

CHAPTER IV

RESULTS AND DISCUSSION

4.1. OVERVIEW

The analysis of the data collected is presented in this chapter. The purpose of the investigation was to find out the effect of specified training with sign language and vibrator aid on selected psycho motor variables and skills in handball among deaf and dumb college students. To achieve this purpose, 45 deaf and dumb male students those who were selected from Presidency College, Chennai, Tamil Nadu, India. The age of the subjects ranged between 18 and 25 years.

The study was formulated as a true random group design, consisting of pretest and post test. The selected subjects were divided into two experimental groups namely vibrator aid training group and combination of vibrator aid and sign language training group and control group on the basis of their level of challenge with fifteen subjects (n=15) in each. The effect of the two independent variables namely VTG and VSTG on reaction time and movement time as psycho motor variables and 9 M front throw, dominant hand speed pass, over head pass, accuracy throw, jump & throw and dribbling as skills in handball were investigated. The duration of the training period was twelve weeks and the number of sessions per week was confined to five. However, control group was not exposed to any specific training but they participated in the regular scheduled work.

All the subjects were tested on selected dependent variables prior to and after the treatment. The data pertaining to the variables in this study were examined by using dependent t-test to find out significant changes and analysis of covariance (ANCOVA) for each variable separately in order to determine the differences if any

among the adjusted post test means. Whenever 'F' ratio for the adjusted post-test was found to be significant, the Scheffe's test was used as post-hoc test to determine the three paired mean differences. The level of significance was fixed at 0.05 level of confidence in all the cases.

4.2. TEST OF SIGNIFICANCE

Clarke and Clarke (1972) said "These data must be analyzed in an appropriate manner to the research design. Such analysis can only be appropriate to the research design. Such analysis can only be accomplished through the application of pertinent statistics".

This is the vital portion of the thesis for achieving the conclusion by examining the hypothesis. 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 one can test whether the difference between the three groups or within many groups the scores were significant or not. In this study, however, the obtained F value was greater than the table value, the hypothesis was accepted to the effect that there existed significant difference among the means of the groups compared and if obtained F-value was lesser than the table value, then the hypothesis was rejected to the effect that there existed no significant difference among the means of the groups under study.

4.2.1. LEVEL OF SIGNIFICANCE

The purpose of this study was to find out the effect of specified training with sign language and vibrator aid on selected psycho motor variables and skills in handball among the deaf and dumb college students. The collected data were analyzed by using the analysis of covariance (ANCOVA) to find out the significant differences if any between the groups on selected criterion variables separately. In all the cases, 0.05 level of confidence was fixed to test of significance which was considered as appropriate for this study.

4.3. COMPUTATION OF DEPENDENT 't' TEST, ANALYSIS OF COVARIANCE AND SCHEFFE'S POST HOC TEST ON REACTION TIME

The analysis of dependent 't' test on the data obtained for **reaction time** of the pre-test and post-test means of VTG, VSTG and CG were analysed and presented in Table VIII.

TABLE VIII
SUMMARY OF MEAN STANDARD DEVIATION AND DEPENDENT 't'
TEST FOR THE PRE AND POST TESTS ON REACTION TIME OF
EXPERIMENTAL AND CONTROL GROUPS

(Reaction time scores are expressed in seconds)

		VTG	VSTG	CG
Pre test	Mean	0.213	0.213	0.212
	SD	0.010	0.012	0.009
Post test	Mean	0.196	0.182	0.210
	SD	0.015	0.016	0.013
't' test		6.961*	7.368*	0.764

*Significant at .05 level. The table value required for .05 level of significance with df 14 is 1.761.

4.3.1. Results of Dependent 't' Test on Reaction Time

Table VIII shows that the pre-test mean values of VTG, VSTG and CG on **reaction time** are 0.213, 0.213 and 0.212 respectively and the post-test mean values on **reaction time** are 0.196, 0.182 and 0.210 respectively. The obtained dependent t-ratio values between the pre and post test means of VTG, VSTG and CG on **reaction time** are 6.961, 7.368 and 0.764 respectively. The table value required for significant difference with df 14 at .05 level is 1.761. Since, the obtained 't' ratio values of experimental groups are greater than the table value, it is understood that specified training with vibrator aid and specified training with combination of vibrator aid & sign language groups had significantly improved in the performance of **reaction time**. However, the control group had not significantly improved in the performance of **reaction time**. The obtained 't' value for the control group is less than the table value as they were not subjected to any specific training.

The analysis of covariance on **reaction time** of VTG, VSTG and CG were analysed and presented in Table IX.

TABLE IX
ANALYSIS OF COVARIANCE FOR THE DATA ON REACTION TIME
AMONG EXPERIMENTAL AND CONTROL GROUPS

Adjusted Post Test Means			Sources of Variance	Sum of Squares	df	Mean Squares	F-Ratio
VTG	VSTG	CG					
0.196	0.182	0.210	Between	0.00607	2	0.00303	18.938*
			Within	0.00651	41	0.00016	

* Significant at 0.05 level of confidence.

The table value for significance at 0.05 with df 2 and 41 is 3.23.

4.3.2. Results of Analysis of Covariance on Reaction Time

Table IX shows that the adjusted post-test means of VTG, VSTG and CG on **reaction time** are 0.196, 0.182 and 0.210 respectively. The obtained F-ratio

value is 18.938, which is higher than the table value 3.23 with df 2 and 41 required for significance at .05 level. Since the value of F-ratio is higher than the table value, it indicates that there exist significant differences among the adjusted post-test means of VTG, VSTG and CG. To find out which of the paired means had a significant difference on **reaction time**, the Scheffe's post-hoc test was applied and the results are presented in Table X.

TABLE X
SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN THE ADJUSTED POST TEST PAIRED MEANS OF REACTION TIME

VTG	VSTG	CG	Mean Difference	Confidential Interval
0.196	0.182		0.014*	0.012
0.196		0.210	0.015*	0.012
	0.182	0.210	0.028*	0.012

*Significant at .05 level.

4.3.3. Results of Scheffe's Test on Reaction Time

The table X shows that the adjusted post test mean difference on **reaction time** between VTG and VSTG, VTG and CG and between VSTG and CG are 0.014, 0.015 and 0.028 respectively which are higher than the confidence interval value of 0.002 at .05 level of confidence.

The pre and post test mean values of VTG, VSTG and CG on **reaction time** are graphically represented in figure 1.

The adjusted post test mean values of VTG, VSTG and CG on **reaction time** are graphically represented in figure 2.

FIGURE 1
PRE TEST AND POST TEST MEAN VALUES OF VTG, VSTG
AND CG ON REACTION TIME

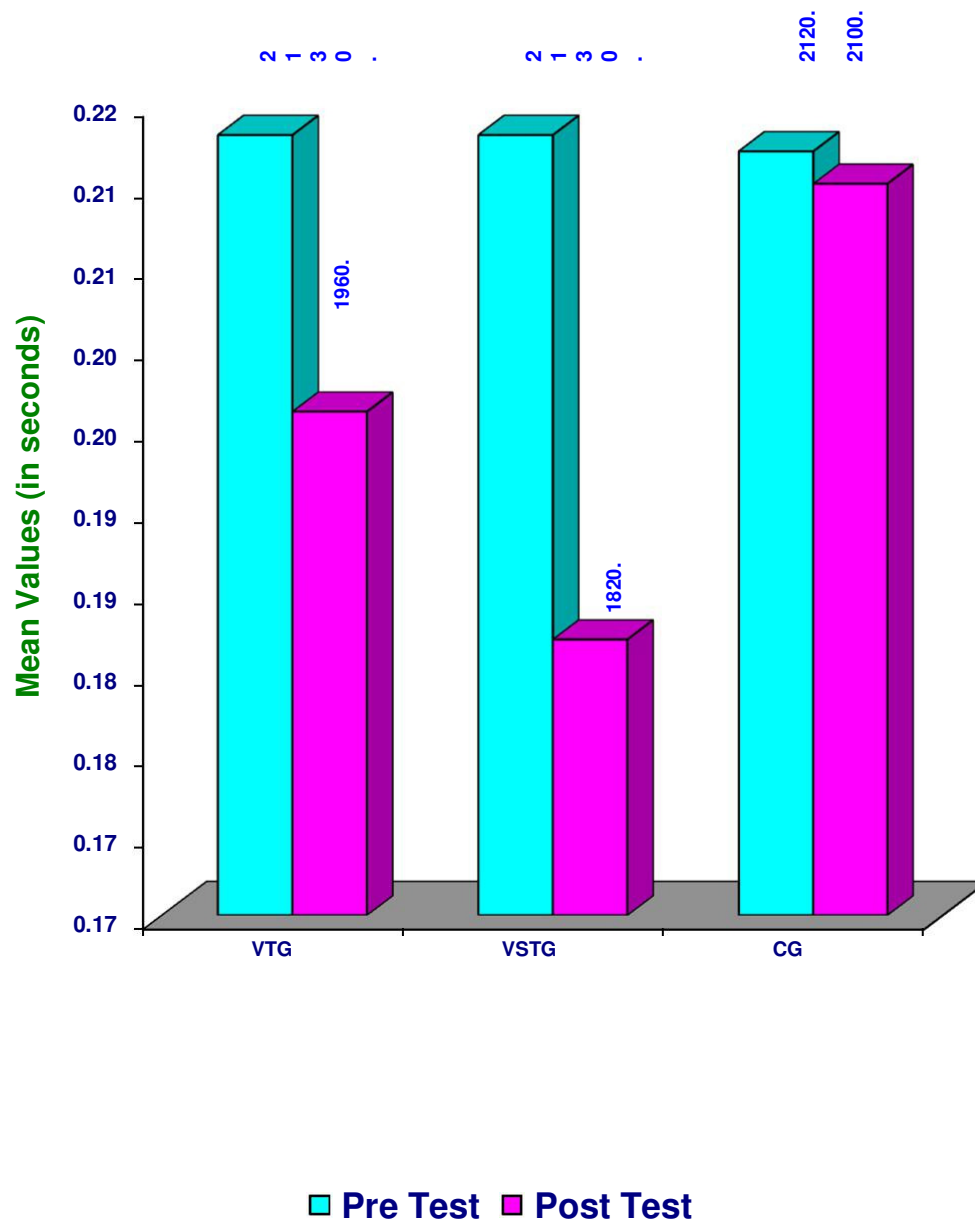
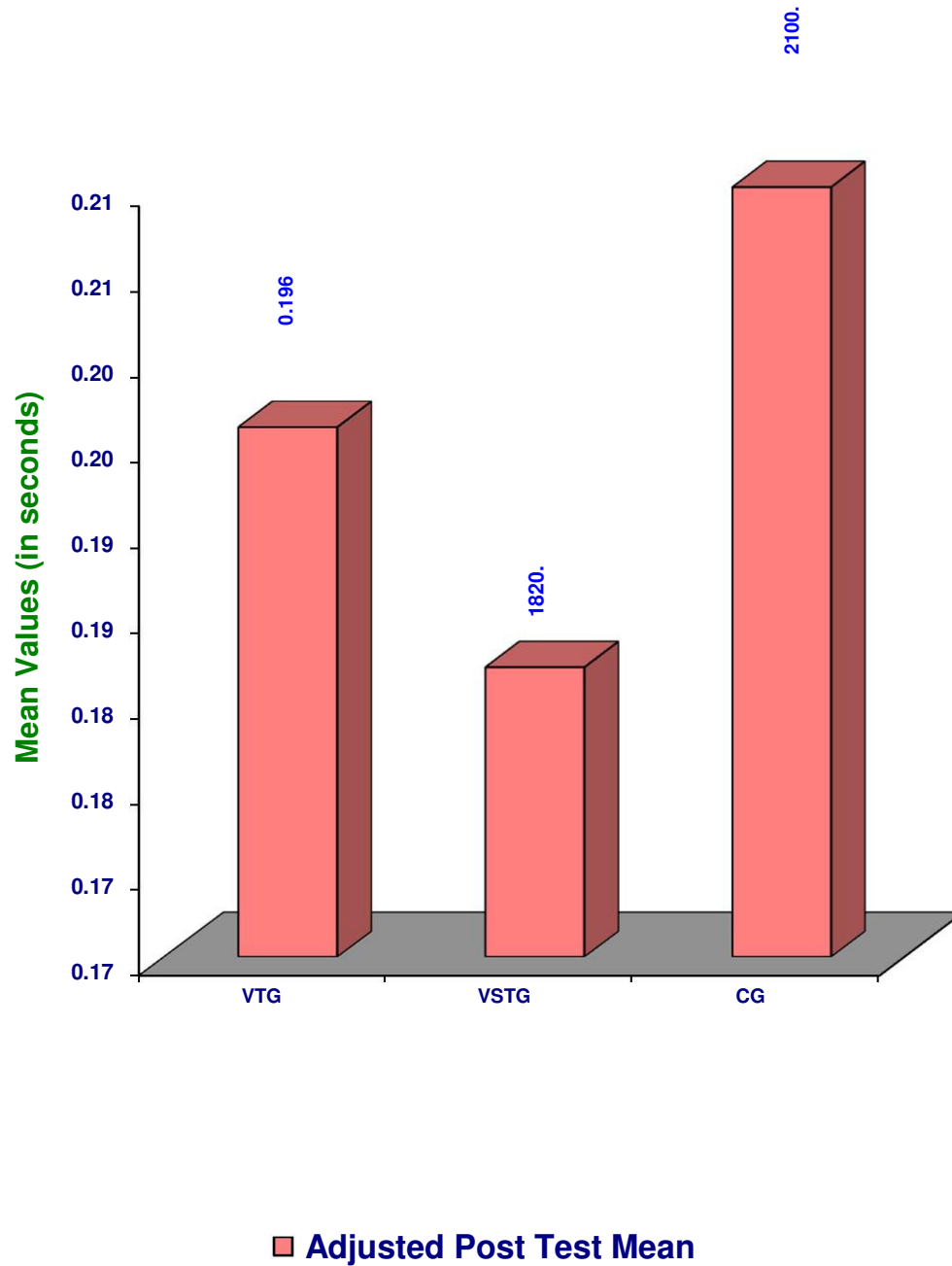


FIGURE 2
ADJUSTED POST TEST MEAN VALUES OF VTG, VSTG AND
CG ON REACTION TIME



4.3.4. Discussion on Findings on Reaction Time

The result of the study indicates that both the experimental groups significantly differed when compared to the control group on **reaction time**. However, it is further revealed that the experimental group namely VTG and VSTG had reduced **reaction time** better than the control group (CG) but VSTG had reduced **reaction time** better than the other two groups.

Sreejit (1988) concluded that basketball and volleyball players had a marked difference in their hand reaction times. **Sharma, Khan and Butchiramaiah (1986)** found out that the competitive volleyball players respond more quickly to the visual and auditory stimuli when compared to the recreational volleyball players. The present study also revealed that 12 weeks of specified training with vibrator aid and specified training with combination of vibrator aid and sign language reduced the reaction time. The present findings also very well sustained by the researchers **Shahbazia (2011), Reddy (1993) and Wei and Ji (2014)**.

4.4. COMPUTATION OF DEPENDENT 't' TEST, ANALYSIS OF COVARIANCE AND SCHEFFE'S POST HOC TEST ON MOVEMENT TIME

The analysis of dependent 't' test on the data obtained for movement time of the pre-test and post-test means of VTG, VSTG and CG were analysed and presented in Table XI.

TABLE XI
SUMMARY OF MEAN STANDARD DEVIATION AND DEPENDENT 't' TEST FOR THE PRE AND POST TESTS ON MOVEMENT TIME OF EXPERIMENTAL AND CONTROL GROUPS

(Movement time scores are expressed in seconds)

		VTG	VSTG	CG
Pre test	Mean	0.285	0.290	0.286
	SD	0.008	0.007	0.009
Post test	Mean	0.271	0.262	0.281
	SD	0.010	0.009	0.009
't' test		9.065*	11.045*	1.365

*Significant at .05 level. The table value required for .05 level of significance with df 14 is 1.761.

4.4.1. Results of Dependent 't' Test on Movement Time

Table XI shows that the pre-test mean values of VTG, VSTG and CG on **movement time** are 0.285, 0.290 and 0.286 respectively and the post-test mean values on **movement time** are 0.271, 0.262 and 0.281 respectively. The obtained dependent t-ratio values between the pre and post test means of VTG, VSTG and CG on **movement time** are 9.065, 11.045 and 1.365 respectively. The table value required for significant difference with df 14 at .05 level is 1.761. Since, the obtained 't' ratio values of experimental groups are greater than the table value, it is understood that specified training with vibrator aid and specified training with combination of vibrator aid & sign language groups had significantly improved in

the performance of **movement time**. However, the control group had not significantly improved in the performance of **movement time**. The obtained 't' value for the control group is less than the table value as they were not subjected to any specific training.

The analysis of covariance on **movement time** of VTG, VSTG and CG were analysed and presented in Table XII.

TABLE XII
ANALYSIS OF COVARIANCE FOR THE DATA ON MOVEMENT TIME
AMONG EXPERIMENTAL AND CONTROL GROUPS

Adjusted Post Test Means			Sources of Variance	Sum of Squares	df	Mean Squares	F-Ratio
VTG	VSTG	CG					
0.273	0.260	0.282	Between	0.00347	2	0.00174	29.000*
			Within	0.00242	41	0.00006	

* Significant at 0.05 level of confidence.

The table value for significance at 0.05 with df 2 and 41 is 3.23.

4.4.2. Results of Analysis of Covariance on Movement Time

Table XII shows that the adjusted post-test means of VTG, VSTG and CG on **movement time** are 0.273, 0.260 and 0.282 respectively. The obtained F-ratio value is 29.000, which is higher than the table value 3.23 with df 2 and 41 required for significance at .05 level. Since the value of F-ratio is higher than the table value, it indicates that there exist significant differences among the adjusted post-test means of VTG, VSTG and CG. To find out which of the paired means had a significant difference on **movement time**, the Scheffe's post-hoc test was applied and the results are presented in Table XIII.

TABLE XIII
SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN THE ADJUSTED
POST TEST PAIRED MEANS OF MOVEMENT TIME

VTG	VSTG	CG	Mean Difference	Confidential Interval
0.273	0.260		0.013*	0.007
0.273		0.282	0.009*	0.007
	0.260	0.282	0.022*	0.007

*Significant at .05 level.

4.4.3. Results of Scheffe's Test on Movement Time

Table XIII shows that the adjusted post test mean difference on **movement time** between VTG and VSTG, VTG and CG and between VSTG and CG are 0.013, 0.009 and 0.022 respectively which are higher than the confidence interval value of 0.007 at .05 level of confidence.

The pre and post test mean values of VTG, VSTG and CG on **movement time** are graphically represented in figure 3.

The adjusted post test mean values of VTG, VSTG and CG on **movement time** are graphically represented in figure 4.

FIGURE 3
PRE TEST AND POST TEST MEAN VALUES OF VTG, VSTG
AND CG ON MOVEMENT TIME

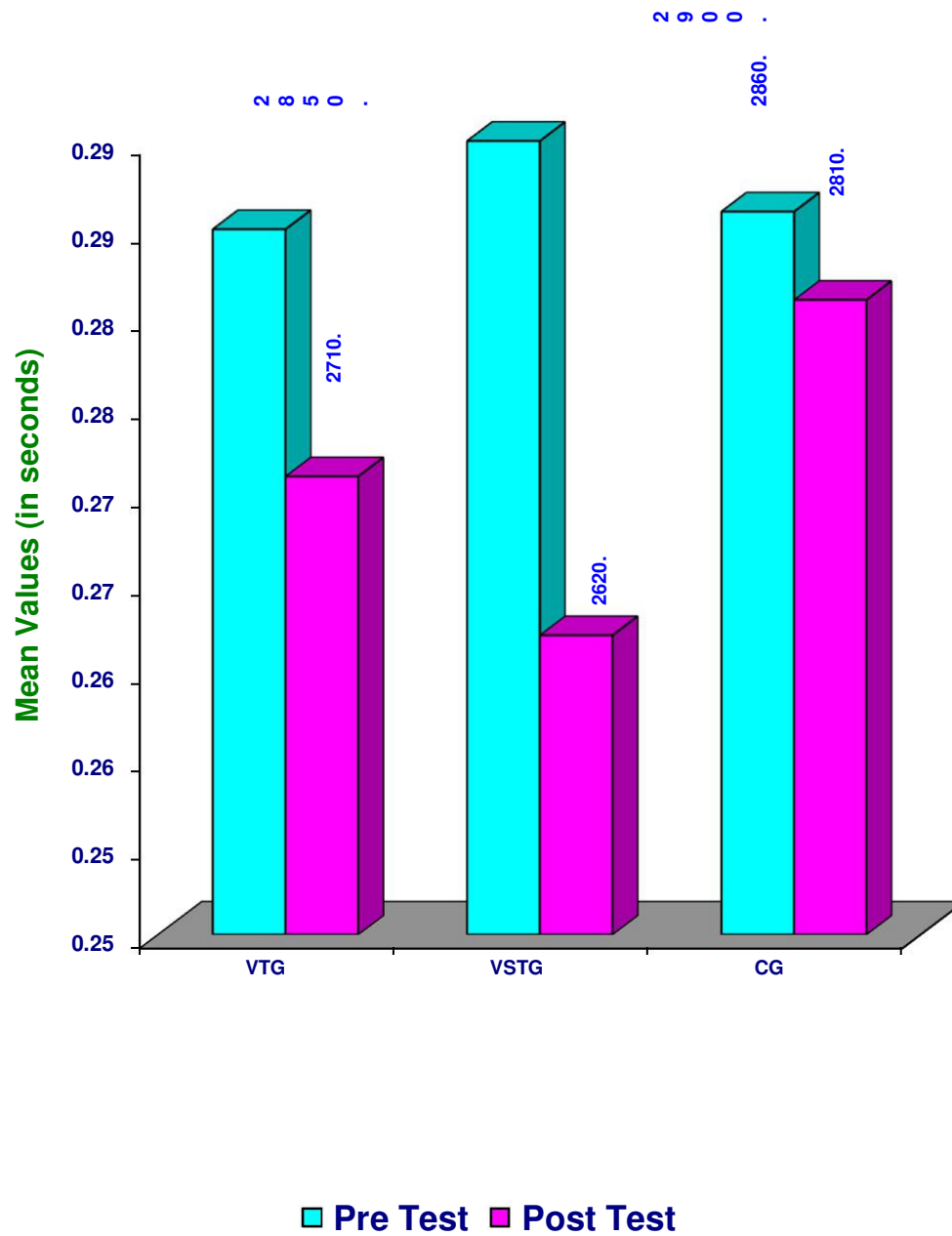
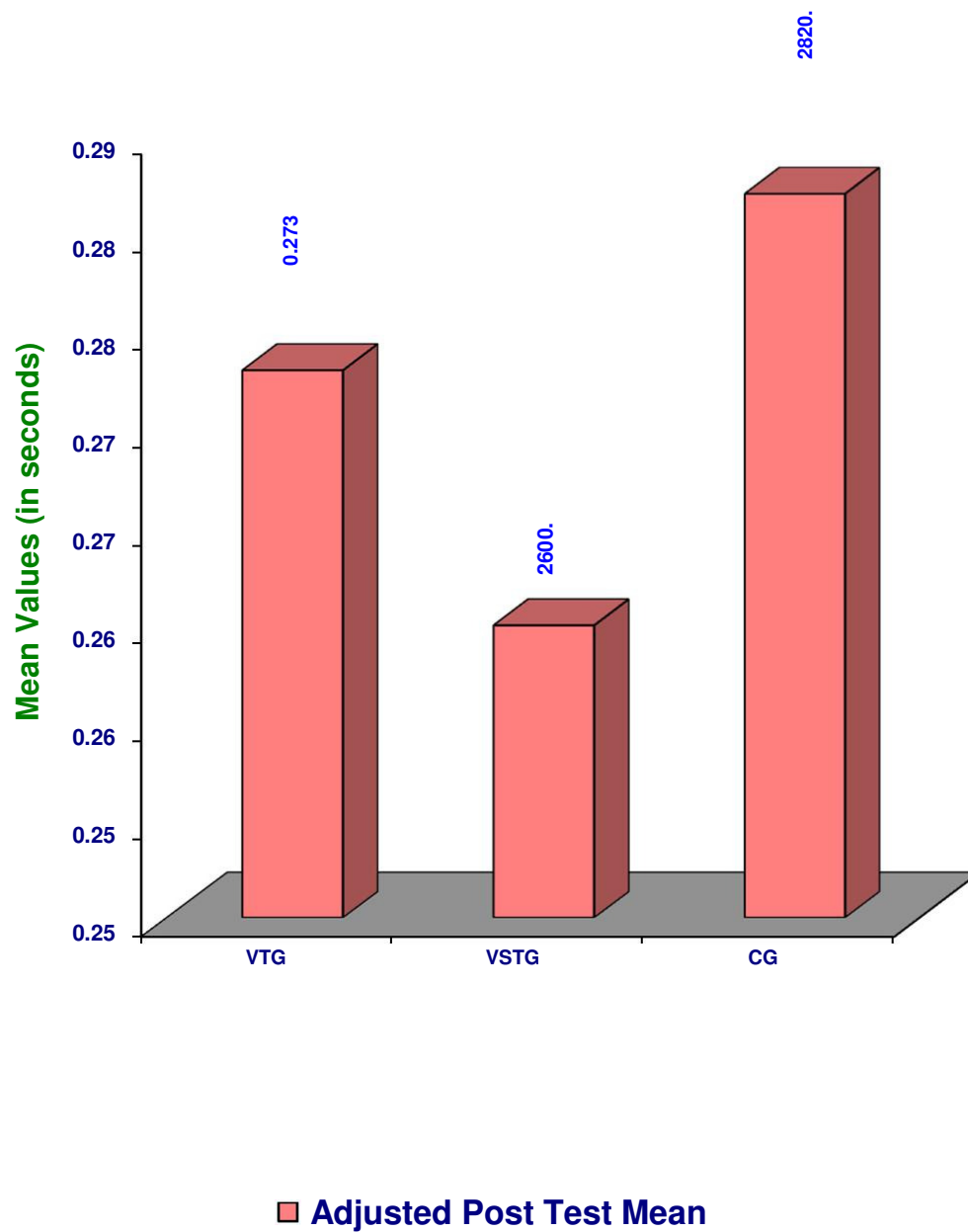


FIGURE 4
ADJUSTED POST TEST MEAN VALUES OF VTG, VSTG AND
CG ON MOVEMENT TIME



4.4.4. Discussion on Findings on Movement Time

The result of the study indicates that both the experimental groups were significantly differed when compared to control group on **movement time**. However, it is further revealed that the experimental group namely VTG and VSTG had improved in the performance of **movement time** better than the control group (CG) but VSTG had improved in the performance of **movement time** better than the other two groups.

Wei and Ji (2014) concluded that due to training effect the cognitive abilities improved movement time had a close relation with the cognitive abilities. **Sharma, Khan and Butchiramaiah (1986)** also stated that national level Volleyball players are superior to the state level players in visual and auditory reaction time and concentration. The present study also revealed that 12 weeks of specified training with vibrator aid and specified training with combination of vibrator aid and sign language improved the movement time.

4.5. COMPUTATION OF DEPENDENT 't' TEST, ANALYSIS OF COVARIANCE AND SCHEFFE'S POST HOC TEST ON 9M FRONT THROW

The analysis of dependent 't' test on the data obtained for **9M front throw** of the pre-test and post-test means of VTG, VSTG and CG were analysed and presented in Table XIV.

TABLE XIV
SUMMARY OF MEAN STANDARD DEVIATION AND DEPENDENT 't' TEST FOR THE PRE AND POST TESTS ON 9M FRONT THROW OF EXPERIMENTAL AND CONTROL GROUPS

(9M Front Throw scores are expressed in points)

		VTG	VSTG	CG
Pre test	Mean	10.867	11.267	11.400
	SD	1.642	1.486	0.737
Post test	Mean	15.000	17.200	11.933
	SD	2.236	2.484	1.033
't' test		7.923*	12.191*	1.069

*Significant at .05 level. The table value required for .05 level of significance with df 14 is 1.761.

4.5.1. Results of Dependent 't' Test on 9M Front Throw

Table XIV shows that the pre-test mean values of VTG, VSTG and CG on **9M front throw** are 10.867, 11.267 and 11.400 respectively and the post-test mean values on **9M front throw** are 15.000, 17.200 and 11.933 respectively. The obtained dependent t-ratio values between the pre and post test means of VTG, VSTG and CG on **9M front throw** are 7.923, 12.191 and 1.069 respectively. The table value required for significant difference with df 14 at .05 level is 1.761. Since, the obtained 't' ratio values of experimental groups are greater than the table value, it is understood that specified training with vibrator aid and specified training with combination of vibrator aid & sign language groups had significantly improved in

the performance of **9M front throw**. However, the control group had not significantly improved in the performance of **9m front throw**. The obtained ‘t’ value for the control group is less than the table value as they were not subjected to any specific training.

The analysis of covariance on **9M front throw** of VTG, VSTG and CG were analysed and presented in Table XV.

TABLE XV
ANALYSIS OF COVARIANCE FOR THE DATA ON 9M FRONT THROW
AMONG EXPERIMENTAL AND CONTROL GROUPS

Adjusted Post Test Means			Sources of Variance	Sum of Squares	df	Mean Squares	F-Ratio
VTG	VSTG	CG					
15.264	17.125	11.745	Between	222.829	2	111.414	39.171*
			Within	116.615	41	2.844	

* Significant at 0.05 level of confidence.

The table value for significance at 0.05 with df 2 and 41 is 3.23.

4.5.2. Results of Analysis of Covariance on 9M Front Throw

Table XV shows that the adjusted post-test means of VTG, VSTG and CG on **9M front throw** are 15.264, 17.125 and 11.745 respectively. The obtained F-ratio value is 39.171, which is higher than the table value 3.23 with df 2 and 41 required for significance at .05 level. Since the value of F-ratio is higher than the table value, it indicates that there exist significant differences among the adjusted post-test means of VTG, VSTG and CG. To find out which of the paired means had a significant difference on **9M front throw**, the Scheffe’s post-hoc test was applied and the results are presented in Table XVI.

TABLE XVI
SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN THE ADJUSTED
POST TEST PAIRED MEANS OF 9M FRONT THROW

VTG	VSTG	CG	Mean Difference	Confidential Interval
15.264	17.125		1.861*	1.564
15.264		11.745	3.518*	1.564
	17.125	11.745	5.380*	1.564

*Significant at .05 level.

4.5.3. Results of Scheffe's Test on 9M Front Throw

Table XVI shows that the adjusted post test mean difference on **9M front throw** between VTG and VSTG, VTG and CG and between VSTG and CG are 1.861, 3.518 and 5.380 respectively which are higher than the confidence interval value of 1.564 at .05 level of confidence.

The pre and post test mean values of VTG, VSTG and CG on **9M front throw** are graphically represented in figure 5.

The adjusted post test mean values of VTG, VSTG and CG on **9M front throw** are graphically represented in figure 6.

FIGURE 5
PRE TEST AND POST TEST MEAN VALUES OF VTG, VSTG
AND CG ON 9M FRONT THROW

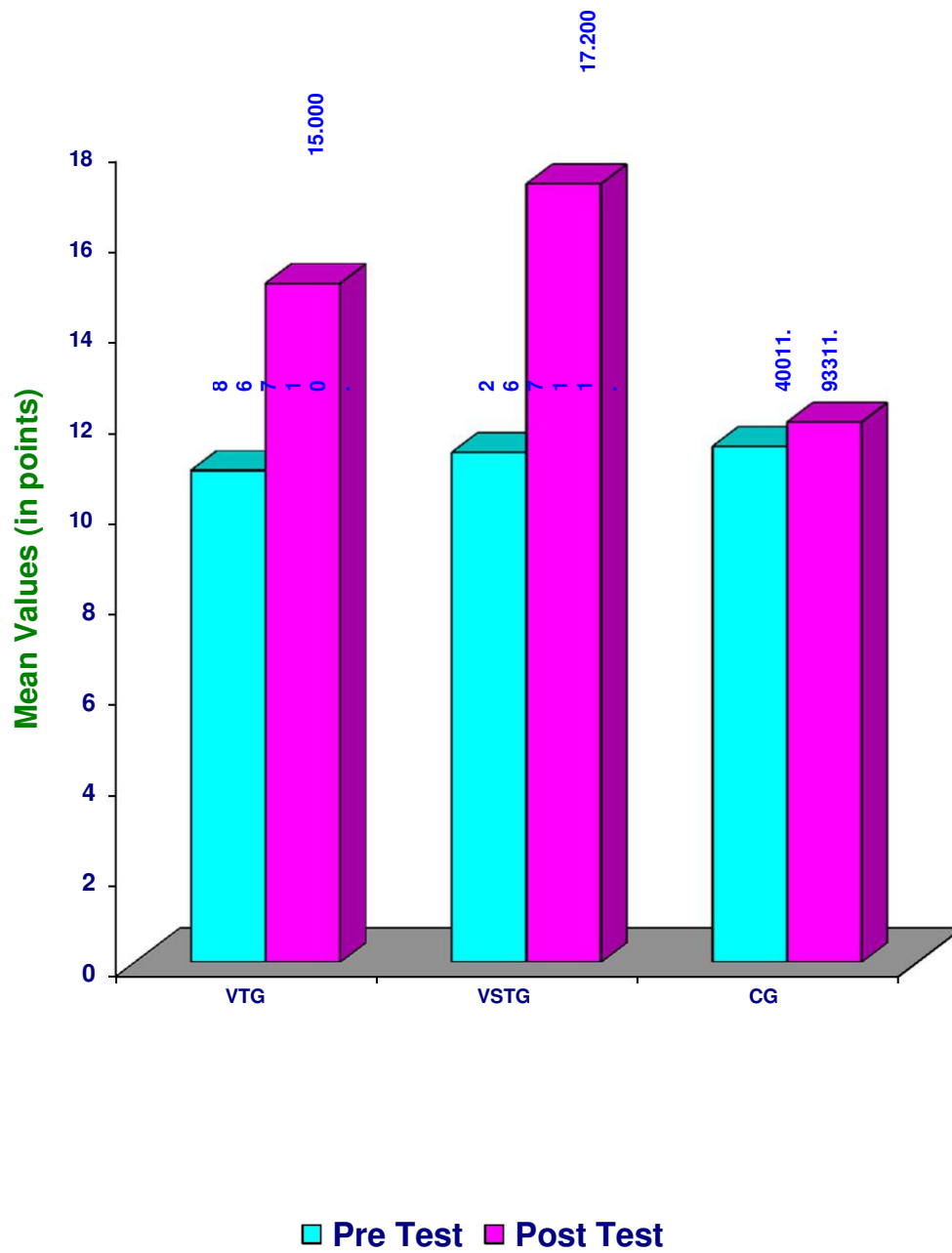
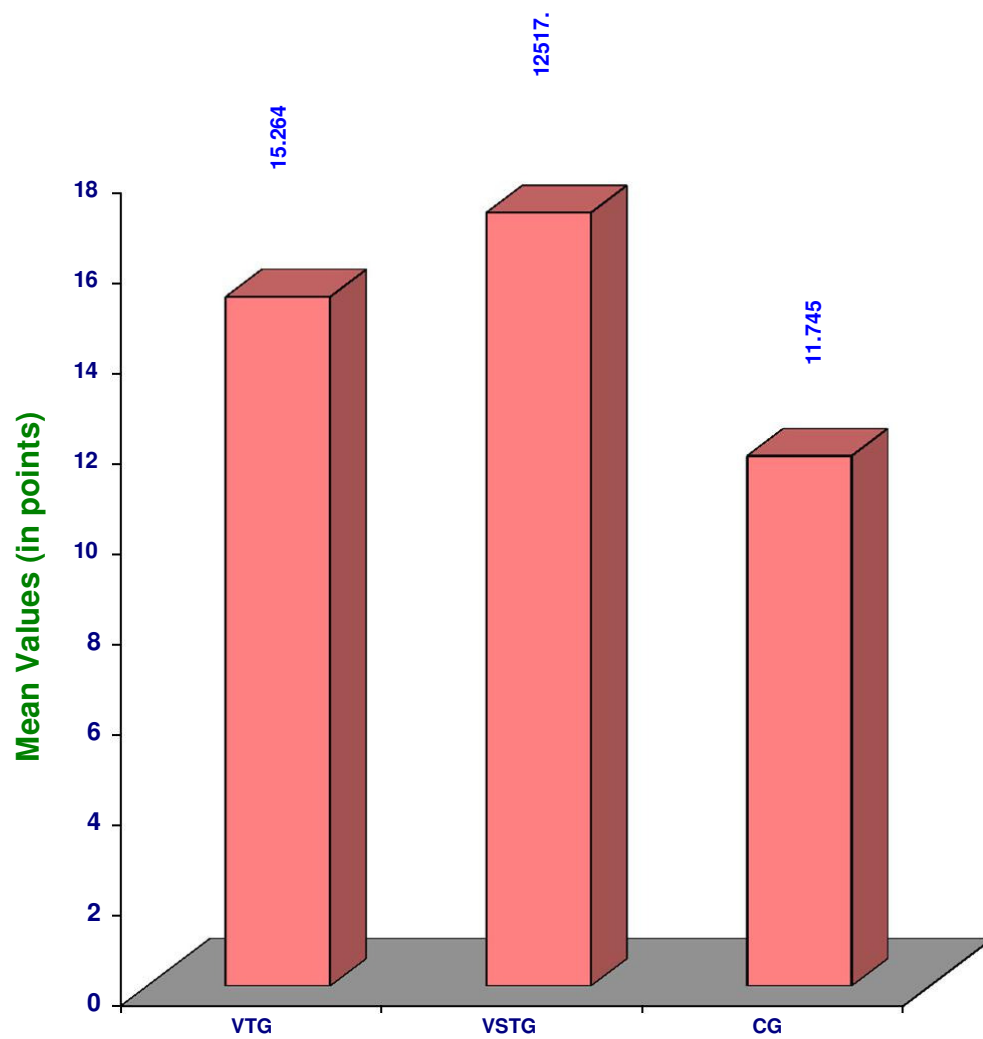


FIGURE 6
ADJUSTED POST TEST MEAN VALUES OF VTG, VSTG AND
CG ON 9M FRONT THROW



■ Adjusted Post Test Mean

4.5.4. Discussion on Findings on 9M Front Throw

The result of the study indicates that both the experimental groups were significantly differed when compared to control group on **9M front throwing ability**. However, it is further revealed that the experimental group namely VTG and VSTG had improved the **9M front throwing ability** better than the control group (CG) but VSTG had improved the **9M front throwing ability** better than the VTG and CG.

Wagner and Muller (2008) suggested that team-handball players who were taller and of greater body weight have the ability to achieve a higher ball release speed in the jump throw and **Wagner, et al., (2012)** concluded that team-handball players had the ability to compensate an increase in movement variability in the acceleration phase to throw accurately, and skilled players were able to control the movement, although movement variability decreased in the standing throw with run-up. **Rivilla-García (2010)** suggested that handball players' throwing ability was a decisive factor in competitive and professional level. The present study also revealed that 12 weeks of specified training with vibrator aid and specified training with combination of vibrator aid and sign language improved the 9M front throwing ability. The result of the present investigation is also incorporated with the findings of **Cetin and Ozdol (2012)**, **Eliasz, (Apr, 2015)**, **Marques, et al., (2007)**, **Skoufas, et al., (2002)**, **Rogulj, et al., (2007)**, **Ziva and Lidora (2009)** and **Pori, Bon, and Sibila, (2005)**.

4.6. COMPUTATION OF DEPENDENT 't' TEST, ANALYSIS OF COVARIANCE AND SCHEFFE'S POST HOC TEST ON DOMINANT HAND SPEED PASS

The analysis of dependent 't' test on the data obtained for **dominant hand speed pass** of the pre-test and post-test means of VTG, VSTG and CG were analysed and presented in Table XVII.

TABLE XVII
SUMMARY OF MEAN STANDARD DEVIATION AND DEPENDENT 't'
TEST FOR THE PRE AND POST TESTS ON DOMINANT HAND SPEED
PASS OF EXPERIMENTAL AND CONTROL GROUPS
 (Dominant hand speed pass scores are expressed in seconds)

		VTG	VSTG	CG
Pre test	Mean	46.733	46.400	45.933
	SD	1.668	2.261	2.314
Post test	Mean	44.667	42.467	45.067
	SD	2.193	2.031	2.404
't' test		11.973*	21.438*	1.179

*Significant at .05 level. The table value required for .05 level of significance with df 14 is 1.761.

4.6.1. Results of Dependent 't' Test on Dominant Hand Speed Pass

Table XVII shows that the pre-test mean values of VTG, VSTG and CG on **dominant hand speed pass** are 46.733, 46.400 and 45.933 respectively and the post-test mean values on **dominant hand speed pass** are 44.667, 42.467 and 45.067 respectively. The obtained dependent t-ratio values between the pre and post test means of VTG, VSTG and CG on **dominant hand speed pass** are 11.973, 21.438 and 1.179 respectively. The table value required for significant difference with df 14 at .05 level is 1.761. Since, the obtained 't' ratio values of experimental groups are greater than the table value, it is understood that specified training with vibrator aid and specified training with combination of vibrator aid & sign language groups had

significantly improved in the performance of **dominant hand speed pass**. However, the control group had not significantly improved in the performance of **dominant hand speed pass**. The obtained 't' value for the control group is less than the table value as they were not subjected to any specific training.

The analysis of covariance on **dominant hand speed pass** of VTG, VSTG and CG were analysed and presented in Table XVIII.

TABLE XVIII
ANALYSIS OF COVARIANCE FOR THE DATA ON DOMINANT HAND SPEED PASS AMONG EXPERIMENTAL AND CONTROL GROUPS

Adjusted Post Test Means			Sources of Variance	Sum of Squares	df	Mean Squares	F-Ratio
VTG	VSTG	CG					
44.318	42.426	45.456	Between	69.912	2	34.956	29.574*
			Within	48.461	41	1.182	

* Significant at 0.05 level of confidence.

The table value for significance at 0.05 with df 2 and 41 is 3.23.

4.6.2. Results of Analysis of Covariance on Dominant Hand Speed Pass

Table XVIII shows that the adjusted post-test means of VTG, VSTG and CG on **dominant hand speed pass** are 44.318, 42.426 and 45.456 respectively. The obtained F-ratio value is 29.574, which is higher than the table value 3.23 with df 2 and 41 required for significance at .05 level. Since the value of F-ratio is higher than the table value, it indicates that there exist significant differences among the adjusted post-test means of VTG, VSTG and CG. To find out which of the paired means had a significant difference on **dominant hand speed pass**, the Scheffe's post-hoc test was applied and the results are presented in Table XIX.

TABLE XIX
SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN THE ADJUSTED
POST TEST PAIRED MEANS OF DOMINANT HAND SPEED PASS

VTG	VSTG	CG	Mean Difference	Confidential Interval
44.318	42.426		1.893*	1.008
44.318		45.456	1.137*	1.008
	42.426	45.456	3.030*	1.008

*Significant at .05 level.

4.6.3. Results of Scheffe's Test on Dominant Hand Pass

The table XIX shows that the adjusted post test mean difference on **dominant hand speed pass** between VTG and VSTG, VTG and CG and between VSTG and CG are 1.893, 1.137 and 3.030 respectively which are higher than the confidence interval value of 1.008 at .05 level of confidence.

The pre and post test mean values of VTG, VSTG and CG on **dominant hand speed pass** are graphically represented in figure 7.

The adjusted post test mean values of VTG, VSTG and CG on **dominant hand speed pass** are graphically represented in figure 8.

FIGURE 7
PRE TEST AND POST TEST MEAN VALUES OF VTG, VSTG
AND CG ON DOMINANT HAND SPEED PASS

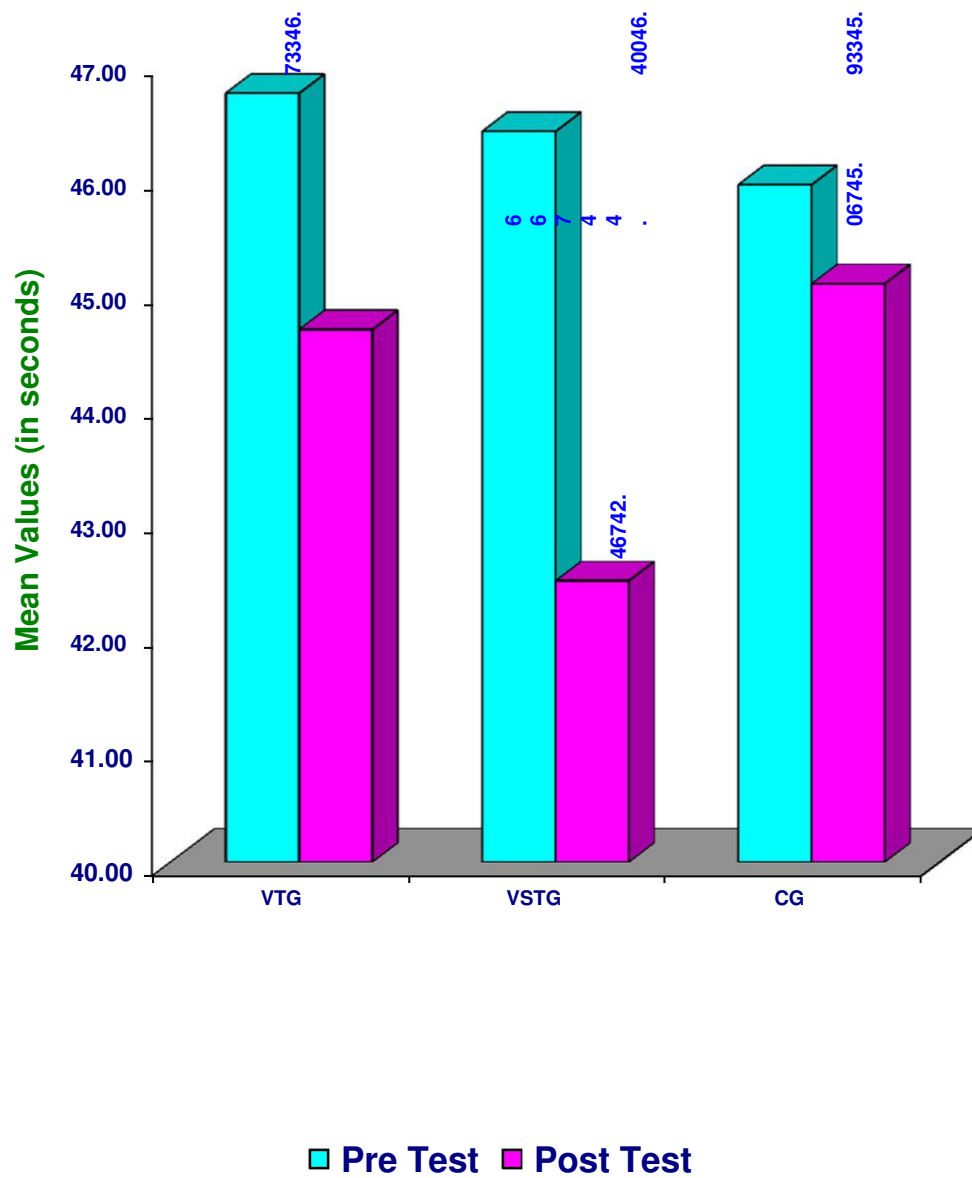
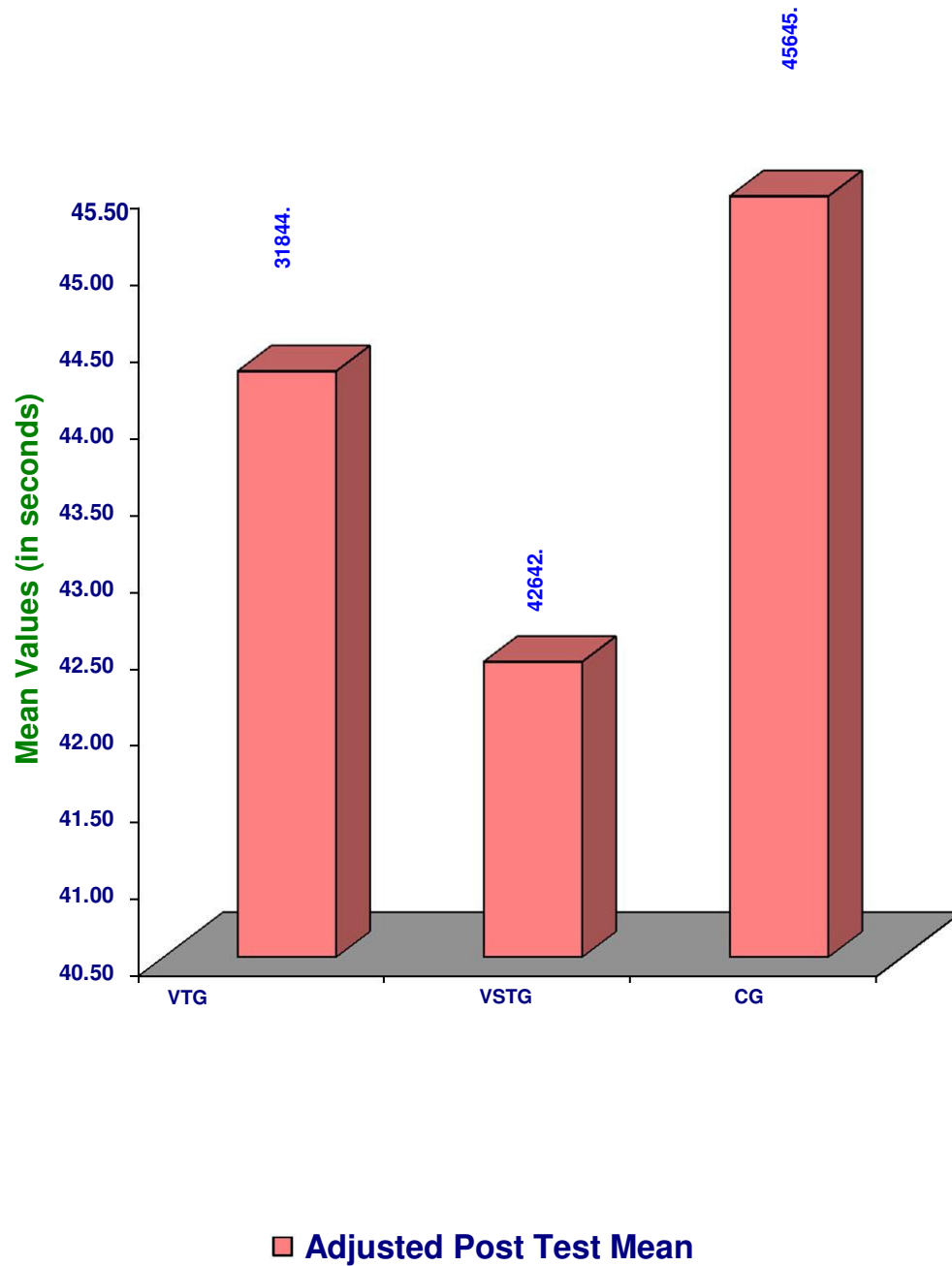


FIGURE 8
ADJUSTED POST TEST MEAN VALUES OF VTG, VSTG AND
CG ON DOMINANT HAND SPEED PASS



4.6.4. Discussion on Findings on Dominant Hand Speed Pass

The result of the study indicates that both the experimental groups significantly differed when compared to the control group on **dominant hand speed pass**. However, it is further revealed that the experimental group namely VTG and VSTG had improved in the performance of **dominant hand speed pass** better than the control group (CG) but VSTG had improved in the performance of **dominant hand speed pass** better than the other two groups.

The present study also revealed that 12 weeks of specified training with vibrator aid and specified training with combination of vibrator aid and sign language improved dominant hand speed pass.

4.7. COMPUTATION OF DEPENDENT 't' TEST, ANALYSIS OF COVARIANCE AND SCHEFFE'S POST HOC TEST ON OVERHEAD PASS

The analysis of dependent 't' test on the data obtained for **overhead pass** of the pre-test and post-test means of VTG, VSTG and CG were analysed and presented in Table XX.

TABLE XX
SUMMARY OF MEAN STANDARD DEVIATION AND DEPENDENT 't' TEST FOR THE PRE AND POST TESTS ON OVERHEAD PASS OF EXPERIMENTAL AND CONTROL GROUPS

(Overhead pass scores are expressed in points)

		VTG	VSTG	CG
Pre test	Mean	6.400	7.000	6.667
	SD	1.056	1.558	1.291
Post test	Mean	8.200	10.133	7.133
	SD	1.146	1.187	1.685
't' test		7.585*	11.225*	0.201

*Significant at .05 level. The table value required for .05 level of significance with df 14 is 1.761.

4.7.1. Results of Dependent 't' Test on Overhead Pass

Table XX shows that the pre-test mean values of VTG, VSTG and CG on **overhead pass** are 6.400, 7.000 and 6.667 respectively and the post-test mean values on **overhead pass** are 8.200, 10.133 and 7.133 respectively. The obtained dependent t-ratio values between the pre and post test means of VTG, VSTG and CG on **overhead pass** are 7.585, 11.225 and 0.201 respectively. The table value required for significant difference with df 14 at .05 level is 1.761. Since, the obtained 't' ratio values of experimental groups are greater than the table value, it is understood that specified training with vibrator aid and specified training with combination of vibrator aid & sign language groups had significantly improved in

the performance of **overhead pass**. However, the control group had not significantly improved in the performance of **overhead pass**. The obtained 't' value for the control group is less than the table value as they were not subjected to any specific training.

The analysis of covariance on **overhead pass** of VTG, VSTG and CG were analysed and presented in Table XXI.

TABLE XXI
ANALYSIS OF COVARIANCE FOR THE DATA ON OVERHEAD PASS
AMONG EXPERIMENTAL AND CONTROL GROUPS

Adjusted Post Test Means			Sources of Variance	Sum of Squares	df	Mean Squares	F-Ratio
VTG	VSTG	CG					
8.344	9.978	7.144	Between	59.827	2	29.914	20.574*
			Within	59.633	41	1.454	

* Significant at 0.05 level of confidence.

The table value for significance at 0.05 with df 2 and 41 is 3.23.

4.7.2. Results of Analysis of Covariance on Overhead Pass

Table XXI shows that the adjusted post-test means of VTG, VSTG and CG on **overhead pass** are 8.344, 9.978 and 7.144 respectively. The obtained F-ratio value is 20.574, which is higher than the table value 3.23 with df 2 and 41 required for significance at .05 level. Since the value of F-ratio is higher than the table value, it indicates that there exist significant differences among the adjusted post-test means of VTG, VSTG and CG. To find out which of the paired means had a significant difference on **overhead pass**, the Scheffe's post-hoc test was applied and the results are presented in Table XXII.

TABLE XXII
SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN THE ADJUSTED
POST TEST PAIRED MEANS OF OVERHEAD PASS

VTG	VSTG	CG	Mean Difference	Confidential Interval
8.344	9.978		1.633*	1.118
8.344		7.144	1.200*	1.118
	9.978	7.144	2.833*	1.118

*Significant at .05 level.

4.7.3. Results of Scheffe's Test on Overhead Pass

The table XXII shows that the adjusted post test mean difference on **overhead pass** between VTG and VSTG, VTG and CG and between VSTG and CG are 1.633, 1.200 and 2.833 respectively which are higher than the confidence interval value of 1.118 at .05 level of confidence.

The pre and post test mean values of VTG, VSTG and CG on **overhead pass** are graphically represented in figure 9.

The adjusted post test mean values of VTG, VSTG and CG on **overhead pass** are graphically represented in figure 10.

FIGURE 9
PRE TEST AND POST TEST MEAN VALUES OF VTG, VSTG
AND CG ON OVERHEAD PASS

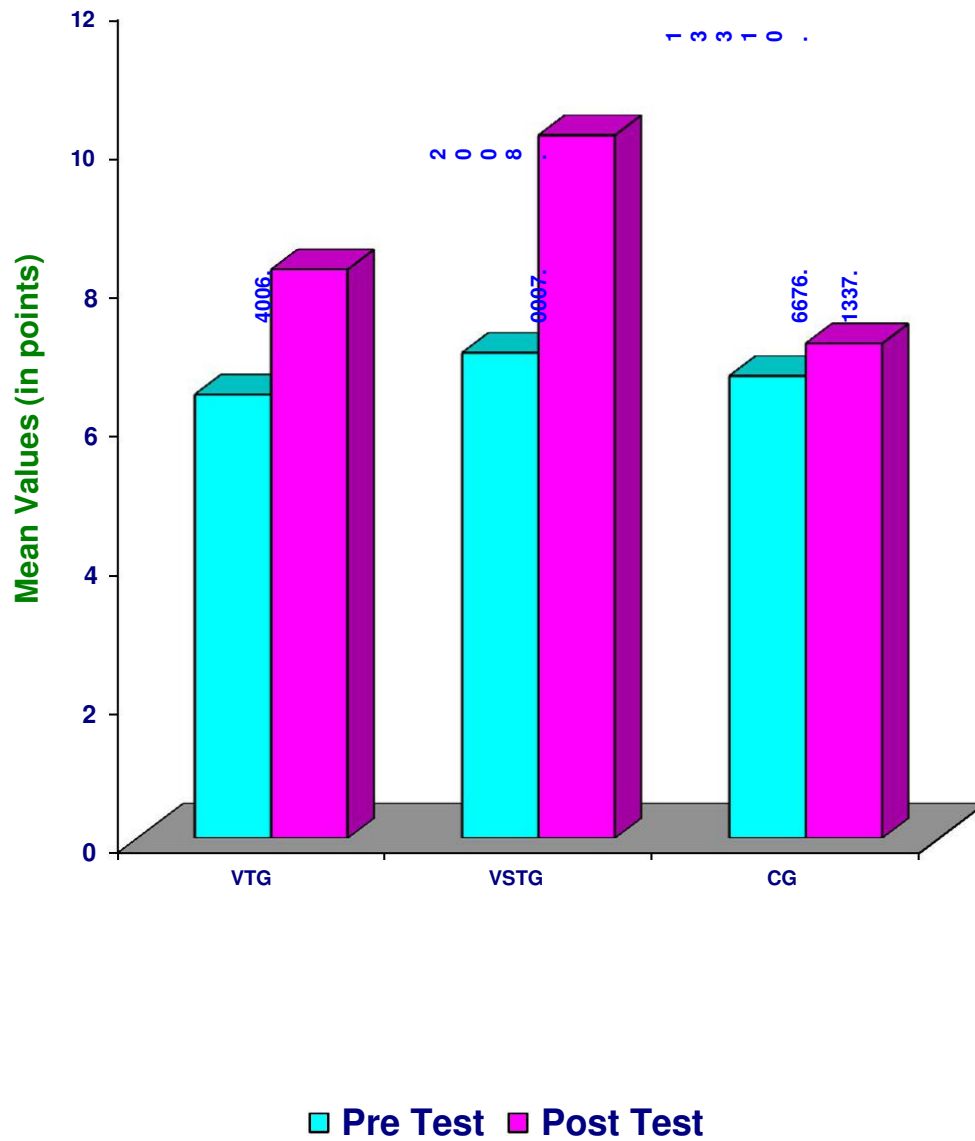
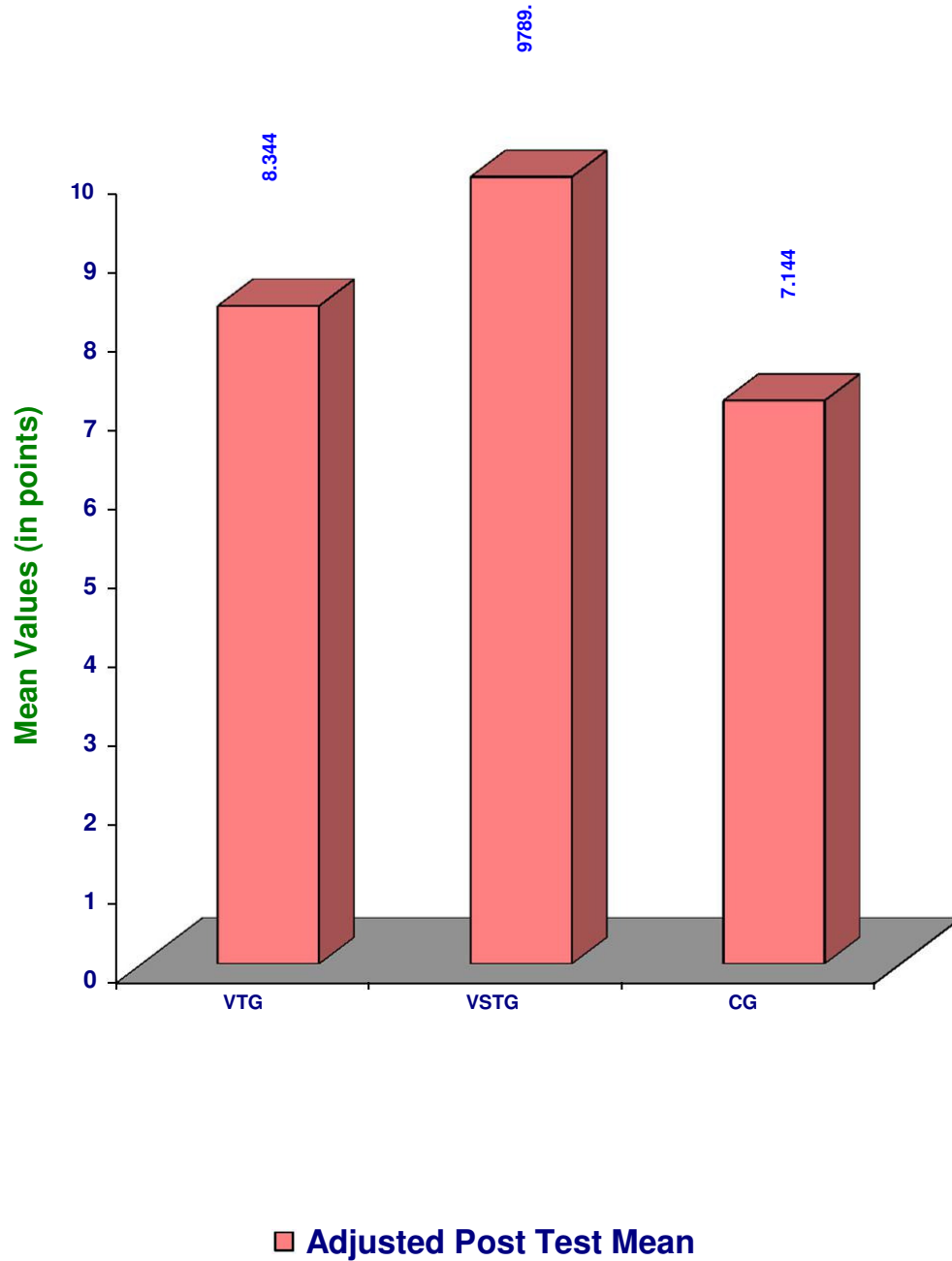


FIGURE 10
ADJUSTED POST TEST MEAN VALUES OF VTG, VSTG AND
CG ON OVERHEAD PASS



4.7.4. Discussion on Findings on Overhead Pass

The result of the study indicates that both the experimental groups were significantly differed when compared to the control group on **overhead passing ability**. However, it is further revealed that the experimental group namely VTG and VSTG had improved in the performance of **overhead passing ability** better than the control group (CG) and sign and vibrator training group (SVTG) had improved in the performance of **overhead passing ability** better than the other two groups.

Reddy (1993) in his study concluded that the accuracy improved due to regular involvement in physical activity and on the whole results showed that the students improved significantly in coordinative abilities after their active involvement in physical activity which comprised of gymnastics, athletics and yoga. The present study also revealed that 12 weeks of specified training with vibrator aid and specified training with combination of vibrator aid and sign language improved the overhead passing ability of the deaf and dumb students.

4.8. COMPUTATION OF DEPENDENT 't' TEST, ANALYSIS OF COVARIANCE AND SCHEFFE'S POST HOC TEST ON ACCURACY THROW

The analysis of dependent 't' test on the data obtained for **accuracy throw** of the pre-test and post-test means of VTG, VSTG and CG were analysed and presented in Table XXIII.

TABLE XXIII
SUMMARY OF MEAN STANDARD DEVIATION AND DEPENDENT 't' TEST FOR THE PRE AND POST TESTS ON ACCURACY THROW OF EXPERIMENTAL AND CONTROL GROUPS

(Accuracy throw scores are expressed in points)

		VTG	VSTG	CG
Pre test	Mean	4.733	4.867	4.667
	SD	0.594	0.743	0.724
Post test	Mean	5.600	6.533	4.867
	SD	0.632	0.743	1.125
't' test		8.641*	12.574*	1.497

*Significant at .05 level. The table value required for .05 level of significance with df 14 is 1.761.

4.8.1. Results of Dependent 't' Test on Accuracy throw

Table XXIII shows that the pre-test mean values of VTG, VSTG and CG on **accuracy throw** are 4.733, 4.867 and 4.667 respectively and the post-test mean values on **accuracy throw** are 5.600, 6.533 and 4.867 respectively. The obtained dependent t-ratio values between the pre and post test means of VTG, VSTG and CG on **accuracy throw** are 8.641, 12.574 and 1.497 respectively. The table value required for significant difference with df 14 at .05 level is 1.761. Since, the obtained 't' ratio values of experimental groups are greater than the table value, it is understood that specified training with vibrator aid and specified training with combination of vibrator aid & sign language groups had significantly improved in

the performance of **accuracy throw**. However, the control group had not significantly improved in the performance of **accuracy throw**. The obtained 't' value for the control group is less than the table value as they were not subjected to any specific training.

The analysis of covariance on **accuracy throw** of VTG, VSTG and CG were analysed and presented in Table XXIV.

TABLE XXIV
ANALYSIS OF COVARIANCE FOR THE DATA ON ACCURACY THROW
AMONG EXPERIMENTAL AND CONTROL GROUPS

Adjusted Post Test Means			Sources of Variance	Sum of Squares	df	Mean Squares	F-Ratio
VTG	VSTG	CG					
5.618	6.446	4.937	Between	16.867	2	8.434	18.618*
			Within	18.585	41	0.453	

* Significant at 0.05 level of confidence.

The table value for significance at 0.05 with df 2 and 41 is 3.23.

4.8.2. Results of Analysis of Covariance on Accuracy throw

Table XXIV shows that the adjusted post-test means of VTG, VSTG and CG on **accuracy throw** are 5.618, 6.446 and 4.937 respectively. The obtained F-ratio value is 18.618, which is higher than the table value 3.23 with df 2 and 41 required for significance at .05 level. Since the value of F-ratio is higher than the table value, it indicates that there exist significant differences among the adjusted post-test means of VTG, VSTG and CG. To find out which of the paired means had a significant difference on **accuracy throw**, the Scheffe's post-hoc test was applied and the results are presented in Table XXV.

TABLE XXV
SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN THE ADJUSTED
POST TEST PAIRED MEANS OF ACCURACY THROW

VTG	VSTG	CG	Mean Difference	Confidential Interval
5.618	6.446		0.828*	0.624
5.618		4.937	0.681*	0.624
	6.446	4.937	1.509*	0.624

*Significant at .05 level.

4.8.3. Results of Scheffe's Test on Accuracy Throw

The table XXV shows that the adjusted post test mean difference on **accuracy throw** between VTG and VSTG, VTG and CG and between VSTG and CG are 0.828, 0.681 and 1.509 respectively which are higher than the confidence interval value of 0.624 at .05 level of confidence.

The pre and post test mean values of VTG, VSTG and CG on **accuracy throw** are graphically represented in figure 11.

The adjusted post test mean values of VTG, VSTG and CG on **accuracy throw** are graphically represented in figure 12.

FIGURE 11
PRE TEST AND POST TEST MEAN VALUES OF VTG, VSTG
AND CG ON ACCURACY THROW

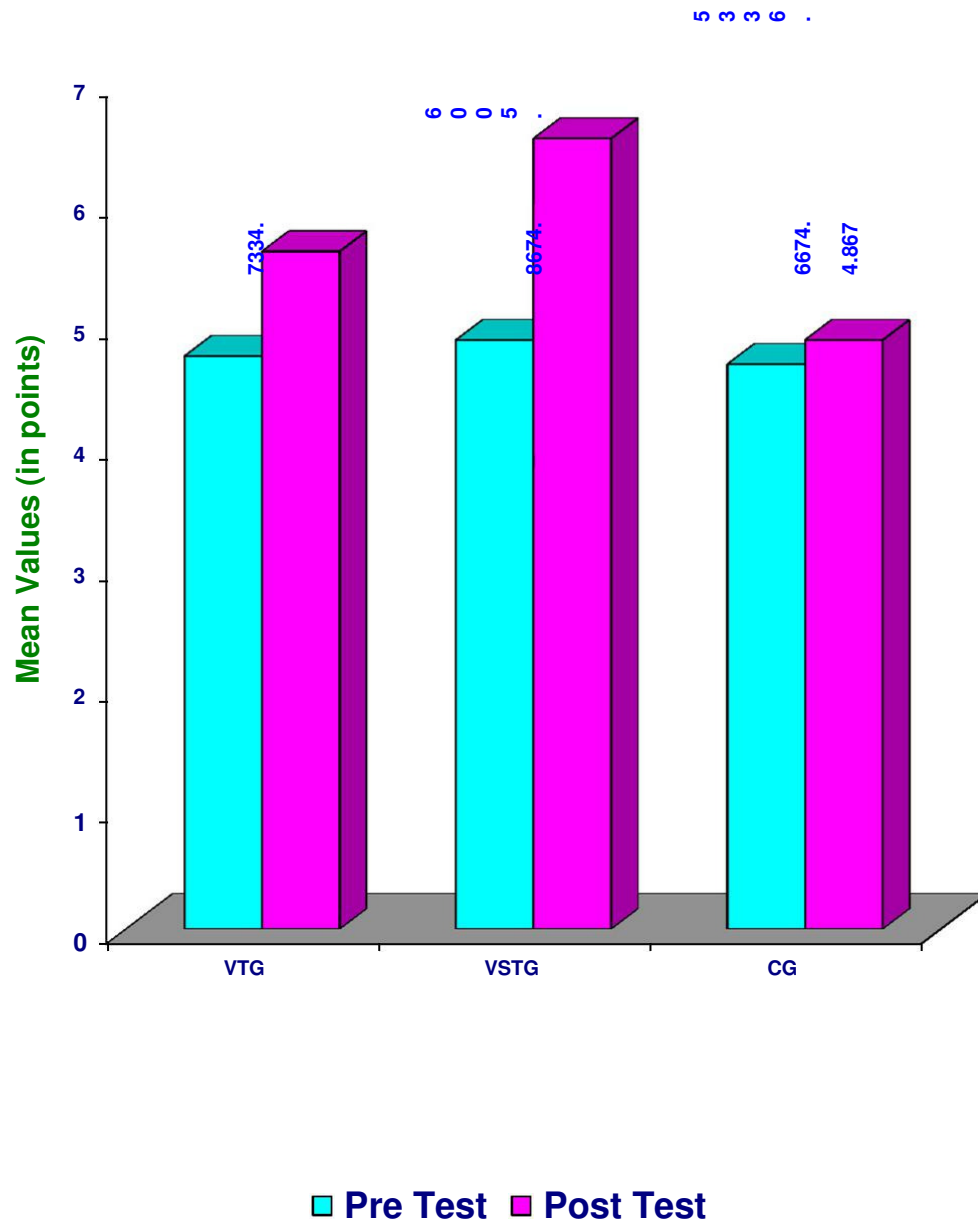
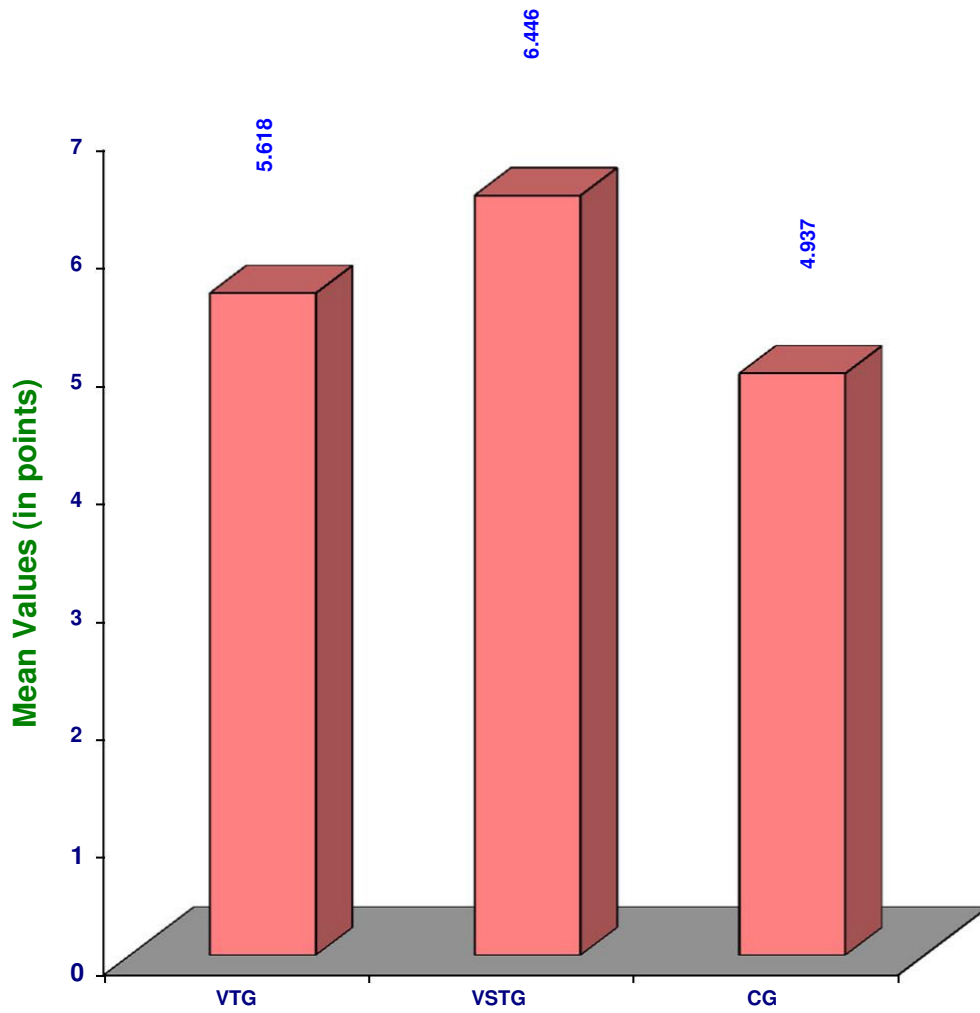


FIGURE 12
ADJUSTED POST TEST MEAN VALUES OF VTG, VSTG AND
CG ON ACCURACY THROW



■ Adjusted Post Test Mean

4.8.4. Discussion on Findings on Accuracy Throw

The result of the study indicates that both the experimental groups were significantly differed when compared to the control group on **accuracy throw**. However, it is further revealed that the experimental group namely VTG and VSTG had improved in the performance of **accuracy throw** better than the control group (CG) but VSTG had improved in the performance of **accuracy throw** better than the other two groups.

Ziva and Lidora (2009) concluded that throwing velocity is higher by as much as 9% in elite male players compared with amateur male players and suggested that strength and power exercises should be emphasized in conditioning programmes, as they are associated with both sprint performance and throwing velocity. **Rogulj, et al., (2007)** found that the ball movement speed during the jump shot and the floor shot was determined, at the level of statistical importance, only by explosive strength in the form of throw. It is acceptable because this very ability from the aspects of kinesiology and anatomy requires, to the maximum extent, the kinetic efficacy of the ball throw in Handball. **Visnapuu, et al., (2007)** stated that finger control is especially important for the accuracy of different shots, both in handball and basketball. The present investigation also exposed that specified training with vibrator aid and specified training with combination of vibrator aid and sign language improved the accuracy throw. The findings of the present study also supported with the findings of **Reddy (1993) and Marques and Gonzalez (2006)**.

4.9. COMPUTATION OF DEPENDENT 't' TEST, ANALYSIS OF COVARIANCE AND SCHEFFE'S POST HOC TEST ON JUMP AND THROW

The analysis of dependent 't' test on the data obtained for **jump and throw** of the pre-test and post-test means of VTG, VSTG and CG were analysed and presented in Table XXVI.

TABLE XXVI
SUMMARY OF MEAN STANDARD DEVIATION AND DEPENDENT 't' TEST FOR THE PRE POST AND ADJUSTED POST TESTS ON JUMP AND THROW OF EXPERIMENTAL AND CONTROL GROUPS

(Jump and throw scores are expressed in points)

		VTG	VSTG	CG
Pre test	Mean	3.667	3.533	3.600
	SD	0.900	0.516	1.056
Post test	Mean	4.800	5.733	3.733
	SD	1.265	0.961	0.961
't' test		7.221*	9.646*	0.423

*Significant at .05 level. The table value required for .05 level of significance with df 14 is 1.761.

4.9.1. Results of Dependent 't' Test on Jump and Throw

Table XXVI shows that the pre-test mean values of VTG, VSTG and CG on **jump and throw** are 3.667, 3.533 and 3.600 respectively and the post-test mean values on **jump and throw** are 4.800, 5.733 and 3.733 respectively. The obtained dependent t-ratio values between the pre and post test means of VTG, VSTG and CG on **jump and throw** are 7.221, 9.646 and 0.423 respectively. The table value required for significant difference with df 14 at .05 level is 1.761. Since, the obtained 't' ratio values of experimental groups are greater than the table value, it is understood that specified training with vibrator aid and specified training with combination of vibrator aid & sign language groups had significantly improved in

the performance of **jump and throw**. However, the control group had not significantly improved in the performance of **jump and throw**. The obtained 't' value for the control group is less than the table value as they were not subjected to any specific training.

The analysis of covariance on **jump and throw** of VTG, VSTG and CG were analysed and presented in Table XXVII.

TABLE XXVII
ANALYSIS OF COVARIANCE FOR THE DATA ON JUMP AND THROW
AMONG EXPERIMENTAL AND CONTROL GROUPS

Adjusted Post Test Means			Sources of Variance	Sum of Squares	df	Mean Squares	F-Ratio
VTG	VSTG	CG					
4.747	5.787	3.733	Between	31.588	2	15.794	22.595*
			Within	28.640	41	0.699	

* Significant at 0.05 level of confidence.

The table value for significance at 0.05 with df 2 and 41 is 3.23.

4.9.2. Results of Analysis of Covariance on Jump and Throw

Table XXVII shows that the adjusted post-test means of VTG, VSTG and CG on **jump and throw** are 4.747, 5.787 and 3.733 respectively. The obtained F-ratio value is 22.595, which is higher than the table value 3.23 with df 2 and 41 required for significance at .05 level. Since the value of F-ratio is higher than the table value, it indicates that there exist significant differences among the adjusted post-test means of VTG, VSTG and CG. To find out which of the paired means had a significant difference on **jump and throw**, the Scheffe's post-hoc test was applied and the results are presented in Table XXVIII.

TABLE XXVIII
SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN THE ADJUSTED
POST TEST PAIRED MEANS OF JUMP AND THROW

VTG	VSTG	CG	Mean Difference	Confidential Interval
4.747	5.787		1.040*	0.775
4.747		3.733	1.013*	0.775
	5.787	3.733	2.053*	0.775

*Significant at .05 level.

4.9.3. Results of Scheffe's Test on Jump and Throw

The table XXVIII shows that the adjusted post test mean difference on **jump and throw** between VTG and VSTG, VTG and CG and between VSTG and CG are 1.040, 1.013 and 2.053 respectively which are higher than the confidence interval value of 0.775 at .05 level of confidence.

The pre and post test mean values of VTG, VSTG and CG on **jump and throw** are graphically represented in figure 13.

The adjusted post test mean values of VTG, VSTG and CG on **jump and throw** are graphically represented in figure 14.

FIGURE 13
PRE TEST AND POST TEST MEAN VALUES OF VTG, VSTG
AND CG ON JUMP AND THROW

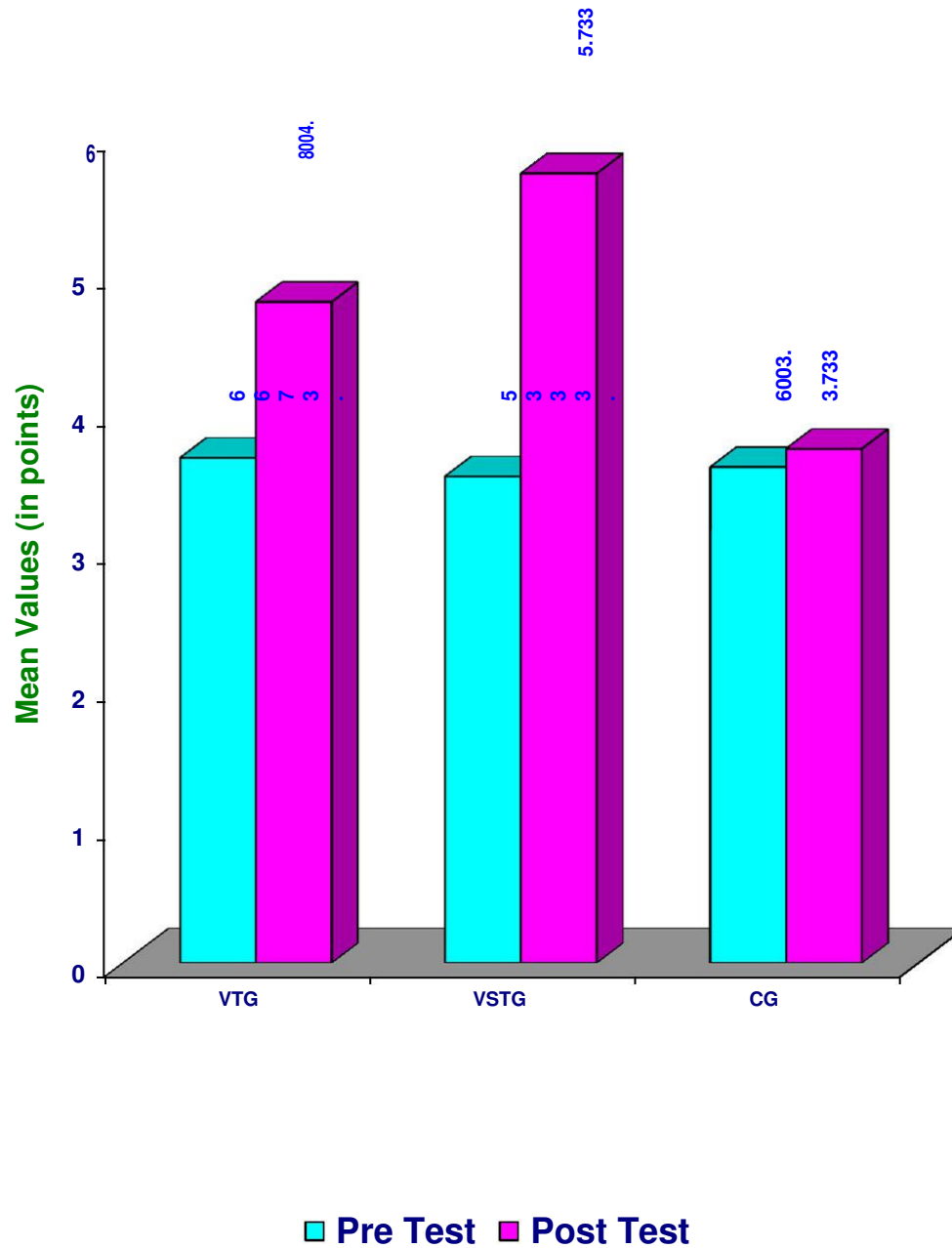
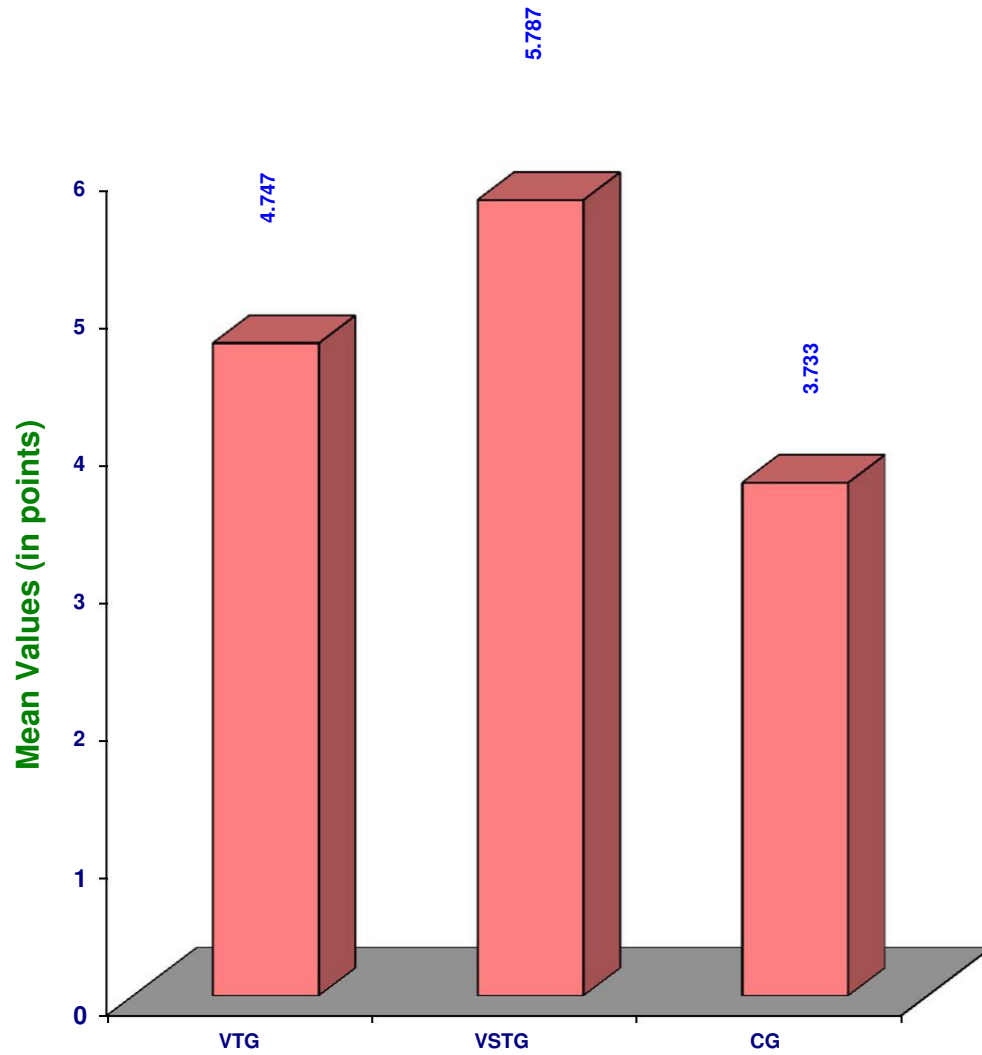


FIGURE 14
ADJUSTED POST TEST MEAN VALUES OF VTG, VSTG AND
CG ON JUMP AND THROW



■ Adjusted Post Test Mean

4.9.4. Discussion on Findings on Jump and Throw

The result of the study indicates that both the experimental groups significantly differed when compared to the control group on **jump and throw**. However, it is further revealed that the experimental group namely VTG and VSTG had improved in the performance of **jump and throw** better than the control group (CG) but VSTG had improved in the performance of **jump and throw** better than the other two groups.

Cetin and Ozdol (2012) concluded that there were significant differences between before and after training program in push up and the height of center of gravity parameters and but there is no significant differences found that vertical jump (VJ) and velocity of center of gravity (VCG). **Wagner and Muller (2008)** suggest that team-handball players who were taller and of greater body weight have the ability to achieve a higher ball release speed in the jump throw. The present study also concealed that the 12 weeks of specified training with vibrator aid and specified training with combination of vibrator aid and sign language improved the jump and throw. The result of the present investigation is also incorporated with the findings of **Rogulj, et al., (2007)** **Ziva and Lidora (2009)** and **Pori, Bon, and Sibila (2005)**.

4.10. COMPUTATION OF DEPENDENT ‘t’ TEST, ANALYSIS OF COVARIANCE AND SCHEFFE’S POST HOC TEST ON DRIBBLING

The analysis of dependent ‘t’ test on the data obtained for **dribbling** of the pre-test and post-test means of VTG, VSTG and CG were analysed and presented in Table XXIX.

TABLE XXIX
SUMMARY OF MEAN STANDARD DEVIATION AND DEPENDENT ‘t’ TEST FOR THE PRE AND POST TESTS ON DRIBBLING OF EXPERIMENTAL AND CONTROL GROUPS

(Dribbling scores are expressed in seconds)

		VTG	VSTG	CG
Pre test	Mean	39.333	38.933	38.400
	SD	2.610	2.219	2.414
Post test	Mean	36.267	33.733	37.333
	SD	2.890	2.017	3.331
‘t’ test		7.668*	12.373*	0.948

*Significant at .05 level. The table value required for .05 level of significance with df 14 is 1.761.

4.10.1. Results of Dependent ‘t’ Test on Dribbling

Table XXIX shows that the pre-test mean values of VTG, VSTG and CG on **dribbling** are 39.333, 38.933 and 38.400 respectively and the post-test mean values on **dribbling** are 36.267, 33.733 and 37.333 respectively. The obtained dependent t-ratio values between the pre and post test means of VTG, VSTG and CG on **dribbling** are 7.668, 12.373 and 0.948 respectively. The table value required for significant difference with df 14 at .05 level is 1.761. Since, the obtained ‘t’ ratio values of experimental groups are greater than the table value, it is understood that specified training with vibrator aid and specified training with combination of vibrator aid & sign language groups had significantly improved in the performance

of **dribbling**. However, the control group had not significantly improved in the performance of **dribbling**. The obtained ‘t’ value for the control group is less than the table value as they were not subjected to any specific training.

The analysis of covariance on **dribbling** of VTG, VSTG and CG were analysed and presented in Table XXX.

TABLE XXX
ANALYSIS OF COVARIANCE FOR THE DATA ON DRIBBLING AMONG
EXPERIMENTAL AND CONTROL GROUPS

Adjusted Post Test Means			Sources of Variance	Sum of Squares	df	Mean Squares	F-Ratio
VTG	VSTG	CG					
35.894	33.696	37.744	Between	122.287	2	61.143	16.078*
			Within	155.931	41	3.803	

* Significant at 0.05 level of confidence.

The table value for significance at 0.05 with df 2 and 41 is 3.23.

4.10.2. Results of Analysis of Covariance on Dribbling

Table XXX shows that the adjusted post-test means of VTG, VSTG and CG on **dribbling** are 35.894, 33.696 and 37.744 respectively. The obtained F-ratio value is 16.078, which is higher than the table value 3.23 with df 2 and 41 required for significance at .05 level. Since the value of F-ratio is higher than the table value, it indicates that there exist significant differences among the adjusted post-test means of VTG, VSTG and CG. To find out which of the paired means had a significant difference on **dribbling**, the Scheffe’s post-hoc test was applied and the results are presented in Table XXXI.

TABLE XXXI
SCHEFFE'S TEST FOR THE DIFFERENCES BETWEEN THE ADJUSTED
POST TEST PAIRED MEANS OF DRIBBLING

VTG	VSTG	CG	Mean Difference	Confidential Interval
35.894	33.696		2.198*	1.809
35.894		37.744	1.850*	1.809
	33.696	37.744	4.048*	1.809

*Significant at .05 level.

4.10.3. Results of Scheffe's Test on Dribbling

The table XXXI shows that the adjusted post test mean difference on **dribbling** between VTG and VSTG, VTG and CG and between VSTG and CG are 2.198, 1.850 and 4.048 respectively which are higher than the confidence interval value of 1.809 at .05 level of confidence.

The pre and post test mean values of VTG, VSTG and CG on **dribbling** are graphically represented in figure 15.

The adjusted post test mean values of VTG, VSTG and CG on **dribbling** are graphically represented in figure 16.

FIGURE 15
PRE TEST AND POST TEST MEAN VALUES OF VTG, VSTG
AND CG ON DRIBBLING

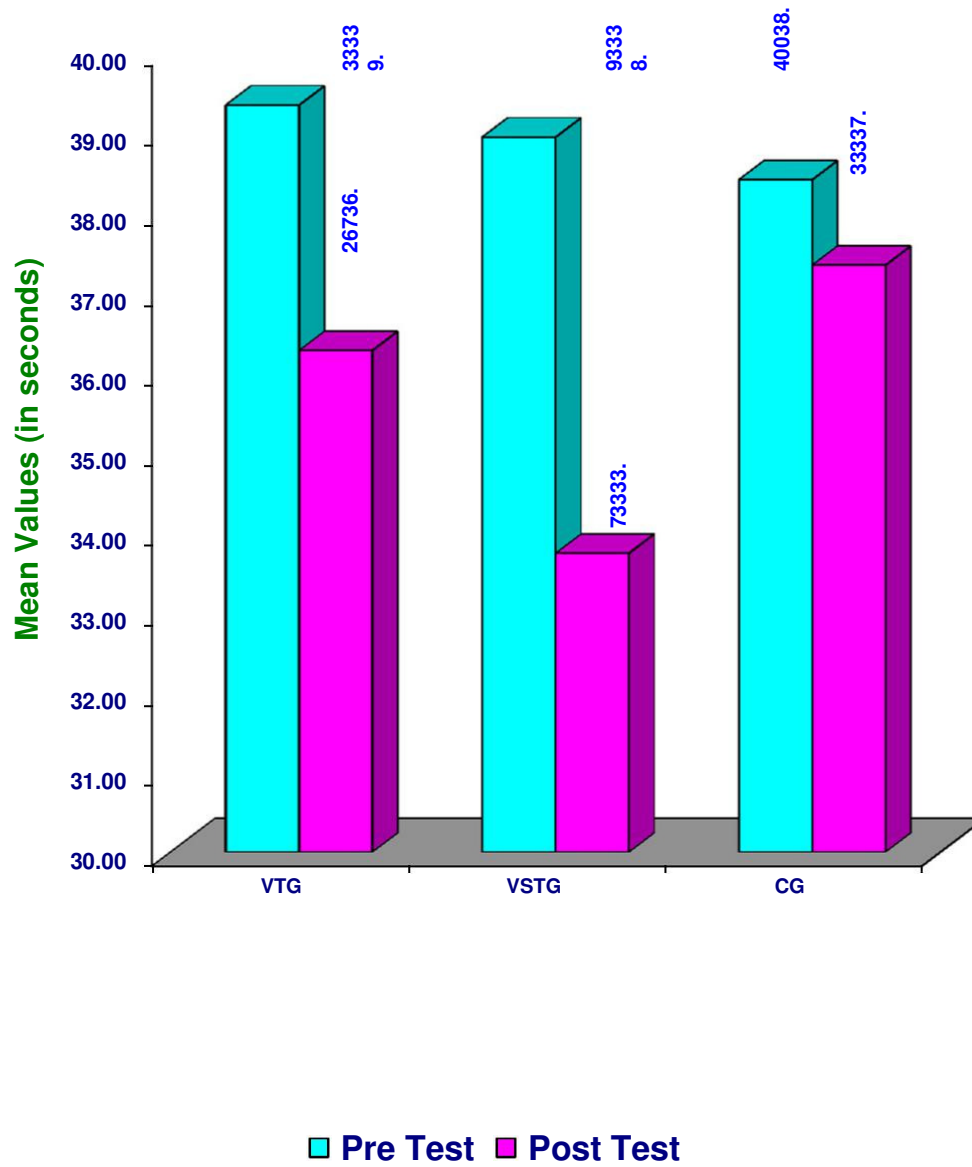
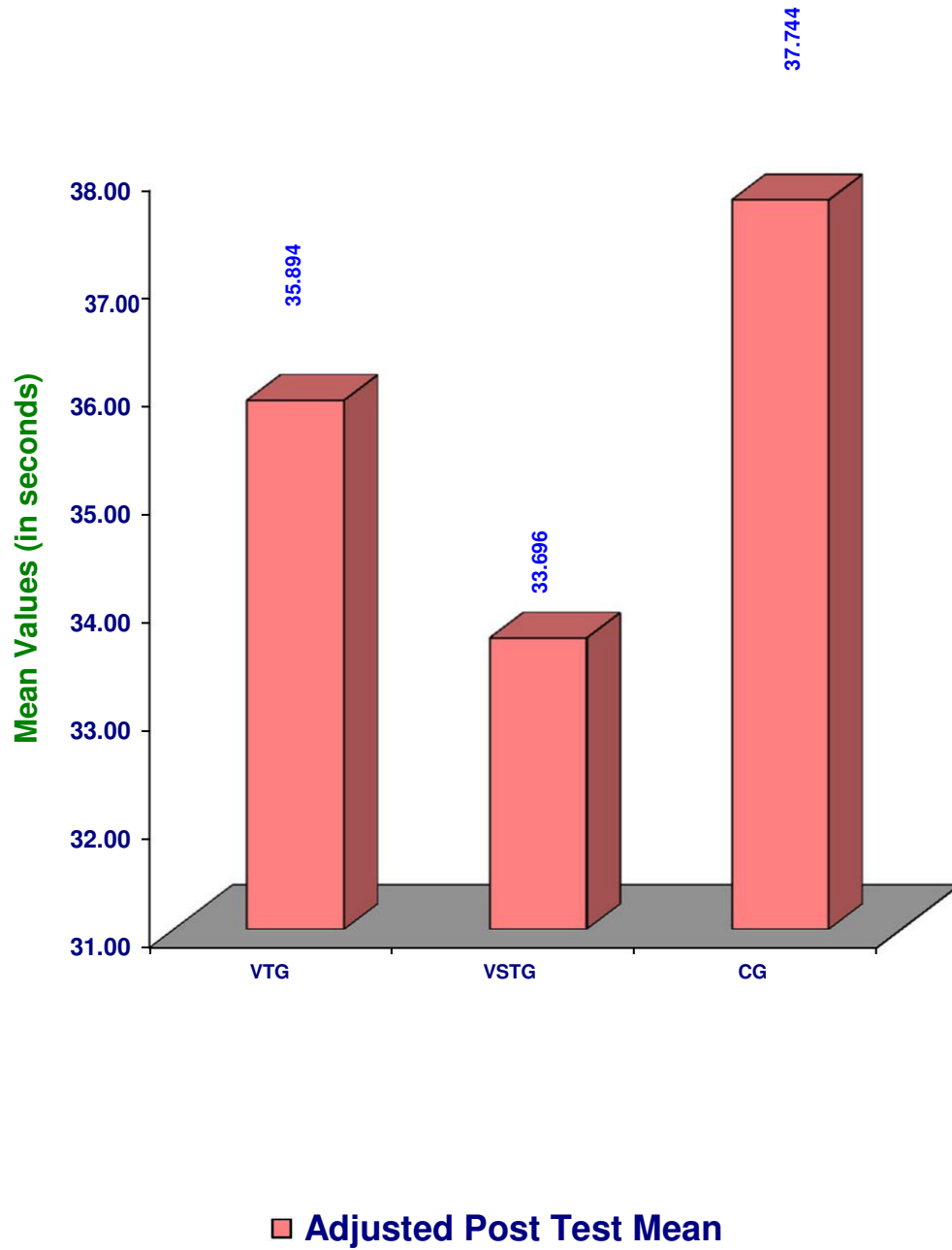


FIGURE 16
ADJUSTED POST TEST MEAN VALUES OF VTG, VSTG AND
CG ON DRIBBLING



4.10.4. Discussion on Findings on Dribbling

The result of the study indicates that both the experimental groups significantly differed when compared to the control group on **dribbling**. However, it is further revealed that the experimental group namely VTG and VSTG had improved in the performance of **dribbling** better than the control group (CG) but VSTG had improved in the performance of **dribbling** better than the other two groups.

Zozo and Hassan (1999), in their study concluded that the preliminary games led to learn games and improve the basic skills of handball in the deaf and dumb and improving the motor capacity associated with these skills.

Alathari (2009), also concluded that sign language was more effective than lip-reading in learning the skills of throwing the ball from the bottom ,and throwing it front bottom to front, and didn't show any difference in the skill of throwing form the top between lip reading and sign language.

Mihaila Ion, (2014), examined the learning to play handball technique is to find and assimilate technical processes driving expression of the players optimal opportunities and increase their effectiveness as structured driving current game. This research was conducted at the level of junior handball teams during a competitive year in which research subjects were in training a large percentage of technical exercises, assessed by control samples prepared by federation of specialized or domain experts. To assess the level of technical training and progress have passed control samples at the beginning and end of the research. The present investigation also revealed that the 12 weeks of specified training with vibrator aid

and specified training with combination of vibrator aid and sign language improved the dribbling.

4.11. SUMMARY OF FINDINGS

The results of the study indicate that significant difference exists among the pre, post and adjusted post test means of experimental and control groups on selected dependent variables among deaf-and-dumb subjects.

Successful performance in handball is determined by the specific technical-tactical skills (or knowledge of the elements) and by the quality level of basic physical condition or fitness. Successful performance of handball technical-tactical elements depend primarily on the level of the coordination-related abilities and on the strength/power fitness. Previous Croatian studies on situation-related motor abilities (**Vuleta, Simenc, & Ticic, 1990**), make it possible to presume that there are five latent situation-related motor dimensions accuracy, ball handling, motion speed without the ball, motion speed with the ball and ball throwing power. **Abdullah and Yakoot Zidane (2001)**, recommend that special training programme improved the Volleyball skill among the deaf-and-dumb students. **Zozo and Hassan (1999)**, stated that preliminary games led to learn games and improve the basic skills of handball among the deaf-and-dumb students and improving the motor capacity associated with these skills.

Previous research conducted by **Spelmezan,, et al., (2012)**, focused on designing tactile stimuli that could intuitively represent body movements. Accuracy of throwing at the goal is an ability to realize cumulative attacking engagement of the whole team in score-open situations which is the last controlled action on the attack. For acquiring motor skills, such as in sports training, it is important that the

learner frequently receives instructions on how to perform the skill and feedback on the performance. Coaches typically give instructions and feedback before and after a trial, and concurrently during the execution of the movements. Yet in many sports the coach cannot correct the learner during an exercise. A good case in point is snowboarding. Snowboarders receive instructions before descending the slope and delayed feedback after the ride. During the ride, they are spatially separated from their coach. They have to rely on their own perception of what is right or wrong (Van, et al., 2006). Vulet, et al., (2006), stated that teaching and training programmes should simultaneously develop all motor abilities and continuously apply operators (training contents) in which aiming and hitting of targets of various sizes and forms is performed both from standing positions and while moving. Present research also reported that deaf-and-dumb subjects were able to recognize and to identify vibration-aid and sign language instructions during the training period. In the present investigation the result showed that, the use of a vibrator aid instruction based specified training and combination of vibrator-aid and sign language instruction based specified training improve dribbling, accuracy throw, jump and throw performance in handball.

Galvin, et al., (1993), studied the training program used with the University of Melbourne's multiple-channel electrotactile device is presented to show how these important factors may be addressed, to indicate the flexibility required in a training program and to provide a general framework on which researchers may base the development of programs for other tactile devices. Spelmezan, (2012), identified the conditions under which tactile instructions can support athletes in sports training. Alathari and Manatee (2009), study showed that

sign language was more effective than lip-reading in learning the skills of throwing the ball from the bottom and throwing it front bottom to front among deaf and mute. **Gallace, et al., (2007)**, concluded that in relation to current theories of cross-modal integration and to the cognitive resources and/or common higher order spatial representations possibly accessed by both visual and tactile stimuli. The present study also used the tactile instructions and sign language method during the specified training sessions. In the analysis of the data indicating that specific training with vibrator aid and specific training with combination of vibrator aid & sign language method improves the psycho-motor variables and skills in handball among deaf and dumb college students.

4.12. DISCUSSION ON HYPOTHESES

1. It was mentioned in the first hypothesis that there would be a significant improvement on selected psycho motor and skill related variables in handball due to the influence of specified training with vibrator aid instruction. The result of the present study showed that significant improvement on selected criterion variables such as reaction time, movement time, 9 meter front throw, dominant hand speed pass, overhead pass, accuracy throw, jump and throw, and dribbling among deaf and dumb college students. Hence, the first hypothesis was accepted at 0.05 level of confidence.
2. It was mentioned in the second hypothesis that there would be a significant improvement on selected psycho motor and skill related variables in handball due to the influence of specified training with combination of vibrator aid & sign language instruction. The analysis of the data revealed that due to the influence of specified training with vibrator aid and sign language significantly

improved on selected criterion variables among deaf and dumb college students. Hence, the second hypothesis was also accepted at 0.05 level of confidence.

3. In the third hypothesis, it was mentioned that there would be a significant improvement difference between specified training with vibrator aid and specified training with combination of vibrator aid and sign language instruction on selected criterion variables among deaf and dumb students. The result of the present investigation also showed that the deaf and dumb college students who underwent specified training with combination of vibrator aid and sign language instruction improved significantly on selected criterion variables than that of who underwent specified training with vibrator aid instruction. Hence, the third hypothesis was accepted at 0.05 level of confidence.