	0.58
35.67	-	33.85	-	1.83*	0.58
35.67	-	-	31.76	3.92*	0.58
-	37.52	33.85	-	3.68*	0.58
-	37.52	-	31.76	5.77*	0.58
-	-	33.85	31.76	2.09*	0.58

* Significant at .05 level of confidence.

The table III-A shows that the mean difference values between SAQ training group and circuit resistance training group, SAQ training group and plyometric training group, SAQ training group and control group, circuit resistance training group and plyometric training group, circuit resistance training group and control group, plyometric training group and control group on muscular strength 1.85, 1.83, 3.92, 3.68, 5.77 and 2.09 which were greater than the required confidence interval value 0.58 for significance at .05 level of confidence.

The results of this study showed that there was a significant difference between SAQ training group and circuit resistance training group, SAQ training group and plyometric training group, SAQ training group and control group, circuit resistance training group and plyometric training group, circuit resistance training group and control group, plyometric training group and control group on muscular strength.

The adjusted post-test mean values of SAQ training, circuit resistance training, plyometric training and control groups on muscular strength were graphically represented in figure I.

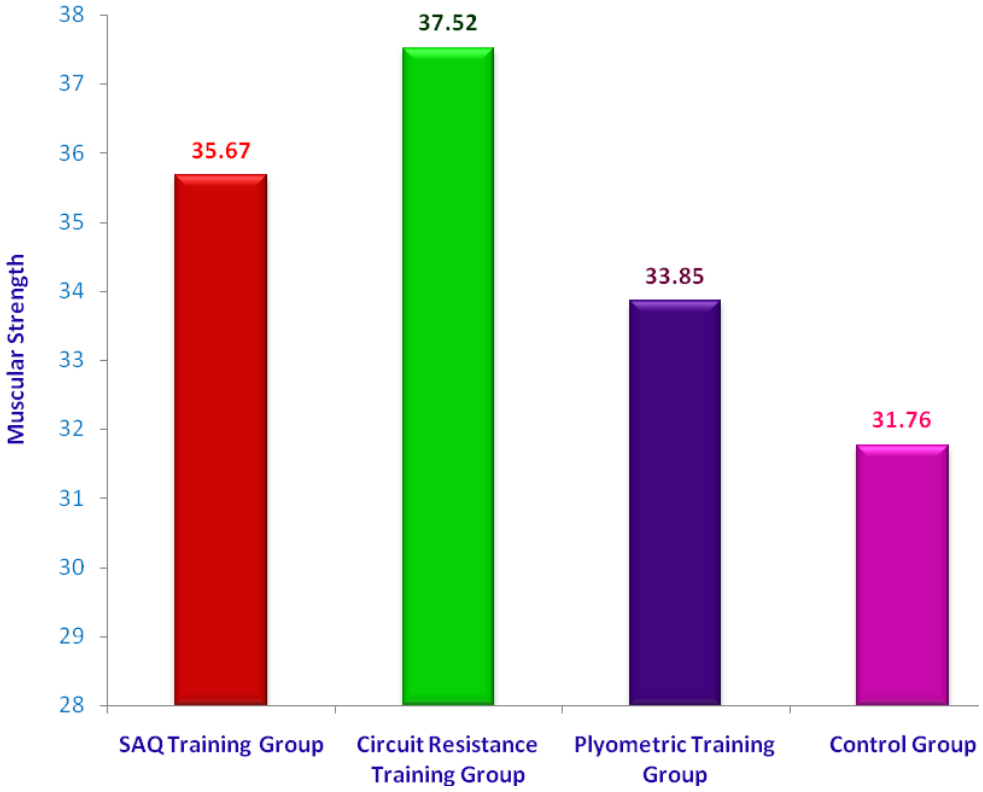

FIGURE I: THE ADJUSTED POST-TEST MEAN VALUES OF SAQ TRAINING, CIRCUIT RESISTANCE TRAINING, PLYOMETRIC TRAINING AND CONTROL GROUPS ON MUSCULAR STRENGTH

4.1.2 Muscular Endurance

The analysis of covariance on muscular endurance of the pre and post test scores of SAQ training, circuit resistance training, plyometric training and control groups have been analyzed and presented in Table IV.

TABLE IV

ANALYSIS OF COVARIANCE OF THE DATA ON MUSCULAR ENDURANCE OF PRE AND POST TESTS SCORES OF SAQ TRAINING, CIRCUIT RESISTANCE TRAINING, PLYOMETRIC TRAINING AND CONTROL GROUPS

(Scores in numbers)

Test	SAQ Training Group	Circuit Resistance Training Group	Plyometric Training Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre Test									
Mean	28.87	28.73	29.07	29.00	Between	0.98	3	0.3278	0.40
S.D.	0.92	0.80	1.03	0.85	Within	45.60	56	0.8143	
Post Test									
Mean	33.33	34.93	31.33	29.20	Between	277.60	3	92.5333	99.65*
S.D.	0.90	1.03	1.05	0.86	Within	52.00	56	0.9286	
Adjusted Post Test									
Mean	33.37	35.06	31.23	29.14	Between	292.56	3	97.5205	173.95*
					Within	30.83	55	0.5606	

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 3 and 56 and 3 and 55 are 2.776 and 2.78 respectively).

The table IV shows that the pre-test mean values on muscular endurance of SAQ training, circuit resistance training, plyometric training and control groups are 28.87, 28.73, 29.07 and 29.00 respectively. The obtained 'F' ratio of 0.40 for pre-test

scores is less than the table value of 2.776 for df 3 and 56 required for significance at .05 level of confidence on muscular endurance. The post-test mean values on muscular endurance of SAQ training, circuit resistance training, plyometric training and control groups are 33.33, 34.93, 31.33 and 29.20 respectively. The obtained "F" ratio of 99.65 for post-test scores is more than the table value of 2.776 for df 3 and 56 required for significance at .05 level of confidence on muscular endurance.

The adjusted post-test means on muscular endurance of SAQ training, circuit resistance training, plyometric training and control groups are 33.37, 35.06, 31.23 and 29.14 respectively. The obtained "F" ratio of 173.95 for adjusted post-test means is greater than the table value of 2.78 for df 3 and 55 required for significance at .05 level of confidence on muscular endurance.

The results of the study indicated that there was a significant difference between the adjusted post-test means of SAQ training, circuit resistance training, plyometric training and control groups on muscular endurance.

Since, four groups were compared, whenever the obtained 'F' ratio for adjusted post test was found to be significant, the Scheffe's test to find out the paired mean differences and it was presented in Table IV - A.

TABLE IV- A

THE SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN PAIRED MEANS ON MUSCULAR ENDURANCE

(Scores in numbers)

SAQ Training Group	Circuit Resistance Training Group	Plyometric Training Group	Control Group	Mean Differences	Confidence Interval Value
33.37	35.06	-	-	1.69*	0.97
33.37	-	31.23	-	2.14*	0.97
33.37	-	-	29.14	4.22*	0.97
-	35.06	31.23	-	3.83*	0.97
-	35.06	-	29.14	5.92*	*0.97
-	-	31.23	29.14	2.09*	0.97

* Significant at .05 level of confidence.

The table IV-A shows that the mean difference values between SAQ training group and circuit resistance training group, SAQ training group and plyometric training group, SAQ training group and control group, circuit resistance training group and plyometric training group, circuit resistance training group and control group, plyometric training group and control group on muscular endurance 1.69, 2.14, 4.22, 3.83, 5.92 and 2.09 which were greater than the required confidence interval value 0.97 for significance at .05 level of confidence.

The results of this study showed that there was a significant difference between SAQ training group and circuit resistance training group, SAQ training group and plyometric training group, SAQ training group and control group, circuit resistance training group and plyometric training group, circuit resistance training group and control group, plyometric training group and control group on muscular endurance.

The adjusted post-test mean values of SAQ training, circuit resistance training, plyometric training and control groups on muscular endurance were graphically represented in figure II.

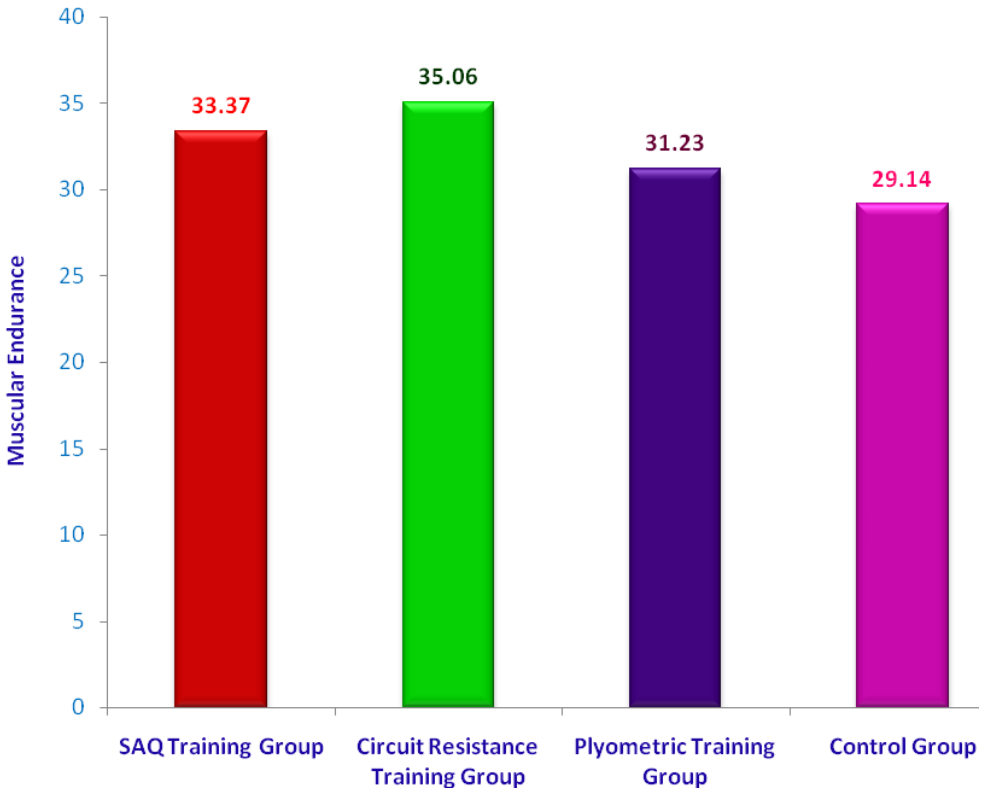

FIGURE II: THE ADJUSTED POST-TEST MEAN VALUES OF SAQ TRAINING, CIRCUIT RESISTANCE TRAINING, PLYOMETRIC TRAINING AND CONTROL GROUPS ON MUSCULAR ENDURANCE

4.1.3 Speed

The analysis of covariance on speed of the pre and post test scores of SAQ training, circuit resistance training, plyometric training and control groups have been analyzed and presented in Table V.

TABLE V

ANALYSIS OF COVARIANCE OF THE DATA ON SPEED OF PRE AND POST TESTS SCORES OF SAQ TRAINING, CIRCUIT RESISTANCE TRAINING, PLYOMETRIC TRAINING AND CONTROLGROUPS

(Scores in seconds)

Test	SAQ Training Group	Circuit Resistance Training Group	Plyometric Training Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre Test									
Mean	8.21	8.25	8.19	8.20	Between	0.0325	3	0.0108	1.67
S.D.	0.09	0.07	0.08	0.08	Within	0.3640	56	0.0065	
Post Test									
Mean	7.94	8.04	8.10	8.19	Between	0.4840	3	0.1613	25.86*
S.D.	0.08	0.09	0.08	0.06	Within	0.3493	56	0.0062	
Adjusted Post Test									
Mean	7.94	8.01	8.12	8.20	Between	0.5736	3	0.1912	103.02*
					Within	0.1021	55	0.0019	

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 3 and 56 and 3 and 55 are 2.776 and 2.78 respectively).

The table V shows that the pre-test mean values on speed of SAQ training, circuit resistance training, plyometric training and control groups are 8.21, 8.25, 8.19 and 8.20 respectively. The obtained 'F' ratio of 1.67 for pre-test scores is less than the table value of 2.776 for df 3 and 56 required for significance at .05 level of confidence on speed.

The post-test mean values on speed of SAQ training, circuit resistance training, plyometric training and control groups are 7.94, 8.04, 8.10 and 8.19 respectively. The obtained "F" ratio of 25.86 for post-test scores is more than the table value of 2.776 for df 3 and 56 required for significance at .05 level of confidence on speed.

The adjusted post-test means on speed of SAQ training, circuit resistance training, plyometric training and control groups are 7.94, 8.01, 8.12 and 8.20 respectively. The obtained "F" ratio of 103.02 for adjusted post-test means is greater than the table value of 2.78 for df 3 and 55 required for significance at .05 level of confidence on speed.

The results of the study indicated that there was a significant difference between the adjusted post-test means of SAQ training, circuit resistance training, plyometric training and control groups on speed.

Since, four groups were compared, whenever the obtained 'F' ratio for adjusted post test was found to be significant, the Scheffe's test to find out the paired mean differences and it was presented in Table V - A.

TABLE V- A

THE SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN PAIRED MEANS ON SPEED

(Scores in seconds)

SAQ Training Group	Circuit Resistance Training Group	Plyometric Training Group	Control Group	Mean Differences	Confidence Interval Value
7.94	8.01	-	-	0.07*	0.06
7.94	-	8.12	-	0.18*	0.06
7.94	-	-	8.20	0.26*	0.06
-	8.01	8.12	-	0.11*	0.06
-	8.01	-	8.20	0.19*	0.06
-	-	8.12	8.20	0.08*	0.06

* Significant at .05 level of confidence.

The table V-A shows that the mean difference values between SAQ training group and circuit resistance training group, SAQ training group and plyometric training group, SAQ training group and control group, circuit resistance training group and plyometric training group, circuit resistance training group and control group, plyometric training group and control group on speed 0.07, 0.18, 0.26, 0.11, 0.19 and 0.08 which were greater than the required confidence interval value 0.06 for significance at .05 level of confidence.

The results of this study showed that there was a significant difference between SAQ training group and circuit resistance training group, SAQ training group and plyometric training group, SAQ training group and control group, circuit resistance training group and plyometric training group, circuit resistance training group and control group, plyometric training group and control group on speed.

The adjusted post-test mean values of SAQ training, circuit resistance training, plyometric training and control groups on speed were graphically represented in figure III.

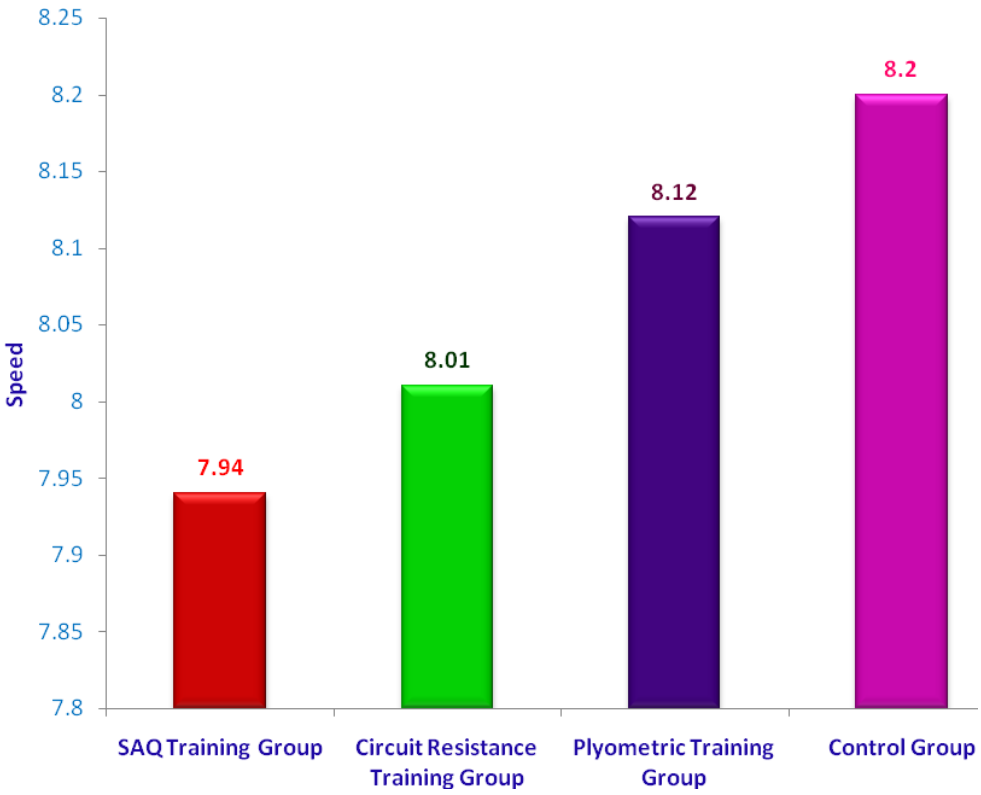

FIGURE III: THE ADJUSTED POST-TEST MEAN VALUES OF SAQ TRAINING, CIRCUIT RESISTANCE TRAINING, PLYOMETRIC TRAINING AND CONTROL GROUPS ON SPEED

4.1.4 Speed Endurance

The analysis of covariance on speed endurance of the pre and post test scores of SAQ training, circuit resistance training, plyometric training and control groups have been analyzed and presented in Table VI.

TABLE VI

ANALYSIS OF COVARIANCE OF THE DATA ON SPEED ENDURANCE OF PRE AND POST TESTS SCORES OF SAQ TRAINING, CIRCUIT RESISTANCE TRAINING, PLYOMETRIC TRAINING AND CONTROL GROUPS

(Scores in seconds)

Test	SAQ Training Group	Circuit Resistance Training Group	Plyometric Training Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre Test									
Mean	21.43	21.41	21.46	21.45	Between	0.02	3	0.01	0.06
S.D.	0.32	0.30	0.31	0.32	Within	5.48	56	0.10	
Post Test									
Mean	20.99	21.17	21.33	21.43	Between	1.62	3	0.54	5.40*
S.D.	0.29	0.33	0.31	0.33	Within	5.54	56	0.10	
Adjusted Post Test									
Mean	21.00	21.19	21.31	21.42	Between	1.45	3	0.48	68.80*
					Within	0.39	55	0.01	

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 3 and 56 and 3 and 55 are 2.776 and 2.78 respectively).

The table VI shows that the pre-test mean values on speed endurance of SAQ training, circuit resistance training, plyometric training and control groups are 21.43, 21.41, 21.46 and 21.45 respectively. The obtained 'F' ratio of 0.06 for pre-test scores is less than the table value of 2.776 for df 3 and 56 required for significance at .05 level of confidence on speed endurance.

The post-test mean values on speed endurance of SAQ training, circuit resistance training, plyometric training and control groups are 20.99, 21.17, 21.33 and 21,43 respectively. The obtained "F" ratio of 5.40 for post-test scores is more than the table value of 2.776 for df 3 and 56 required for significance at .05 level of confidence on speed endurance.

The adjusted post-test means on speed endurance of SAQ training, circuit resistance training, plyometric training and control groups are 21.00, 21.19, 21.31 and 21.43 respectively. The obtained "F" ratio of 68.80 for adjusted post-test means is greater than the table value of 2.78 for df 3 and 55 required for significance at .05 level of confidence on speed endurance.

The results of the study indicated that there was a significant difference between the adjusted post-test means of SAQ training, circuit resistance training, plyometric training and control groups on speed endurance.

Since, four groups were compared, whenever the obtained 'F' ratio for adjusted post test was found to be significant, the Scheffe's test to find out the paired mean differences and it was presented in Table VI - A.

TABLE VI- A

THE SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN PAIRED MEANS ON SPEED ENDURANCE

(Scores in seconds)

SAQ Training Group	Circuit Resistance Training Group	Plyometric Training Group	Control Group	Mean Differences	Confidence Interval Value
21.00	21.19	-	-	0.19*	0.11
21.00	-	21.31	-	0.31*	0.11
21.00	-	-	21.42	0.42*	0.11
-	21.19	21.31	-	0.11*	0.11
-	21.19	-	21.42	0.23*	0.11
-	-	21.31	21.42	0.11*	0.11

* Significant at .05 level of confidence.

The table VI-A shows that the mean difference values between SAQ training group and circuit resistance training group, SAQ training group and plyometric training group, SAQ training group and control group, circuit resistance training group and plyometric training group, circuit resistance training group and control group, plyometric training group and control group on speed endurance 0.19, 0.31, 0.42, 0.11, 0.23 and 0.11 which were greater than and equal to the required confidence interval value 0.11 for significance at .05 level of confidence.

The results of this study showed that there was a significant difference between SAQ training group and circuit resistance training group, SAQ training group and plyometric training group, SAQ training group and control group, circuit resistance training group and plyometric training group, circuit resistance training group and control group, plyometric training group and control group on speed endurance.

The adjusted post-test mean values of SAQ training, circuit resistance training, plyometric training and control groups on speed endurance were graphically represented in figure IV.

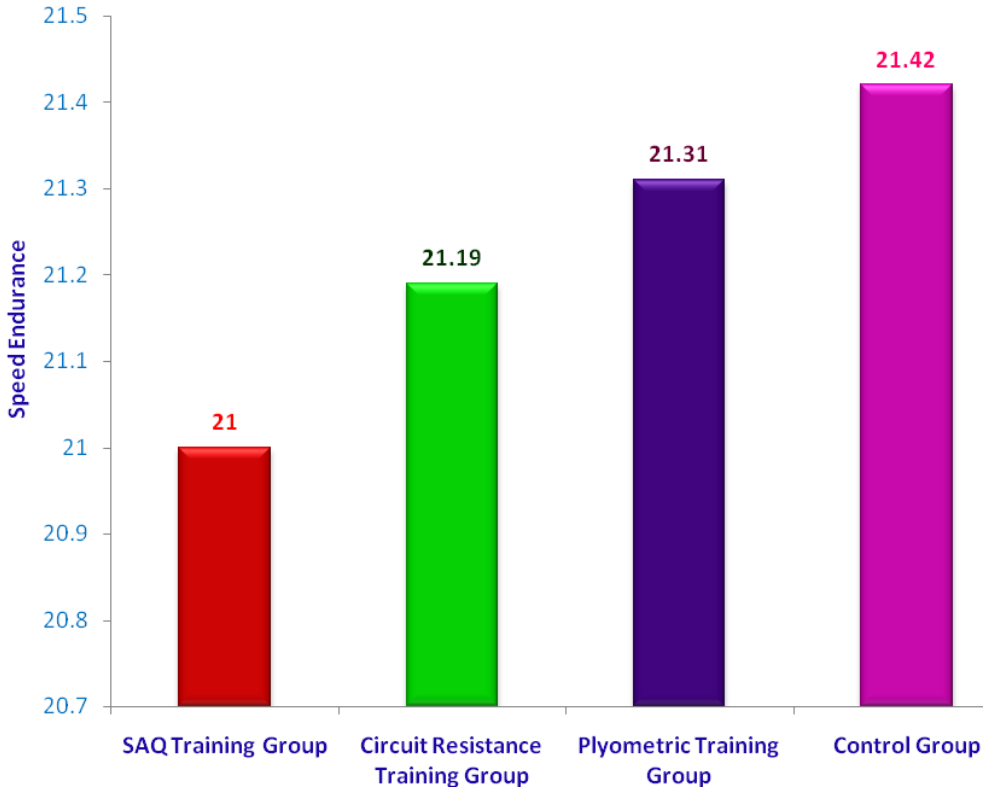

FIGURE IV: THE ADJUSTED POST-TEST MEAN VALUES OF SAQ TRAINING, CIRCUIT RESISTANCE TRAINING, PLYOMETRIC TRAINING AND CONTROL GROUPS ON SPEED ENDURANCE

4.1.5 Leg Explosive Power

The analysis of covariance on leg explosive power of the pre and post test scores of SAQ training, circuit resistance training, plyometric training and control groups have been analyzed and presented in Table VII.

TABLE VII

ANALYSIS OF COVARIANCE OF THE DATA ON LEG EXPLOSIVE POWER OF PRE AND POST TESTS SCORES OF SAQ TRAINING, CIRCUIT RESISTANCE TRAINING, PLYOMETRIC TRAINING AND CONTROL GROUPS

(Scores in centimeters)

Test	SAQ Training Group	Circuit Resistance Training Group	Plyometric Training Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre Test									
Mean	38.27	38.13	38.07	38.00	Between	0.58	3	0.1944	0.05
S.D.	2.22	2.00	2.02	1.93	Within	233.60	56	4.1714	
Post Test									
Mean	41.87	40.13	45.13	38.13	Between	396.05	3	132.0167	30.43*
S.D.	1.81	1.92	2.53	2.00	Within	242.93	56	4.3381	
Adjusted Post Test									
Mean	41.73	40.12	45.18	38.24	Between	389.99	3	129.9979	120.64*
					Within	59.27	55	1.0776	

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 3 and 56 and 3 and 55 are 2.776 and 2.78 respectively).

The table VII shows that the pre-test mean values on leg explosive power of SAQ training, circuit resistance training, plyometric training and control groups are 38.27, 38.13, 38.07 and 38.00 respectively. The obtained 'F' ratio of 0.05 for pre-test scores is less than the table value of 2.776 for df 3 and 56 required for significance at .05 level of confidence on leg explosive power.

The post-test mean values on leg explosive power of SAQ training, circuit resistance training, plyometric training and control groups are 41.87, 40.13, 45.13 and 38.13 respectively. The obtained "F" ratio of 30.43 for post-test scores is more than the table value of 2.776 for df 3 and 56 required for significance at .05 level of confidence on leg explosive power.

The adjusted post-test means on leg explosive power of SAQ training, circuit resistance training, plyometric training and control groups are 41.73, 40.12, 45.18 and 38.24 respectively. The obtained "F" ratio of 120.64 for adjusted post-test means is greater than the table value of 2.78 for df 3 and 55 required for significance at .05 level of confidence on leg explosive power.

The results of the study indicated that there was a significant difference between the adjusted post-test means of SAQ training, circuit resistance training, plyometric training and control groups on leg explosive power.

Since, four groups were compared, whenever the obtained 'F' ratio for adjusted post test was found to be significant, the Scheffe's test to find out the paired mean differences and it was presented in Table VII - A.

TABLE VII- A

THE SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN PAIRED MEANS ON LEG EXPLOSIVE POWER

(Scores in centimeters)

SAQ Training Group	Circuit Resistance Training Group	Plyometric Training Group	Control Group	Mean Differences	Confidence Interval Value
41.73	40.12	-	-	1.62*	1.34
41.73	-	45.18	-	3.44*	1.34
41.73	-	-	38.24	3.50*	1.34
-	40.12	45.18	-	5.06*	1.34
-	40.12	-	38.24	1.88*	1.34
-	-	45.18	38.24	6.94*	1.34

* Significant at .05 level of confidence.

The table VII-A shows that the mean difference values between SAQ training group and circuit resistance training group, SAQ training group and plyometric training group, SAQ training group and control group, circuit resistance training group and plyometric training group, circuit resistance training group and control group, plyometric training group and control group on leg explosive power 1.62, 3.44, 3.50, 5.06, 1.88 and 6.94 which were greater than the required confidence interval value 1.34 for significance at .05 level of confidence.

The results of this study showed that there was a significant difference between SAQ training group and circuit resistance training group, SAQ training group and plyometric training group, SAQ training group and control group, circuit resistance training group and plyometric training group, circuit resistance training

group and control group, plyometric training group and control group on leg explosive power.

The adjusted post-test mean values of SAQ training, circuit resistance training, plyometric training and control groups on leg explosive power were graphically represented in figure V.

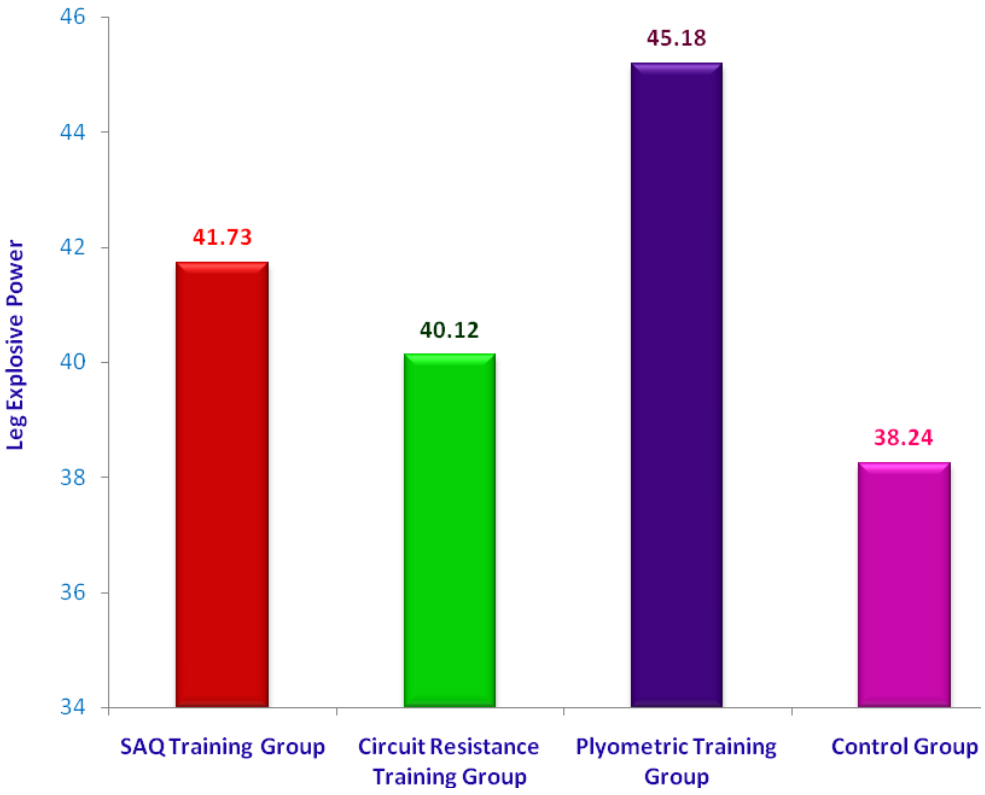

FIGURE V: THE ADJUSTED POST-TEST MEAN VALUES OF SAQ TRAINING, CIRCUIT RESISTANCE TRAINING, PLYOMETRIC TRAINING AND CONTROL GROUPS ON LEG EXPLOSIVE POWER

4.1.6 Agility

The analysis of covariance on agility of the pre and post test scores of SAQ training, circuit resistance training, plyometric training and control groups have been analyzed and presented in Table VIII.

TABLE VIII

ANALYSIS OF COVARIANCE OF THE DATA ON AGILITY OF PRE AND POST TESTS SCORES OF SAQ TRAINING, CIRCUIT RESISTANCE TRAINING, PLYOMETRIC TRAINING AND CONTROL GROUPS

(Scores in seconds)

Test	SAQ Training Group	Circuit Resistance Training Group	Plyometric Training Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre Test									
Mean	15.53	15.51	15.51	15.52	Between	0.0040	3	0.0013	0.03
S.D.	0.21	0.20	0.20	0.21	Within	2.3520	56	0.0420	
Post Test									
Mean	14.93	15.21	15.41	15.50	Between	2.8193	3	0.9398	20.40*
S.D.	0.21	0.24	0.21	0.19	Within	2.5800	56	0.0461	
Adjusted Post Test									
Mean	14.92	15.22	15.41	15.50	Between	2.9705	3	0.9902	215.03*
					Within	0.2533	55	0.0046	

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 3 and 56 and 3 and 55 are 2.776 and 2.78 respectively).

The table VIII shows that the pre-test mean values on agility of SAQ training, circuit resistance training, plyometric training and control groups are 15.53, 15.51, 15.51 and 15.52 respectively. The obtained 'F' ratio of 0.03 for pre-test scores is less than the table value of 2.776 for df 3 and 56 required for significance at .05 level of confidence on agility.

The post-test mean values on agility of SAQ training, circuit resistance training, plyometric training and control groups are 14.93, 15.21, 15.41 and 15.50 respectively. The obtained "F" ratio of 20.40 for post-test scores is more than the table value of 2.776 for df 3 and 56 required for significance at .05 level of confidence on agility.

The adjusted post-test means on agility of SAQ training, circuit resistance training, plyometric training and control groups are 14.92, 15.22, 15.41 and 15.50 respectively. The obtained "F" ratio of 215.03 for adjusted post-test means is greater than the table value of 2.78 for df 3 and 55 required for significance at .05 level of confidence on agility.

The results of the study indicated that there was a significant difference between the adjusted post-test means of SAQ training, circuit resistance training, plyometric training and control groups on agility.

Since, four groups were compared, whenever the obtained 'F' ratio for adjusted post test was found to be significant, the Scheffe's test to find out the paired mean differences and it was presented in Table VIII - A.

TABLE VIII - A

THE SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN PAIRED MEANS ON AGILITY

(Scores in seconds)

SAQ Training Group	Circuit Resistance Training Group	Plyometric Training Group	Control Group	Mean Differences	Confidence Interval Value
14.92	15.22	-	-	0.30*	0.09
14.92	-	15.41	-	0.49*	0.09
14.92	-	-	15.50	0.58*	0.09
-	15.22	15.41	-	0.19*	0.09
-	15.22	-	15.50	0.28*	0.09
-	-	15.41	15.50	0.09*	0.09

* Significant at .05 level of confidence.

The table VIII-A shows that the mean difference values between SAQ training group and circuit resistance training group, SAQ training group and plyometric training group, SAQ training group and control group, circuit resistance training group and plyometric training group, circuit resistance training group and control group, plyometric training group and control group on agility 0.30, 0.49, 0.58, 0.19, 0.28 and 0.09 which were greater and equal to the required confidence interval value 0.09 for significance at .05 level of confidence.

The results of this study showed that there was a significant difference between SAQ training group and circuit resistance training group, SAQ training group and plyometric training group, SAQ training group and control group, circuit resistance training group and plyometric training group, circuit resistance training group and control group, plyometric training group and control group on agility.

The adjusted post-test mean values of SAQ training, circuit resistance training, plyometric training and control groups on agility were graphically represented in figure VI.

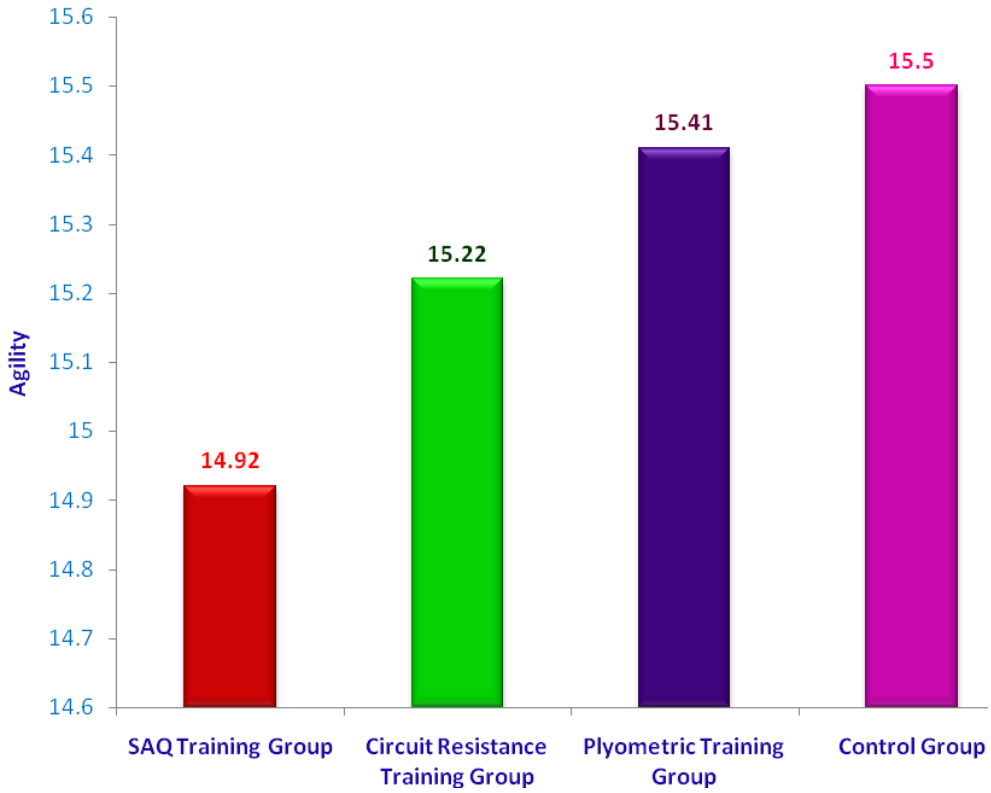

FIGURE VI: THE ADJUSTED POST-TEST MEAN VALUES OF SAQ TRAINING, CIRCUIT RESISTANCE TRAINING, PLYOMETRIC TRAINING AND CONTROL GROUPS ON AGILITY

4.1.7 Cardio Respiratory Endurance

The analysis of covariance on cardio respiratory endurance of the pre and post test scores of SAQ training, circuit resistance training, plyometric training and control groups have been analyzed and presented in Table IX.

TABLE IX

ANALYSIS OF COVARIANCE OF THE DATA ON CARDIO RESPIRATORY ENDURANCE OF PRE AND POST TESTS SCORES OF SAQ TRAINING, CIRCUIT RESISTANCE TRAINING, PLYOMETRIC TRAINING AND CONTROL GROUPS

(Scores in meters)

Test	SAQ Training Group	Circuit Resistance Training Group	Plyometric Training Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained 'F' Ratio
Pre Test									
Mean	1353.00	1358.00	1352.67	1354.33	Between	268.33	3	89.44	0.06
S.D.	38.35	39.32	38.26	39.14	Within	84166.67	56	1502.98	
Post Test									
Mean	1377.00	1406.67	1364.00	1355.67	Between	22481.67	3	7493.89	4.93*
S.D.	36.83	42.71	38.32	37.84	Within	85126.67	56	1520.12	
Adjusted Post Test									
Mean	1378.49	1403.19	1365.82	1355.83	Between	18805.70	3	6268.57	151.56*
					Within	2274.82	55	41.36	

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 3 and 56 and 3 and 55 are 2.776 and 2.78 respectively).

The table IX shows that the pre-test mean values on cardio respiratory endurance of SAQ training, circuit resistance training, plyometric training and control groups are 1353.00, 1358.00, 1352.67 and 1354.33 respectively. The obtained 'F'

ratio of 0.06 for pre-test scores is less than the table value of 2.776 for df 3 and 56 required for significance at .05 level of confidence on cardio respiratory endurance. The post-test mean values on cardio respiratory endurance of SAQ training, circuit resistance training, plyometric training and control groups are 1377.00, 1406.67, 1364.00 and 1355.67 respectively. The obtained "F" ratio of 4.93 for post-test scores is more than the table value of 2.776 for df 3 and 56 required for significance at .05 level of confidence on cardio respiratory endurance.

The adjusted post-test means on cardio respiratory endurance of SAQ training, circuit resistance training, plyometric training and control groups are 1378.49, 1403.19, 1365.82 and 1355.83 respectively. The obtained "F" ratio of 151.56 for adjusted post-test means is greater than the table value of 2.78 for df 3 and 55 required for significance at .05 level of confidence on cardio respiratory endurance.

The results of the study indicated that there was a significant difference between the adjusted post-test means of SAQ training, circuit resistance training, plyometric training and control groups on cardio respiratory endurance.

Since, four groups were compared, whenever the obtained 'F' ratio for adjusted post test was found to be significant, the Scheffe's test to find out the paired mean differences and it was presented in Table IX - A.

TABLE IX- A

THE SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN PAIRED MEANS ON CARDIO RESPIRATORY ENDURANCE

(Scores in seconds)

SAQ Training Group	Circuit Resistance Training Group	Plyometric Training Group	Control Group	Mean Differences	Confidence Interval Value
1378.49	1403.19	-	-	24.71*	8.29
1378.49	-	1365.82	-	12.67*	8.29
1378.49	-	-	1355.83	22.66*	8.29
-	1403.19	1365.82	-	37.38*	8.29
-	1403.19	-	1355.83	47.36*	8.29
-	-	1365.82	1355.83	9.99*	8.29

* Significant at .05 level of confidence.

The table IX-A shows that the mean difference values between SAQ training group and circuit resistance training group, SAQ training group and plyometric training group, SAQ training group and control group, circuit resistance training group and plyometric training group, circuit resistance training group and control group, plyometric training group and control group on cardio respiratory endurance 24.71, 12.67, 22.66, 37.38, 47.36 and 9.99 which were greater than the required confidence interval value 8.29 for significance at .05 level of confidence.

The results of this study showed that there was a significant difference between SAQ training group and circuit resistance training group, SAQ training group and plyometric training group, SAQ training group and control group, circuit resistance training group and plyometric training group, circuit resistance training

group and control group, plyometric training group and control group on cardio respiratory endurance.

The adjusted post-test mean values of SAQ training, circuit resistance training, plyometric training and control groups on cardio respiratory endurance were graphically represented in figure VII.

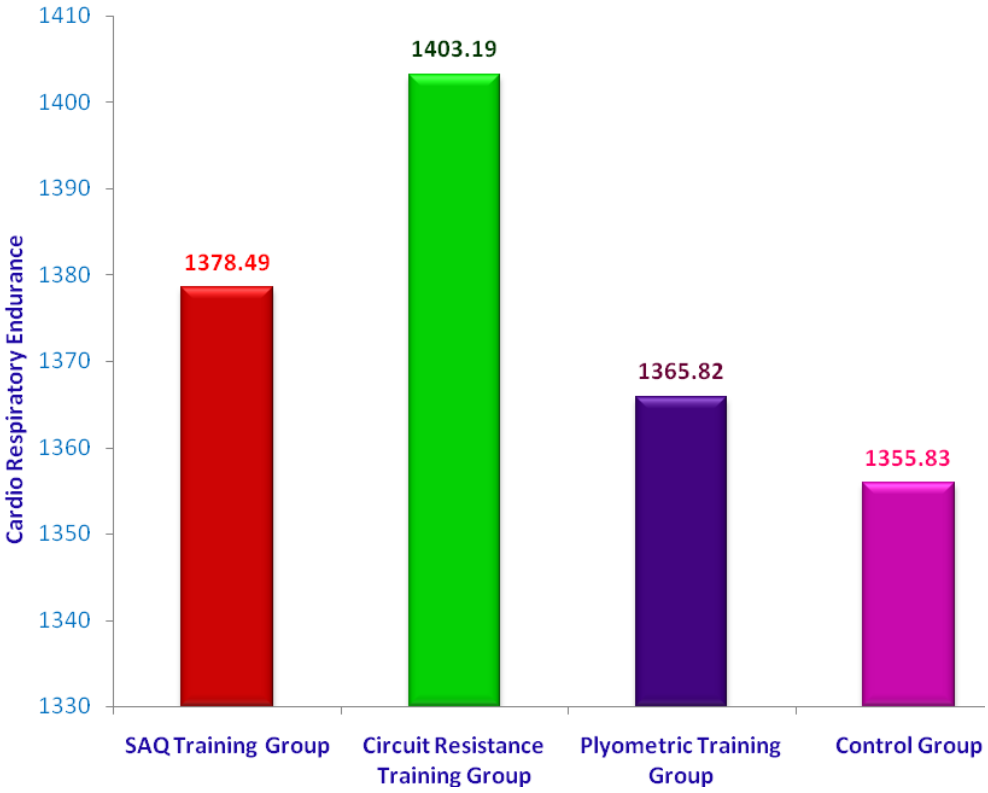

FIGURE VII: THE ADJUSTED POST-TEST MEAN VALUES OF SAQ TRAINING, CIRCUIT RESISTANCE TRAINING, PLYOMETRIC TRAINING AND CONTROL GROUPS ON CARDIO RESPIRATORY ENDURANCE

4.2 RESULTS OF THE STUDY

MOTOR FITNESS VARIABLES

The results of the study showed that there was a significant difference among SAQ training, circuit resistance training, plyometric training and control groups on selected motor fitness variables namely muscular strength, muscular endurance, speed, speed endurance, leg explosive power, agility and cardio respiratory endurance among inter collegiate men football players.

The results of the study also showed that there was a significant difference between SAQ training group and circuit resistance training group, SAQ training group and plyometric training group, SAQ training group and control group, circuit resistance training group and plyometric training group, circuit resistance training group and control group, plyometric training group and control group on selected motor fitness variables namely muscular strength, muscular endurance, speed, speed endurance, leg explosive power, agility and cardio respiratory endurance among inter collegiate men football players.

And also it was found that there was a significant improvement on selected motor fitness variables namely muscular strength, muscular endurance, speed, speed endurance, leg explosive power, agility and cardio respiratory endurance due to SAQ training, circuit resistance training, plyometric training. However, the improvement on muscular strength, muscular endurance and cardio respiratory endurance was in favour for circuit resistance training group, And the improvement on speed, speed endurance and agility was in favour for SAQ training. The improvement on leg explosive power was in favour for plyometric training.

4.3 DISCUSSION ON FINDINGS

The results of this study showed that there was a significant difference among SAQ training, circuit resistance training, plyometric training and control groups on selected motor fitness variables namely muscular strength, muscular endurance, speed, speed endurance, leg explosive power, agility and cardio respiratory endurance among inter collegiate men football players.And also it was found that there was a significant improvement on selected motor fitness variables namely muscular strength, muscular endurance, speed, speed endurance, leg explosive power, agility and cardio respiratory endurance among inter collegiate men football players due to SAQ training, circuit resistance training, plyometric training.

Muscular Strength

After analyzing the results the researcher found that there were significant differences among the experimental and control group and there was a significant improvement on the experimental groups on muscular strength. The selected training group has significantly increased the ability of muscular strength from the base line to post training. The SAQ training group pre (31.53 $\pm$ 1.06 to post (35.60 $\pm$ 0.99), circuit resistance training group pre (31.40 $\pm$ 0.91) to post (37.33 $\pm$ 0.98) and plyometric training group pre (31.87 $\pm$ 0.83) to post (34.07$\pm$ 0.88) have significantly increased pre to post in the three experimental groups with no change in control group. **Polhemus (1987)** explained the significant results by the effects of plyometric training drills on strength gain of collegiate football players.

Muscular Endurance

After analyzing the results the researcher found that there were significant differences among the experimental and control group and there was a significant improvement on the experimental groups on muscular endurance. The selected training group has significantly increased the ability of muscular endurance from the base line to post training. The SAQ training group pre (28.87 $\pm$ 0.92 to post (33.33 $\pm$ 0.90), circuit resistance training group pre (28.73 $\pm$ 0.80) to post (34.93 $\pm$ 1.03) and plyometric training group pre (29.07 $\pm$ 1.03) to post (31.33. $\pm$ 1.05) have significantly increased pre to post in the three experimental groups with no change in control group.

Speed

After analyzing the results the researcher found that there were significant differences among the experimental and control group and there was a significant improvement on the experimental groups on speed. The selected training group has significantly increased the ability of speed from the base line to post training. The SAQ training group pre (8.21 $\pm$ 0.99 to post (7.94 $\pm$ 0.08), circuit resistance training group pre (8.25 $\pm$ 0.07) to post (8.04 $\pm$ 0.09) and plyometric training group pre (8.19 $\pm$ 0.08) to post (8.10. $\pm$ 0.08) have significantly improved pre to post in the three experimental groups with no change in control group. **Markovic G, (2007)** conducted a study on effects of sprint and plyometric training on muscle function athletic performance. It has improved isometric squat strength (10%; Es = 0.4) and SJ and CMJ power (4%; Es=0.4, and 7%Es=0.4) as well as sprint (3.1% ; Es=0.9) and agility (4.3%;Es = 1.1) performance similar or even greater training effects in muscle function and athletic performance than does conventional plyometric training. This

provides support for the use of sprint training as an applicable training method of improving explosive performance of athletics in general.

Speed Endurance

After analyzing the results the researcher found that there were significant differences among the experimental and control group and there was a significant improvement on the experimental groups on speed endurance. The selected training group has significantly decreased the ability of speed endurance from the base line to post training. The SAQ training group pre (21.43 $\pm$ 0.32 to post (20.99 $\pm$ 0.29), circuit resistance training group pre (21.41 $\pm$ 0.30) to post 21.17 $\pm$ 0.33) and plyometric training group pre (21.46 $\pm$ 0.31) to post (21.33 $\pm$ 0.31 have significantly decreased pre to post in the three experimental groups with no change in control group.

Leg Explosive Power

After analyzing the results the researcher found that there were significant differences among the experimental and control group and there was a significant improvement on the experimental groups on leg explosive power. The selected training group has significantly increased the ability of leg explosive power from the base line to post training. The SAQ training group pre (38.27 $\pm$ 2.22 to post (41.87 $\pm$ 1.81), circuit resistance training group pre (38.13 $\pm$ 2.00) to post (40.13 $\pm$ 0.92) and plyometric training group pre (38.07 $\pm$ 2.02) to post (45.13. $\pm$ 2.53) have significantly improved pre to post in the three experimental groups with no change in control group. **Thomas K, French D, (2009)** measured power and agility during two plyometric training techniques in youth Football players. Based on the results, both groups experienced improvements in vertical jump height ($P<0.05$) and agility tie

(P<0.05) and no change in sprint performance (P>0.05). There were no different between the treatment groups (P>0.005). The study concludes that both Depth Jump and Counter Movement Jump plyometrics are worth while training activities for improving power and agility in youth Football players. **Ioannis G, Fatouros (2000)** the combination training produced improvements in vertical jump and leg strength that were significantly greater than improvement in the other 2 training groups (plyometric training and weight training). This study provides support for the use of a combination of traditional and Olympic style weight lighting exercise and plyometric drills too improve vertical jumping ability explosive performance.

Agility

After analyzing the results the researcher found that there were significant differences among the experimental and control group and there was a significant improvement on the experimental groups on agility. The selected training group has significantly increased the ability of agility from the base line to post training. The SAQ training group pre (15.53 $\pm$ 0.21 to post (14.93 $\pm$ 0.21), circuit resistance training group pre (15.51 $\pm$ 0.20) to post (15.21 $\pm$ 0.24) and plyometric training group pre (15.51 $\pm$ 0.20) to post (15.41. $\pm$ 0.21) have significantly decreased pre to post in the three experimental groups with no change in control group. **Thomas K, French D, (2009)** measured power and agility during two plyometric training techniques in youth Football players. Based on the results, both groups experienced improvements in vertical jump height (P<0.05) and agility tie (P<0.05) and no change in sprint performance (P>0.05). There were no different between the treatment groups (P>0.005). The study concludes that both Depth Jump and Counter Movement Jump plyometrics are worth while training activities for improving power and agility in youth Football players.

Cardio Respiratory Endurance

After analyzing the results the researcher found that there were significant differences among the experimental and control group and there was a significant improvement on the experimental groups on cardio respiratory endurance. The selected training group has significantly increased the ability of cardio respiratory endurance from the base line to post training. The SAQ training group pre (1353.00 ± 38.35 to post (1377.00 ± 36.83), circuit resistance training group pre (1358.00 ± 39.32 to post (1406.67± 42.71) and plyometric training group pre (1352.67 ± 38.26) to post (1364. ± 38.32) have significantly improved pre to post in the three experimental groups with no change in control group. **Grieco C cortes (2011)** revealed that plyometric training program had shown significant improvement after training. The results suggest a plyometric / agility training program may increase VO_2 peak in Football players.

These results concur with findings from

SAQ Training Effects

Polman R, Bloomfield J, (2009) investigate the efficacy of both programmed (speed, agility, and quickness; SAQ) and random (small-sided games; SSG) conditioning methods on selected neuromuscular and physical performance variables. There was a 6.9% (95% CI: -4.4 to 18.3) greater improvement in 5-m acceleration time and 4.3% (95% CI: -0.9 to 9.5) in 15-m mean running velocity time for the SAQ group compared with the SSG group. In addition, increases in maximal isokinetic concentric strength for both the flexor and extensor muscles, with the exception of 180 degrees /s flexion, were greater in the SAQ than SSG condition. The

SAQ group also showed 19.5% (95% CI: -11.2 to 50.2) greater gain in reactive strength (contact time depth jump) and 53.8% (95% CI:11.2 to 98.6) in mean gastrocnemius medialis activity in comparison with SSG. SAQ training should benefit the physical conditioning programs of novice players performing invasion games.

Circuit resistance training effects

Bogdanis, Gregory C; et.al., (2011) Conducted a study on the effects of two different half-squat training programs on the repeated-sprint ability of soccer players during the preseason. These results suggest that resistance training with high loads is superior to a moderate-load program, because it increases strength without a change in muscle mass and also results in a greater improvement in repeated sprint ability. Therefore, resistance training with high loads may be preferable when the aim is to improve maximal strength and fatigue during sprinting in professional soccer players. **Wong PL, Chaouachi A, et.al., (2010)** conducted a study on examined the effect of concurrent muscular strength and high-intensity running interval training on professional soccer players' explosive performances and aerobic endurance. High-intensity interval running can be concurrently performed with high load muscular strength training to enhance soccer players' explosive performances and aerobic endurance.**Jullien, Hugues; et.al., (2008)** Conducted a study on assessed the effects of specific leg strength training (as part of a broader exercise program) on running speed and agility in young professional soccer players. The results indicate that in the short sprints or shuttle sprint with changes in direction, lower limb strengthening did not improve performance. Performance improved in all 3 groups in the agility test but more so in the reference and coordination groups. It appears that soccer-specific training composed of exercise circuits specifically adapted to the different types of effort actually used in match play can enhance agility and

coordination. **Dupont G, Akakpo K, et.al. (2004)** conducted a study on the effects of in-season, high-intensity interval training on professional male soccer players' running performances were investigated. Results from the high-intensity interval training have shown that maximal aerobic speed was improved (+8.1 +/- 3.1%; $p < 0.001$) and that the time of the 40-m sprint was decreased (-3.5 +/- 1.5%; $p < 0.001$), whereas no change in either parameters were observed during the control period. This study shows that improvements in physical qualities can be made during the in-season period.

Plyometric training effects

Mathev A et.al. (2011) concluded that the 10-week plyometric programme might be an effective training stimulus to improve speed and explosive strength, in football players.**Twist C (2011)** concluded that the individuals use concurrent plyometric and endurance training programmes to improve endurance performance. **Malafesta D (2009)** demonstrated that a plyometric programme with in regular football practice improved explosive actions of youth players. The results have concurred with the findings of **Luebbers PE et al, (2003)** who conducted a study on effects of plyometic training and recovery on vertical jump performance and anaerobic power. The study of **Jeffrey A. et al, (1999)** reveals that muscle power and fibre characteristics change in muscle power output and fibre characteristics following a 3 $d.wk^{-1}$, 8 week plyometic and aerobic programme.

The above mentioned studies lend support to the results of the present study.

4.4. DISCUSSION ON HYPOTHESES

At earlier, the researcher had formulated the following hypothesis,

At first, It was also hypothesized that there may be a significant improvement on selected motor fitness variables due to SAQ training, circuit resistance training and plyometric training. The results of the study showed that there was a significant improvement on selected criterion variables due to SAQ training, circuit resistance training and plyometric training after experimental period on selected motor fitness variables namely muscular strength, muscular endurance, speed, speed endurance, leg explosive power, agility and cardio respiratory endurance among inter collegiate men football players. Hence, the researcher's first hypothesis was also accepted.

In second, it was hypothesized that there may be a significant difference among SAQ training, circuit resistance training, plyometric training and control groups after experimental period on selected motor fitness variables. The results of the study showed that there was a significant difference among SAQ training, circuit resistance training, plyometric training and control groups after experimental period on selected motor fitness variables namely muscular strength, muscular endurance, speed, speed endurance, leg explosive power, agility and cardio respiratory endurance among inter collegiate men football players. Hence, the researcher's second hypothesis was also accepted.