

## **CHAPTER IV**

### **RESULTS AND DISCUSSIONS**

#### **4.1 OVER VIEW**

This chapter deals with analysis of data, discussion on findings and discussion on hypotheses. The subjects for this study were selected at random but the groups were not equated in relation to the factors have been examined. Hence, the differences among the means of the four groups in pre test had to be taken into account during the analysis of the post test differences among the means. This was achieved by the application of Analysis of Covariance, where the final means were adjusted for differences in the initial means and the adjusted means were tested for significance. When the post test means were significant, Scheffe's Post-hoc test was used to find out the paired mean significant differences.

#### **4.2 TEST OF SIGNIFICANCE**

This is the crucial portion of the dissertation in arriving at the conclusion by examining the hypotheses. The procedure of testing the hypothesis in accordance with the results obtained in relation to the level of confidence which was fixed at 0.05 level was considered necessary for this study.

These tests are usually called the tests of significance to determine whether the difference between the pre test and post test scores of the samples are significant or not. In the present study, if the obtained F-ratio was greater than the table F-ratio at 0.05 level, the hypothesis was accepted to the effect that there existed significant difference between the means of groups compare and if the obtained F-ratio was

lesser than the table F-ratio at 0.05 level, the hypothesis was rejected to the effect that there existed no significant difference between the means of groups compared on this study.

#### **4.2.1 Level of Significance**

The probability level below which we reject the hypothesis is termed as the level of significance. The F-ratio obtained by analysis of variance and analysis of covariance needed for significant at 0.05 level. In addition to that the significant difference between the paired adjusted means were tested by computing the confidence interval value, utilizing the Scheffe's Post-hoc test, in which the obtained mean difference value needed to be greater than the Scheffe's confidence interval value for significance.

#### **4.3 COMPUTATION OF ANALYSIS OF COVARIANCE AND POST HOC TEST**

The following tables illustrated the statistical results of the effect varied capsules of fitness training namely circuit, interval and stair case training on selected physical, physiological, psychological and skill variables among college level handball players and the ordered adjusted means and the differences between means of the groups under study.

To facilitate the statistical analysis, the following short forms were used.

CTG - Circuit Training Group

ITG - Interval Training Group

SCTG - Stair Case Training Group

CG - Control Group

Table V

## COMPUTATION OF ANALYSIS OF COVARIANCE OF SPEED

	CTG	ITG	SCTG	CG	Sources of Variance	Sum of Squares	df	Mean squares	Obtained F-ratio
Pre – test Mean	7.26	7.21	7.19	7.31	Between	0.16	3	0.05	0.53
					Within	7.69	76	0.10	
Post – test Mean	7.05	7.06	7.04	7.34	Between	1.24	3	0.41	6.30*
					Within	4.99	76	0.07	
Adjusted post – test Mean	7.03	7.09	7.08	7.29	Between	0.77	3	0.26	24.31*
					Within	0.80	75	0.01	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73,

3 and 76(df) = 2.72.

\*Significant

The obtained F value on the scores of pre-test means of 0.53 was lesser than the required table F value of 2.72, the obtained F value on the scores of post-test means of 6.30 was greater than the required table F value of 2.72 and the obtained F value of adjusted post-test means of 24.31 was greater than the required table F value of 2.73. Hence, there was no significant difference between pre-test means and there were significant differences between post-test and adjusted post-test means at 0.05 level.

Since significant improvements were recorded, Scheffe's Post-hoc Test was used to find the paired mean differences.

Table V.a

**COMPUTATION OF ANALYSIS OF SCHEFFE'S POST-HOC TEST OF SPEED**

CTG	ITG	SCTG	CG	Mean Difference (MD)	C.I. Value
7.03	7.09			0.06	0.09
7.03		7.08		0.05	
7.03			7.29	0.26*	
	7.09	7.08		0.01	
	7.09		7.29	0.20*	
		7.08	7.29	0.21*	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73.

\*Significant at 0.05 level.

The adjusted post-test mean differences of 0.26, 0.20, and 0.21 were greater than the required confidence interval value of 0.09 and these comparisons were significant at 0.05 level. Circuit training had remarkable improvement on speed among college handball players than other groups.

The pre-test, post-test and adjusted post-test means of speed are presented through a bar diagram for better understanding of the results of this study in figure 1.

Figure 1

## Bar Diagram on Pre-test, Post-test and Adjusted Post-test Means of Speed

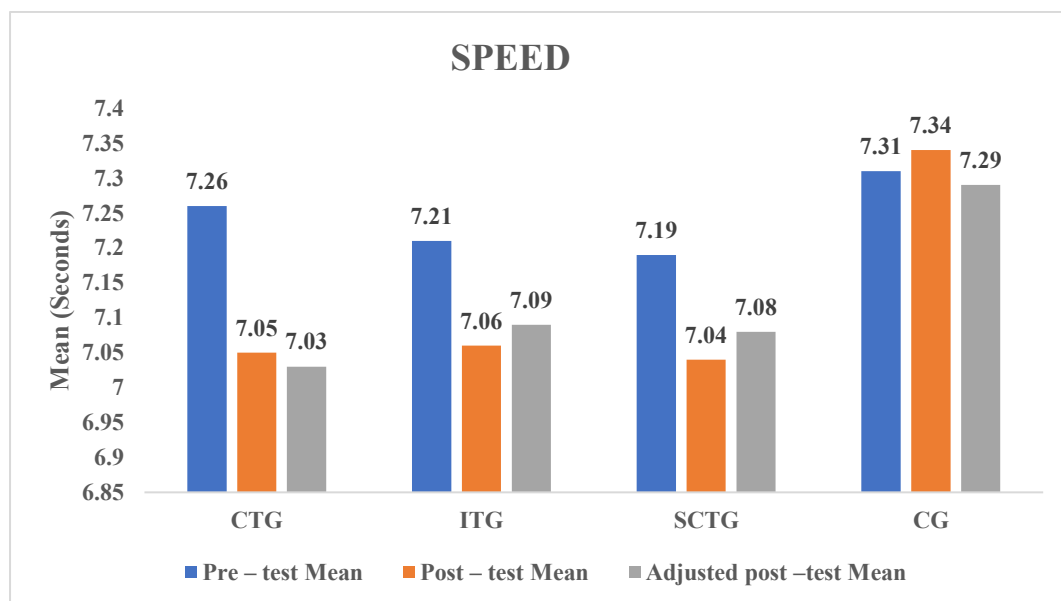


Table VI

## COMPUTATION OF ANALYSIS OF COVARIANCE OF ABDOMINAL STRENGTH

	CTG	ITG	SCTG	CG	Sources of Variance	Sum of Squares	df	Mean squares	Obtained F-ratio
Pre – test Mean	34.90	35.15	36.30	38.50	Between	161.84	3	53.95	1.33
					Within	3083.55	76	40.57	
Post – test Mean	37.25	37.50	40.35	38.55	Between	119.14	3	39.71	2.91*
					Within	2216.25	76	29.16	
Adjusted post – test Mean	38.35	38.39	40.28	36.63	Between	131.48	3	43.83	85.49*
					Within	38.45	75	0.51	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73, 3 and 76(df) = 2.72.

\*Significant

The obtained F value on the scores of pre-test means of 1.33 was lesser than the required table F value of 2.72, the obtained F value on the scores of post-test means of 2.91 was greater than the required table F value of 2.72 and the obtained F value of adjusted post-test means of 85.49 was greater than the required table F value of 2.73. Hence, there was no significant difference between pre-test means and there were significant differences between post-test and adjusted post-test means at 0.05 level.

Since significant improvements were recorded, Scheffe's Post-hoc Test was used to find the paired mean differences.

**Table VI.a**

**COMPUTATION OF ANALYSIS OF SCHEFFE'S POST-HOC TEST OF ABDOMINAL STRENGTH**

<b>CTG</b>	<b>ITG</b>	<b>SCTG</b>	<b>CG</b>	<b>Mean Difference (MD)</b>	<b>C.I. Value</b>
38.35	38.39			0.04	0.65
38.35		40.28		1.92*	
38.35			36.63	1.73*	
	38.39	40.28		1.88*	
	38.39		36.63	1.77*	
		40.28	36.63	3.65*	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73.

\*Significant at 0.05 level.

The adjusted post-test mean differences of 1.92, 1.73, 1.88, 1.77 and 3.65 were greater than the required confidence interval value of 0.65 and these comparisons were significant at 0.05 level. Stair case training had remarkable improvement on abdominal strength among college handball players than other groups.

The pre-test, post-test and adjusted post-test means of abdominal strength are presented through a bar diagram for better understanding of the results of this study in figure 2.

**Figure 2**

**Bar Diagram on Pre-Test, Post-Means and Adjusted Post-Means of Abdominal Strength**

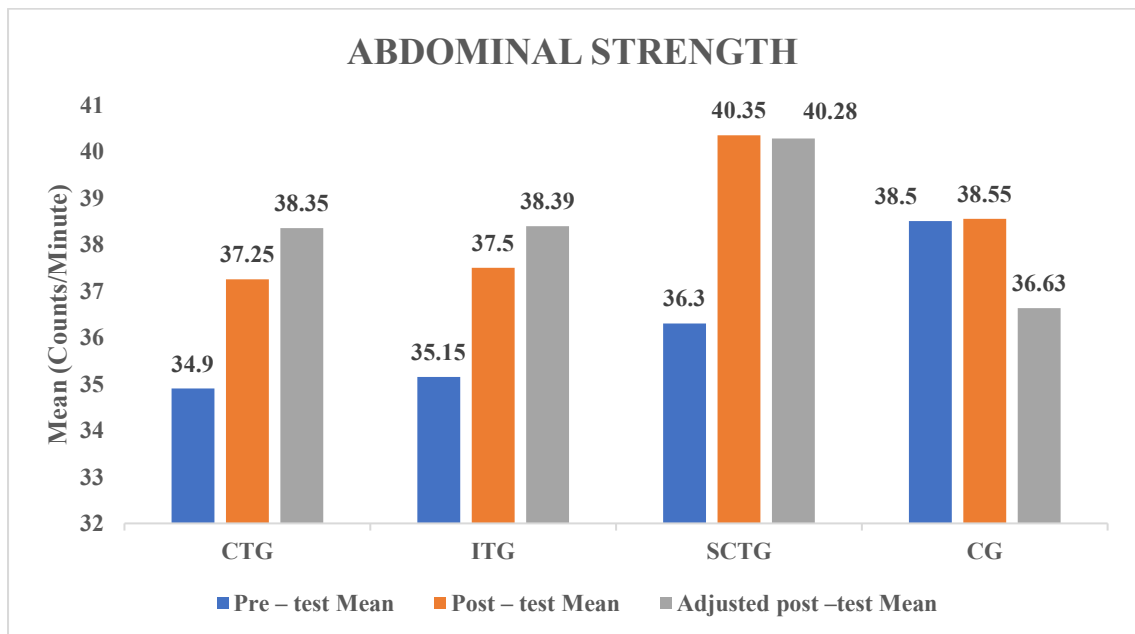


Table VII

## COMPUTATION OF ANALYSIS OF COVARIANCE OF FLEXIBILITY

	CTG	ITG	SCTG	CG	Sources of Variance	Sum of Squares	df	Mean squares	Obtained F-ratio
Pre – test Mean	12.65	13.00	13.40	13.10	Between	5.74	3	1.91	0.42
					Within	343.15	76	4.52	
Post – test Mean	14.80	14.65	15.20	13.65	Between	26.05	3	8.68	2.19
					Within	301.50	76	3.97	
Adjusted post – test Mean	15.13	14.68	14.89	13.60	Between	27.45	3	9.15	12.06*
					Within	56.92	75	0.76	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73, 3 and 76(df) = 2.72.

\*Significant

The obtained F value on the scores of pre-test means of 0.42 was lesser than the required table F value of 2.72, the obtained F value on the scores of post-test means of 2.19 was greater than the required table F value of 2.72 and the obtained F value of adjusted post-test means of 12.06 was greater than the required table F value of 2.73. Hence, there was no significant difference between pre-test means and there were significant differences between post-test and adjusted post-test means at 0.05 level.

Since significant improvements were recorded, Scheffe's Post-hoc Test was used to find the paired mean differences.

Table VII.a

**COMPUTATION OF ANALYSIS OF SCHEFFE'S POST-HOC TEST OF FLEXIBILITY**

CTG	ITG	SCTG	CG	Mean Difference (MD)	C.I. Value
15.13	14.68			0.45	0.79
15.13		14.89		0.23	
15.13			13.60	1.53*	
	14.68	14.89		0.21	
	14.68		13.60	1.08*	
		14.89	13.60	1.30*	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73.

\*Significant at 0.05 level.

The adjusted post-test mean differences of 1.53, 1.08, and 1.30 were greater than the required confidence interval value of 0.79 and these comparisons were significant at 0.05 level. Circuit training had remarkable improvement on flexibility among college handball players than other groups.

The pre-test, post-test and adjusted post-test means of flexibility are presented through a bar diagram for better understanding of the results of this study in figure 3.

Figure 3

Bar Diagram on Pre-test, Post-test and Adjusted Post-test Means of Flexibility

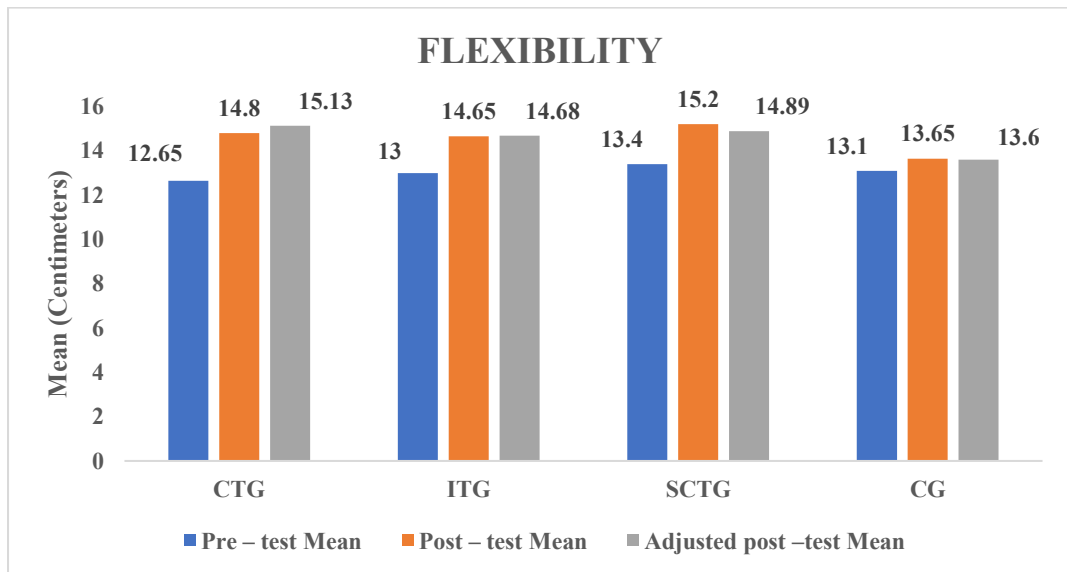


Table VIII

COMPUTATION OF ANALYSIS OF COVARIANCE OF  
CARDIOVASCULAR ENDURANCE

	CTG	ITG	SCTG	CG	Sources of Variance	Sum of Squares	df	Mean squares	Obtained F-ratio
Pre – test Mean	3240.00	3264.50	3259.50	3304.00	Between	43210.00	3	14403.33	0.97
					Within	1127220.00	76	14831.84	
Post – test Mean	3468.50	3380.00	3437.00	3325.00	Between	241173.75	3	80391.25	3.10*
					Within	1971175.00	76	25936.51	
Adjusted post – test Mean	3493.32	3382.30	3443.89	3290.99	Between	440108.79	3	146702.93	10.80*
					Within	1018700.53	75	13582.67	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73, 3 and 76(df) = 2.72.

\*Significant

The obtained F value on the scores of pre-test means of 0.97 was lesser than the required table F value of 2.72, the obtained F value on the scores of post-test means of 3.10 was greater than the required table F value of 2.72 and the obtained F value of adjusted post-test means of 10.80 was greater than the required table F value of 2.73. Hence, there was no significant difference between pre-test means and there were significant differences between post-test and adjusted post-test means at 0.05 level.

Since significant improvements were recorded, Scheffe's Post-hoc Test was used to find the paired mean differences.

**Table VIII.a**

**COMPUTATION OF ANALYSIS OF SCHEFFE'S POST-HOC TEST OF  
CARDIOVASCULAR ENDURANCE**

<b>CTG</b>	<b>ITG</b>	<b>SCTG</b>	<b>CG</b>	<b>Mean Difference (MD)</b>	<b>C.I. Value</b>
3493.32	3382.30			111.02*	105.28
3493.32		3443.89		49.42	
3493.32			3290.99	202.33*	
	3382.30	3443.89		61.60	
	3382.30		3290.99	91.31	
		3443.89	3290.99	152.91*	

The adjusted post-test mean differences of 111.02, 202.33, and 152.91 were greater than the required confidence interval value of 105.28 and these comparisons were significant at 0.05 level. Circuit training had remarkable improvement on cardiovascular endurance among college handball players than other groups.

The pre-test, post-test and adjusted post-test means of cardiovascular endurance are presented through a bar diagram for better understanding of the results of this study in figure 4.

**Figure 4**

**Bar Diagram on Pre-test, Post-test and Adjusted Post-test Means of Cardiovascular Endurance**

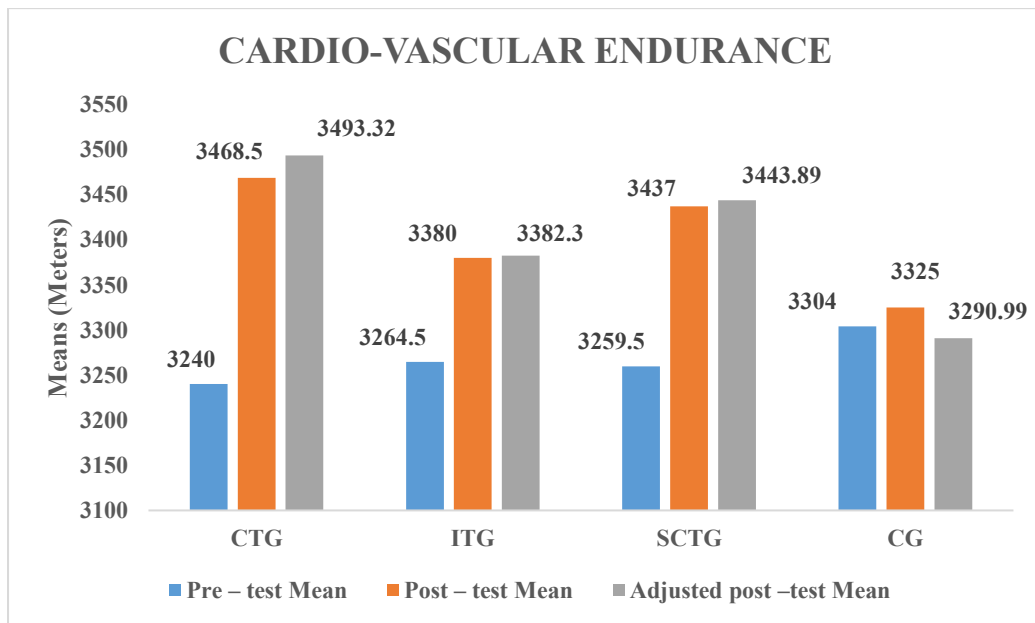


Table IX

## COMPUTATION OF ANALYSIS OF COVARIANCE OF VITAL CAPACITY

	CTG	ITG	SCTG	CG	Sources of Variance	Sum of Squares	df	Mean squares	Obtained F-ratio
Pre – test Mean	3497.50	3555.00	3750.00	3612.50	Between	702625.00	3	234208.33	0.95
					Within	18711250.00	76	246200.66	
Post – test Mean	3697.50	3707.50	3837.50	3660.00	Between	358843.75	3	119614.58	3.56*
					Within	16167375.00	76	212728.62	
Adjusted post – test Mean	3792.25	3750.97	3707.08	3652.20	Between	213519.26	3	71173.09	4.14*
					Within	1288532.65	75	17180.44	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73,

3 and 76(df) = 2.72.

\*Significant

The obtained F value on the scores of pre-test means of 0.95 was lesser than the required table F value of 2.72, the obtained F value on the scores of post-test means of 3.56 was greater than the required table F value of 2.72 and the obtained F value of adjusted post-test means of 4.14 was greater than the required table F value of 2.73. Hence, there was no significant difference between pre-test means and there were significant differences between post-test and adjusted post-test means at 0.05 level.

Since significant improvements were recorded, Scheffe's Post-hoc Test was used to find the paired mean differences.

**Table IX. a**

**COMPUTATION OF ANALYSIS OF SCHEFFE'S POST-HOC TEST OF VITAL CAPACITY**

<b>CTG</b>	<b>ITG</b>	<b>SCTG</b>	<b>CG</b>	<b>Mean Difference (MD)</b>	<b>C.I. Value</b>
3792.25	3750.97			41.27	118.40
3792.25		3707.08		85.16	
3792.25			3652.20	140.05*	
	3750.97	3707.08		43.89	
	3750.97		3652.20	98.77	
		3707.08	3652.20	54.89	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73.

\*Significant at 0.05 level.

The adjusted post-test mean difference of 140.05 was greater than the required confidence interval value of 118.40 and this comparison was significant at 0.05 level. Circuit training had remarkable improvement on vital capacity among college handball players than other groups.

The pre-test, post-test and adjusted post-test means of vital capacity are presented through a bar diagram for better understanding of the results of this study in figure 5.

Figure 5

**Bar Diagram on Pre-test, Post-test and Adjusted Post-test Means of Vital Capacity**

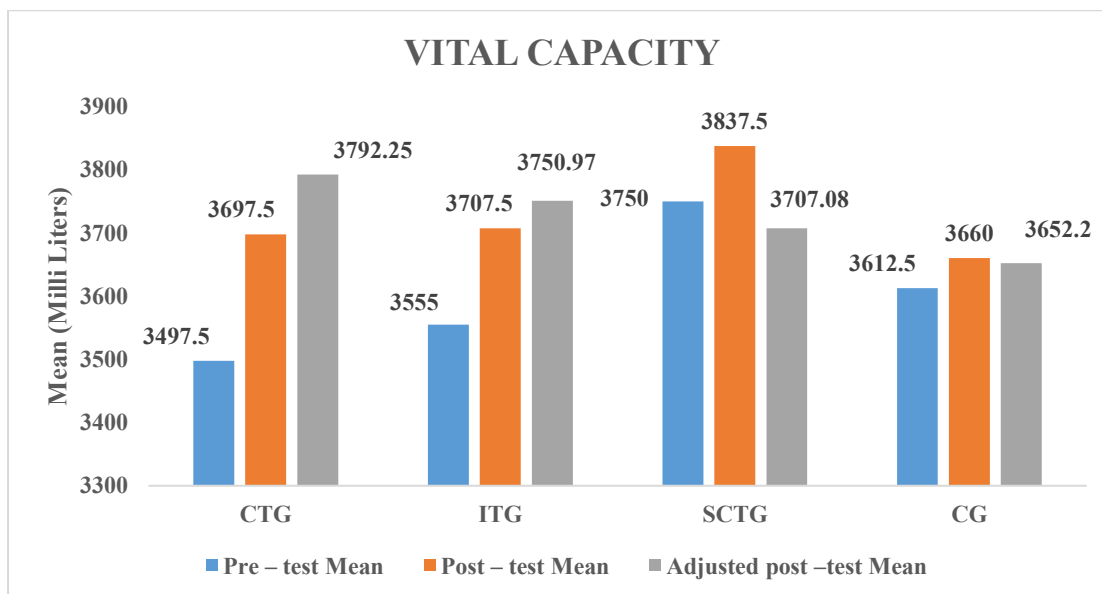


Table X

**COMPUTATION OF ANALYSIS OF COVARIANCE OF BREATH HOLDING TIME**

	CTG	ITG	SCTG	CG	Sources of Variance	Sum of Squares	df	Mean squares	Obtained F-ratio
Pre – test Mean	41.25	40.60	40.95	42.15	Between	26.44	3	8.81	0.15
					Within	4324.05	76	56.90	
Post – test Mean	49.55	48.80	49.45	41.20	Between	982.70	3	327.57	6.29*
					Within	3958.30	76	52.08	
Adjusted post – test Mean	49.54	49.37	49.71	40.38	Between	1253.28	3	417.76	66.85*
					Within	468.67	75	6.25	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73,

3 and 76(df) = 2.72.

\*Significant

The obtained F value on the scores of pre-test means of 0.15 was lesser than the required table F value of 2.72, the obtained F value on the scores of post-test means of 6.29 was greater than the required table F value of 2.72 and the obtained F value of adjusted post-test means of 66.85 was greater than the required table F value of 2.73. Hence, there was no significant difference between pre-test means and there were significant differences between post-test and adjusted post-test means at 0.05 level.

Since significant improvements were recorded, Scheffe's Post-hoc Test was used to find the paired mean differences.

**Table X.a**

**COMPUTATION OF ANALYSIS OF SCHEFFE'S POST-HOC TEST OF BREATH HOLDING TIME**

<b>CTG</b>	<b>ITG</b>	<b>SCTG</b>	<b>CG</b>	<b>Mean Difference (MD)</b>	<b>C.I. Value</b>
49.54	49.37			0.17	2.26
49.54		49.71		-0.17	
49.54			40.38	9.16*	
	49.37	49.71		-0.34	
	49.37		40.38	8.99*	
		49.71	40.38	9.33*	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73.

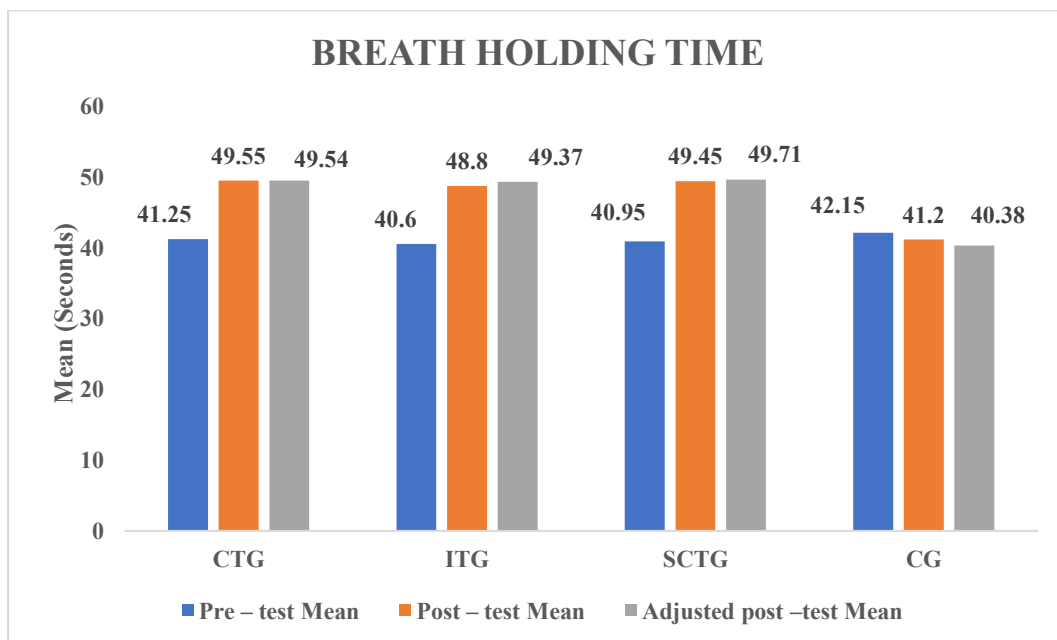
\*Significant at 0.05 level.

The adjusted post-test mean differences of 9.16, 8.99, and 9.33 were greater than the required confidence interval value of 2.26 and these comparisons were significant at 0.05 level. Stair case training had remarkable improvement on breath holding time among college handball players than other groups.

The pre-test, post-test and adjusted post-test means of breath holding time are presented through a bar diagram for better understanding of the results of this study in figure 6.

**Figure 6**

**Bar Diagram on Pre-test, Post-test and Adjusted Post-test Means of Breath Holding Time**



**Table XI**  
**COMPUTATION OF ANALYSIS OF COVARIANCE OF**  
**ACHIEVEMENT MOTIVATION**

	CTG	ITG	SCTG	CG	Sources of Variance	Sum of Squares	df	Mean squares	Obtained F-ratio
Pre – test Mean	23.50	24.40	22.70	23.30	Between	29.75	3	9.92	0.38
					Within	1968.20	76	25.90	
Post – test Mean	27	27.20	25.10	23.60	Between	169.20	3	56.40	2.99*
					Within	1799.60	76	23.68	
Adjusted post – test Mean	26.88	26.33	25.83	23.76	Between	110.87	3	36.96	36.98*
					Within	74.96	75	1.00	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73, 3 and 76(df) = 2.72.

\*Significant

The obtained F value on the scores of pre-test means of 0.38 was lesser than the required table F value of 2.72, the obtained F value on the scores of post-test means of 2.99 was greater than the required table F value of 2.72 and the obtained F value of adjusted post-test means of 36.98 was greater than the required table F value of 2.73. Hence, there was no significant difference between pre-test means and there were significant differences between post-test and adjusted post-test means at 0.05 level.

Since significant improvements were recorded, Scheffe's Post-hoc Test was used to find the paired mean differences.

Table XI.a

**COMPUTATION OF ANALYSIS OF SCHEFFE'S POST-HOC TEST OF  
ACHIEVEMENT MOTIVATION**

CTG	ITG	SCTG	CG	Mean Difference (MD)	C.I. Value
26.88	26.33			0.54	0.90
26.88		25.83		1.05*	
26.88			23.76	3.11*	
	26.33	25.83		0.51	
	26.33		23.76	2.57*	
		25.83	23.76	2.06*	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73.

\*Significant at 0.05 level.

The adjusted post-test mean differences of 1.05, 3.11, 2.57 and 2.06 were greater than the required confidence interval value of 0.90 and these comparisons were significant at 0.05 level. Circuit training had remarkable improvement on achievement motivation among college handball players than other groups.

The pre-test, post-test and adjusted post-test means of achievement motivation are presented through a bar diagram for better understanding of the results of this study in figure 7.

Figure 7

**Bar Diagram on Pre-test, Post-test and Adjusted Post-test Means of Achievement Motivation**

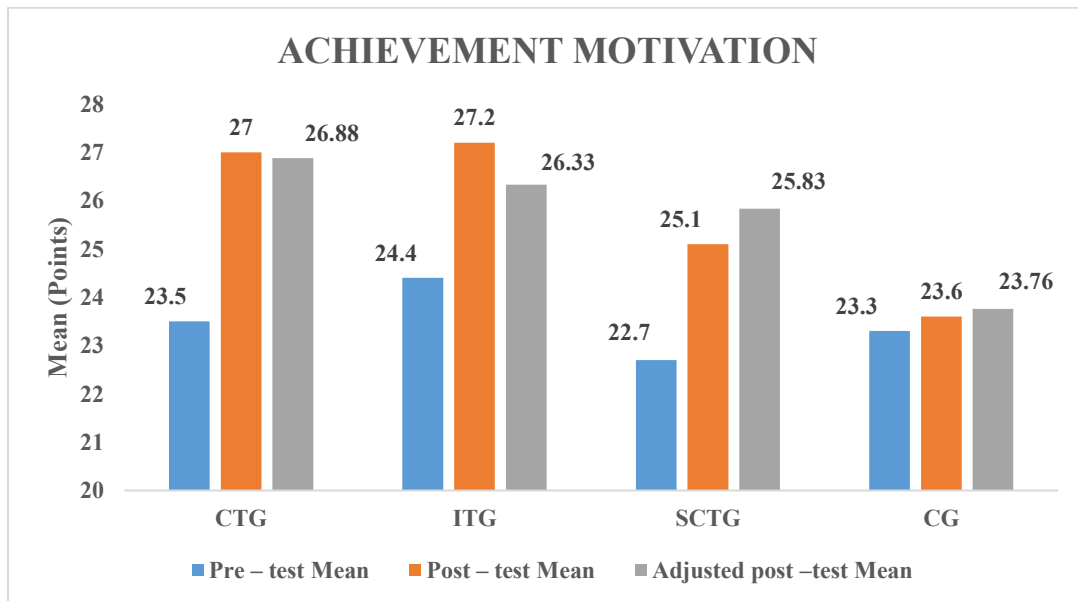


Table XII

**COMPUTATION OF ANALYSIS OF COVARIANCE OF SELF-CONFIDENCE**

	CTG	ITG	SCTG	CG	Sources of Variance	Sum of Squares	df	Mean squares	Obtained F-ratio
Pre – test Mean	45.00	44.40	44.35	46.25	Between	46.90	3	15.63	0.30
					Within	3923.10	76	51.62	
Post – test Mean	54.10	53.00	54.80	45.50	Between	1108.20	3	369.40	8.52*
					Within	3294.00	76	43.34	
Adjusted post – test Mean	54.10	53.51	55.36	44.43	Between	1488.60	3	496.20	91.24*
					Within	407.88	75	5.44	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73, 3 and 76(df) = 2.72.

\*Significant

The obtained F value on the scores of pre-test means of 0.30 was lesser than the required table F value of 2.72, the obtained F value on the scores of post-test means of 8.52 was greater than the required table F value of 2.72 and the obtained F value of adjusted post-test means of 91.24 was greater than the required table F value of 2.73. Hence, there was no significant difference between pre-test means and there were significant differences between post-test and adjusted post-test means at 0.05 level.

Since significant improvements were recorded, Scheffe's Post-hoc Test was used to find the paired mean differences.

**Table XII.a**

**COMPUTATION OF ANALYSIS OF SCHEFFE'S POST-HOC TEST OF SELF-CONFIDENCE**

<b>CTG</b>	<b>ITG</b>	<b>SCTG</b>	<b>CG</b>	<b>Mean Difference (MD)</b>	<b>C.I. Value</b>
54.10	53.51			0.59	2.11
54.10		55.36		1.26	
54.10			44.43	9.67*	
	53.51	55.36		1.84	
	53.51		44.43	9.09*	
		55.36	44.43	10.93*	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73.

\*Significant at 0.05 level.

The adjusted post-test mean differences of 9.67, 9.09, and 10.93 were greater than the required confidence interval value of 2.11 and these comparisons were

significant at 0.05 level. Stair case training had remarkable improvement on self confidence among college handball players than other groups.

The pre-test, post-test and adjusted post-test means of self-confidence are presented through a bar diagram for better understanding of the results of this study in figure 8.

**Figure 8**

**Bar Diagram on Pre-test, Post-test and Adjusted Post-test Means of Self-Confidence**

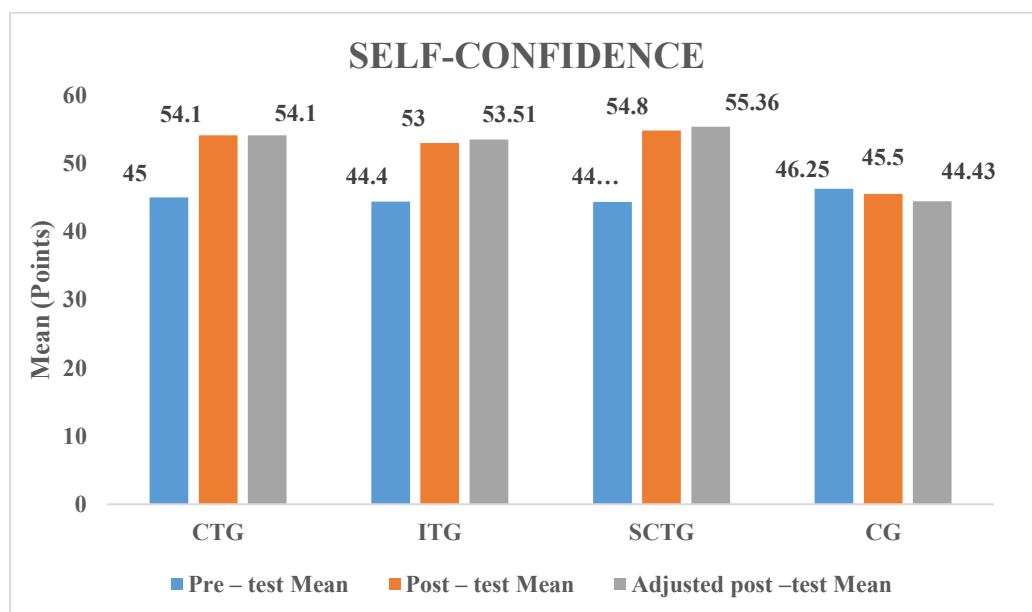


Table XIII

## COMPUTATION OF ANALYSIS OF COVARIANCE OF ANXIETY

	CTG	ITG	SCTG	CG	Sources of Variance	Sum of Squares	df	Mean squares	Obtained F-ratio
Pre – test Mean	58.70	61.05	59.70	59.95	Between	55.90	3	18.63	0.75
					Within	1892.30	76	24.90	
Post – test Mean	54.65	53.05	56.30	59.55	Between	463.34	3	154.45	6.65*
					Within	1764.65	76	23.22	
Adjusted post – test Mean	55.58	52.07	56.42	59.47	Between	551.62	3	183.87	26.81*
					Within	514.29	75	6.86	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73,

3 and 76(df) = 2.72.

\*Significant

The obtained F value on the scores of pre-test means of 0.75 was lesser than the required table F value of 2.72, the obtained F value on the scores of post-test means of 6.65 was greater than the required table F value of 2.72 and the obtained F value of adjusted post-test means of 26.81 was greater than the required table F value of 2.73. Hence, there was no significant difference between pre-test means and there were significant differences between post-test and adjusted post-test means at 0.05 level.

Since significant improvements were recorded, Scheffe's Post-hoc Test was used to find the paired mean differences.

Table XIII.a

**COMPUTATION OF ANALYSIS OF SCHEFFE'S POST-HOC TEST OF ANXIETY**

CTG	ITG	SCTG	CG	Mean Difference (MD)	C.I. Value
55.58	52.07			3.51*	2.37
55.58		56.42		0.84	
55.58			59.47	3.88*	
	52.07	56.42		4.35*	
	52.07		59.47	7.39*	
		56.42	59.47	3.05*	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73.

\*Significant at 0.05 level.

The adjusted post-test mean differences of 3.51, 3.88, 4.35, 7.39 and 3.05 were greater than the required confidence interval value of 2.37 and these comparisons were significant at 0.05 level. Interval training had remarkable improvement on anxiety among college handball players than other groups.

The pre-test, post-test and adjusted post-test means of anxiety are presented through a bar diagram for better understanding of the results of this study in figure 9.

Figure 9

## Bar Diagram on Pre-test, Post-test and Adjusted Post-test Means of Anxiety

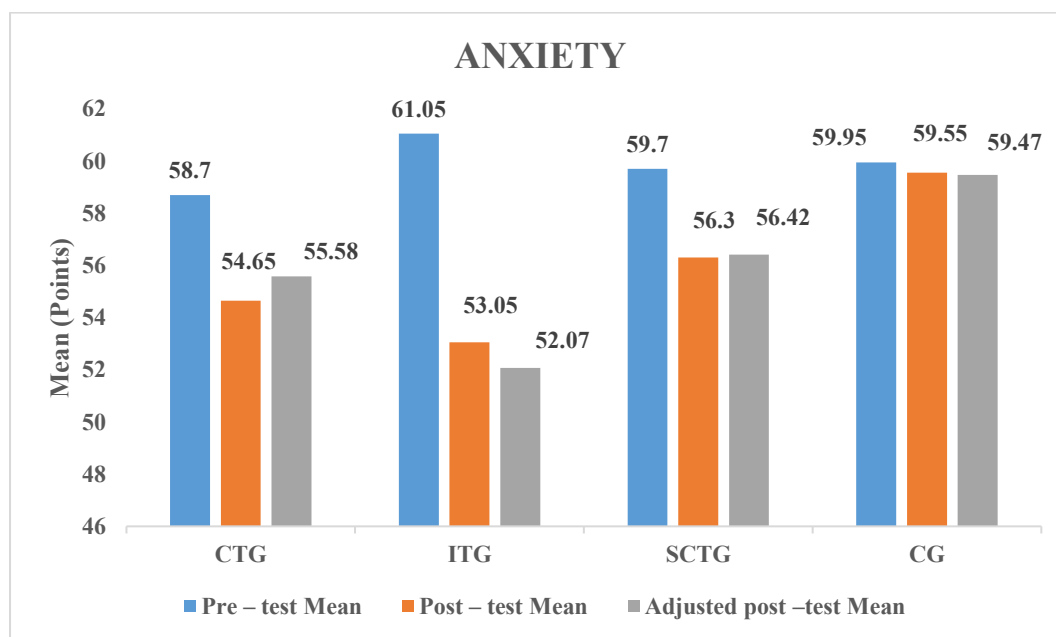


Table XIV

## COMPUTATION OF ANALYSIS OF COVARIANCE OF DRIBBLING

	CTG	ITG	SCTG	CG	Sources of Variance	Sum of Squares	df	Mean squares	Obtained F-ratio
Pre – test Mean	9.10	9.40	9.35	9.10	Between	1.54	3	0.51	0.30
					Within	128.95	76	1.70	
Post – test Mean	10.80	11.00	11.45	9.40	Between	46.94	3	15.65	8.44*
					Within	140.95	76	1.85	
Adjusted post – test Mean	10.91	10.87	11.36	9.51	Between	37.97	3	12.66	17.89*
					Within	53.07	75	0.71	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73,

3 and 76(df) = 2.72.

\*Significant

The obtained F value on the scores of pre-test means of 0.30 was lesser than the required table F value of 2.72, the obtained F value on the scores of post-test means of 8.44 was greater than the required table F value of 2.72 and the obtained F value of adjusted post-test means of 17.89 was greater than the required table F value of 2.73. Hence, there was no significant difference between pre-test means and there were significant differences between post-test and adjusted post-test means at 0.05 level.

Since significant improvements were recorded, Scheffe's Post-hoc Test was used to find the paired mean differences.

**Table XIV.a**

**COMPUTATION OF ANALYSIS OF SCHEFFE'S POST-HOC TEST OF DRIBBLING**

<b>CTG</b>	<b>ITG</b>	<b>SCTG</b>	<b>CG</b>	<b>Mean Difference (MD)</b>	<b>C.I. Value</b>
10.91	10.87			0.05	0.76
10.91		11.36		0.44	
10.91			9.51	1.40*	
	10.87	11.36		0.49	
	10.87		9.51	1.35*	
		11.36	9.51	1.84*	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73.

\*Significant at 0.05 level.

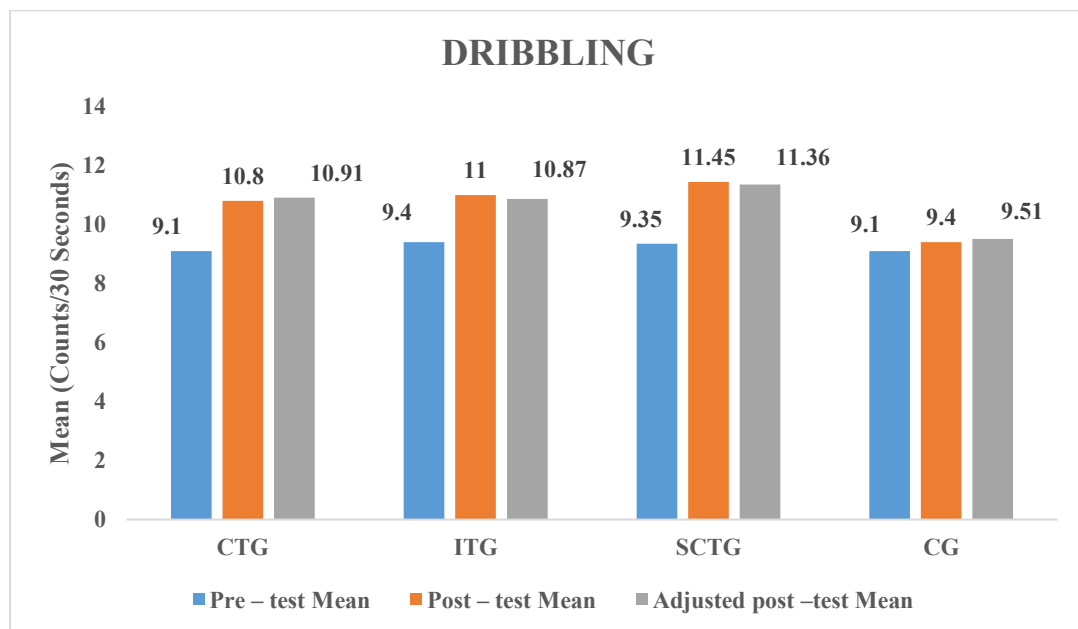
The adjusted post-test mean differences of 1.40, 1.35, and 1.84 were greater than the required confidence interval value of 0.76 and these comparisons were

significant at 0.05 level. Stair case training had remarkable improvement on dribbling among college handball players than other groups.

The pre-test, post-test and adjusted post-test means of dribbling are presented through a bar diagram for better understanding of the results of this study in figure 10.

**Figure 10**

**Bar Diagram on Pre-test, Post-test and Adjusted Post-test Means of Dribbling**



**Table XV**  
**COMPUTATION OF ANALYSIS OF COVARIANCE OF SHOOTING**  
**(7 METERS THROW)**

	CTG	ITG	SCTG	CG	Sources of Variance	Sum of Squares	df	Mean squares	Obtained F-ratio
Pre – test Mean	18.45	17.50	17.85	18.30	Between	11.25	3	3.75	0.30
					Within	960.70	76	12.64	
Post – test Mean	21.45	20.20	20.35	18.65	Between	79.64	3	26.55	2.97*
					Within	989.25	76	13.02	
Adjusted post – test Mean	21.04	20.70	20.52	18.39	Between	86.93	3	28.98	21.66*
					Within	100.36	75	1.34	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73,  
 3 and 76(df) = 2.72.

\*Significant

The obtained F value on the scores of pre-test means of 0.30 was lesser than the required table F value of 2.72, the obtained F value on the scores of post-test means of 2.97 was greater than the required table F value of 2.72 and the obtained F value of adjusted post-test means of 21.66 was greater than the required table F value of 2.73. Hence, there was no significant difference between pre-test means and there were significant differences between post-test and adjusted post-test means at 0.05 level.

Since significant improvements were recorded, Scheffe's Post-hoc Test was used to find the paired mean differences.

Table XV.a

**COMPUTATION OF ANALYSIS OF SCHEFFE'S POST-HOC TEST OF SHOOTING (7 METERS THROW)**

CTG	ITG	SCTG	CG	Mean Difference (MD)	C.I. Value
21.04	20.70			0.34	1.04
21.04		20.52		0.52	
21.04			18.39	2.66*	
	20.70	20.52		0.19	
	20.70		18.39	2.32*	
		20.52	18.39	2.13*	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73.

\*Significant at 0.05 level.

The adjusted post-test mean differences of 2.66, 2.32, and 2.13 were greater than the required confidence interval value of 1.04 and these comparisons were significant at 1.04 level. Circuit training had remarkable improvement on shooting among college handball players than other groups.

The pre-test, post-test and adjusted post-test means of shooting are presented through a bar diagram for better understanding of the results of this study in figure 11.

Figure 11

## Bar Diagram on Pre-test, Post-test and Adjusted Post-test Means of Shooting

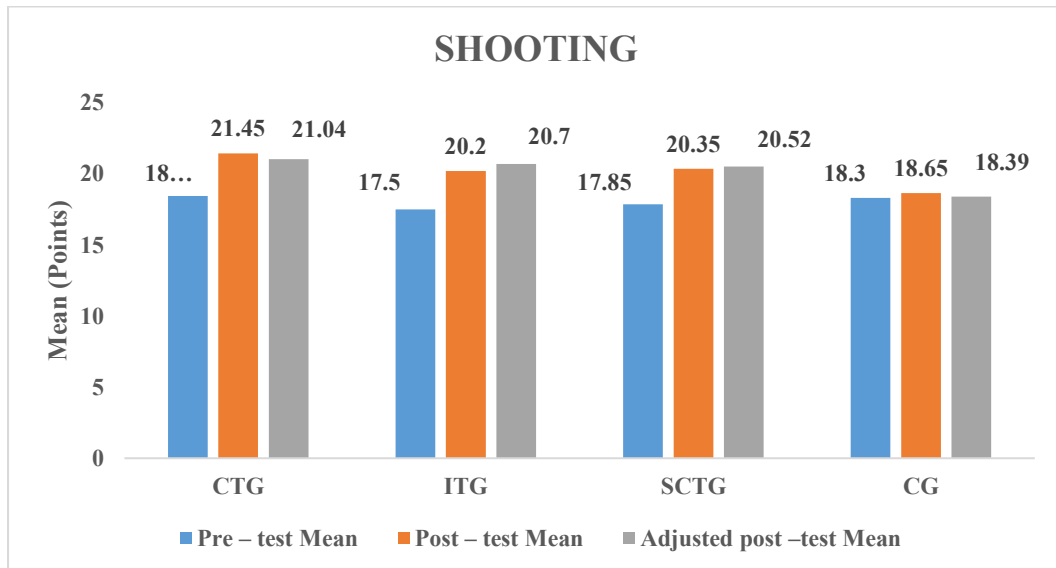


Table XVI

## COMPUTATION OF ANALYSIS OF COVARIANCE OF WING SHOT

## SHOOTING

	CTG	ITG	SCTG	CG	Sources of Variance	Sum of Squares	df	Mean squares	Obtained F-ratio
Pre – test Mean	9.50	10.06	9.91	9.59	Between	4.10	3	1.37	0.77
					Within	135.18	76	1.78	
Post – test Mean	11.18	11.26	11.88	9.90	Between	41.77	3	13.92	8.07*
					Within	131.05	76	1.72	
Adjusted post – test Mean	11.35	11.07	11.78	10.01	Between	34.01	3	11.34	12.09*
					Within	70.36	75	0.94	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73, 3 and 76(df) = 2.72.

\*Significant

The obtained F value on the scores of pre-test means of 0.77 was lesser than the required table F value of 2.72, the obtained F value on the scores of post-test means of 8.07 was greater than the required table F value of 2.72 and the obtained F value of adjusted post-test means of 12.09 was greater than the required table F value of 2.73. Hence, there was no significant difference between pre-test means and there were significant differences between post-test and adjusted post-test means at 0.05 level.

Since significant improvements were recorded, Scheffe's Post-hoc Test was used to find the paired mean differences.

**Table XVI. a**

**COMPUTATION OF ANALYSIS OF SCHEFFE'S POST-HOC TEST OF WING SHOT SHOOTING**

<b>CTG</b>	<b>ITG</b>	<b>SCTG</b>	<b>CG</b>	<b>Mean Difference (MD)</b>	<b>C.I. Value</b>
11.35	11.07			0.28	0.87
11.35		11.78		0.43	
11.35			10.01	1.34*	
	11.07	11.78		0.72	
	11.07		10.01	1.06*	
		11.78	10.01	1.77*	

Table F ratio at 0.05 level of confidence for 3 and 75 (df) = 2.73.

\*Significant at 0.05 level.

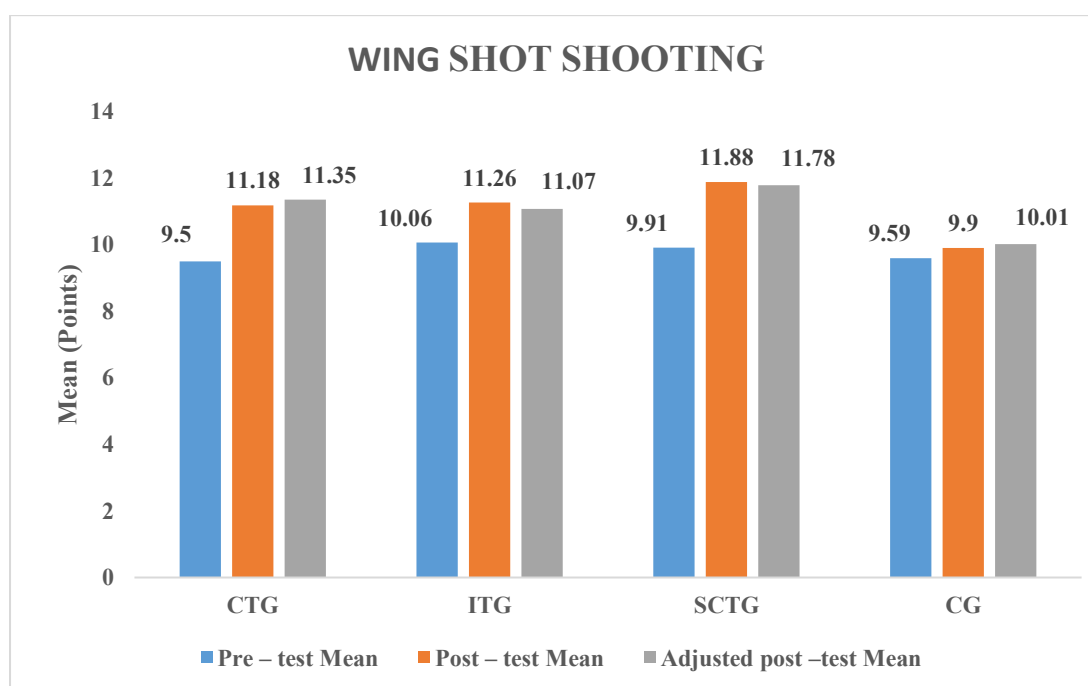
The adjusted post-test mean differences of 1.34, 1.06, and 1.77 were greater than the required confidence interval value of 0.87 and these comparisons were

significant at 0.05 level. Stair case training had remarkable improvement on wing shot shooting among college handball players than other groups.

The pre-test, post-test and adjusted post-test means of wing shot shooting are presented through a bar diagram for better understanding of the results of this study in figure 12.

**Figure 12**

**Bar Diagram on Pre-test, Post-test and Adjusted Post-test Means of Wing Shot Shooting**



#### 4.4 DISCUSSION ON HYPOTHESES

1. The first hypothesis was stated that 12 weeks of varied capsules of fitness training namely circuit training, interval training and stair case training would significantly improve the selected physical variables namely speed, abdominal strength, flexibility and cardiovascular endurance and physiological variables namely vital capacity and breath holding time and psychological variables

namely achievement motivation, self-confidence and anxiety and skill performance variables namely dribbling, shooting and wing shot shooting among college level men handball players.

The findings of the study showed that there were significant effects due to the influence of the 12 weeks of circuit training, interval training and stair case training on selected dependent variables such as speed, abdominal strength, flexibility, cardiovascular endurance, vital capacity, breath holding time, achievement motivation, self-confidence, anxiety dribbling, shooting and wing shot shooting. Hence, the first hypothesis was accepted on above said variables.

2. The second hypothesis was stated that 12 weeks of circuit training would significantly improve the selected physical variables namely speed, flexibility and cardiovascular endurance and physiological variables namely vital capacity and breath holding time and psychological variables namely achievement motivation and self-confidence than stair case and interval trainings among college level men handball players.

The findings of the study showed that there were significant effects due to the influence of the 12 weeks of circuit training on selected dependent variables such as speed, flexibility, cardiovascular endurance, vital capacity, breath holding time, achievement motivation and self-confidence. Hence, the second hypothesis was accepted on above said variables.

3. The third hypothesis was stated that 12 weeks of stair case training would significantly improve the selected physical variable namely abdominal strength and psychological variable namely anxiety and skill performance

variables namely dribbling, shooting and wing shot shooting than circuit and interval trainings among college level men handball players.

The findings of the study showed that there were significant effects due to the influence of the 12 weeks of stair case training on selected dependent variables such as abdominal strength, anxiety, dribbling, shooting and wing shot shooting. Hence, the third hypothesis was accepted on above said variables.

4. The fourth hypothesis was stated that 12 weeks of interval training and stair case training would significantly improve the selected physical variables namely speed, abdominal strength, flexibility and cardiovascular endurance and physiological variables namely vital capacity and breath holding time and psychological variables namely achievement motivation, self-confidence and anxiety and skill performance variables namely dribbling, shooting and wing shot shooting than control group among college level men handball players.

The findings of the study showed that there were significant effects due to the influence of the 12 weeks of interval training and stair case training on selected dependent variables such as speed, abdominal strength, flexibility, cardiovascular endurance. vital capacity, breath holding time, achievement motivation, self-confidence, anxiety, dribbling, shooting and wing shot shooting. Hence, the fourth hypothesis was accepted on above said variables.