CHAPTER – IV

ANALYSIS AND INTERPRETATION OF DATA

4.1 Over View

A crucial phase of a research study was the analysis of the data and the study's findings. To use the data from the data acquired for the research and for its serial presentations, statistical approaches were used. One of the fundamental tasks in research is to analyse data correctly. The appropriate strategy was chosen for the goal. That approach resulted in a calculation that followed the statistical formula. It was rightly construed on that basis. Only a meaningful interpretation can lead to the correct conclusion. On that foundation, appropriate remarks and ideas might be made.

Ninety (n=90) female volleyball players were divided into three groups such as speed-jump training group, Strength-Jump training group and control group. To test the significant changes made from the base line to post test on all the groups' individually dependent t-test was applied. The significance of the means of the obtained test results was tested at 0.05 level of confidence. The collected data have been processed by using analysis of covariance (ANCOVA) to determine if there was any significant difference among the treatment means of each variable. When analysis of covariance showed significant differences between treatment means, LSD post hoc test was applied to test the significance of difference between the paired adjusted means at 0.05 level of confidence. The Statistical Package for the Social Science (SPSS-20) for Windows computer programme was used to assemble and analyse the data.

4.2 Level of Significance

The level of significance was defined as the probability threshold below which the investigator rejects the hypothesis. For the degrees of freedom 1 and 29, the 't' ratio of (2.045) was required for analysis at the level of confidence $P<0.05$. The F ratio required for the analysis of the analysis of covariance for degrees of freedom 2 and 86 was (3.10) at a level of confidence $P<0.05$.

4.3 Test of Significance

This is the section of the thesis that is most important for drawing conclusions from the analysis of the hypothesis. For the study, it was deemed sufficient to follow a process of accepting or rejecting the hypothesis based on the findings in respect to the degree of significance. The significance level was set at 0.05 levels.

Since the investigator determines whether the difference between the baseline and post-test was significant or not, the test is typically referred to as the test of significance. The hypothesis that there was no significant difference between the groups was rejected if the calculated F-ratio was less than the table F-ratio at $P<0.05$.

4.4 Analysis of Data

The following analysis and presentation show how the independent variables affected each criteria variable.

4.4.1 Speed

Table – 4.1

Means, Standard Deviations and Dependent 'T' Test Values on Speed of Experimental Group and Control Groups

Group	Pre Test		Post Test		't' test value	Sig. (2-tailed)
	Mean	SD	Mean	SD		
Speed-Jump Training	9.08	0.47	8.79	0.47	12.18*	0.00
Strength-Jump Training	8.98	0.42	8.71	0.35	9.18*	0.00
Control Group	9.02	0.33	9.01	0.34	1.46	0.16

***Significant at 0.05 level of significance if p-value is < 0.05**

According to Table 4.1, the 't' ratios for the speed of the speed-jump training group and the strength-jump training Group are (12.18, $p<0.05$) and (9.18, $p<0.05$), respectively. It was determined that these 't' ratios were statistically significant at the 0.05 level of confidence for degrees of freedom 1 and 29. Additionally, it was determined that the obtained 't' ratio between the pre- and post-test results for the control group (1.46, $p>0.05$) was not statistically significant.

The findings suggested that the acceleration speed of female volleyball players had significantly improved in both the speed-jump training group and the strength-jump training group.

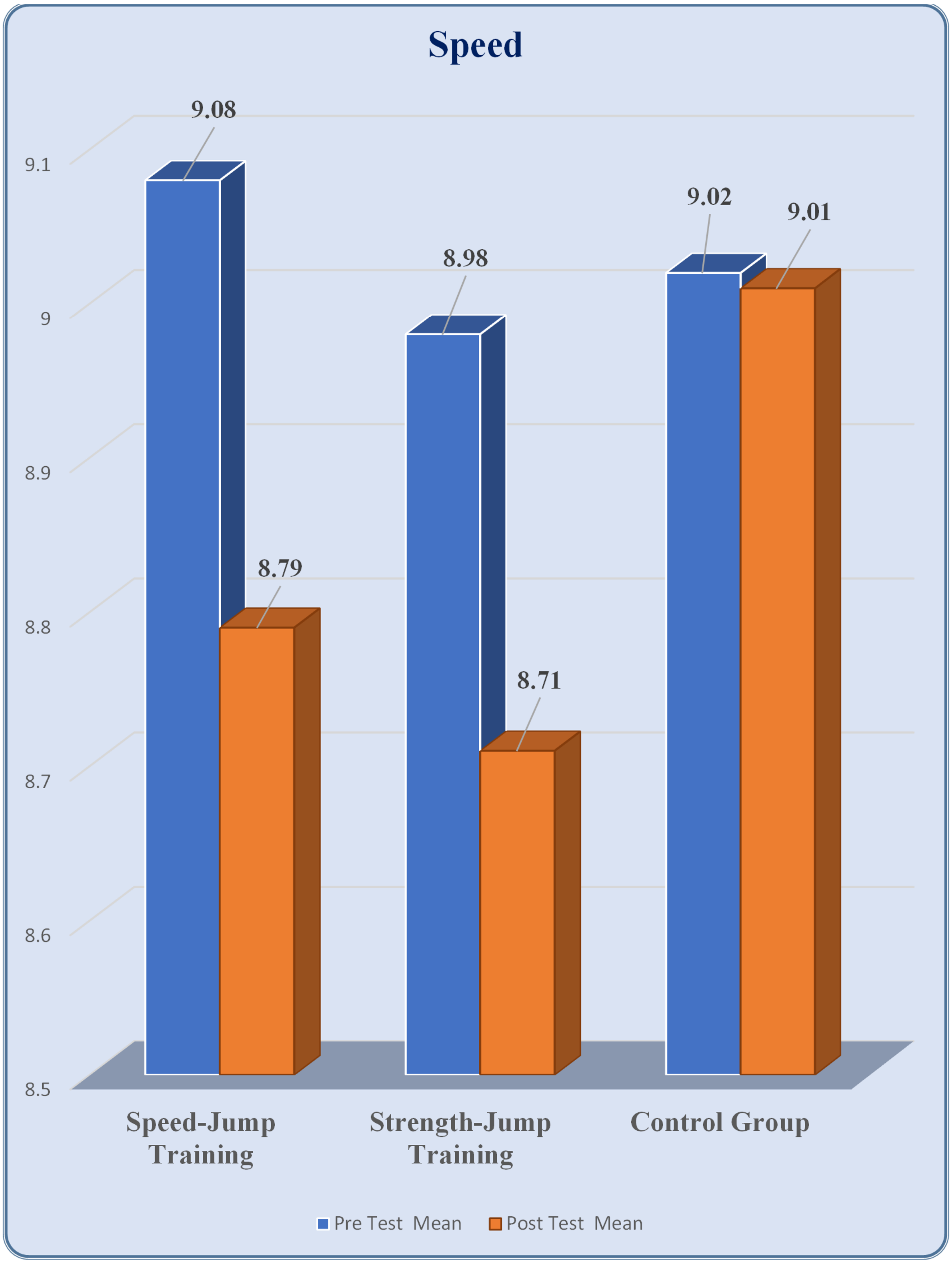

Figure 4.1:

Pre-test and Post-test Mean Values of Experimental Group and Control Groups on Speed

The analysis of covariance (ANCOVA) on speed of experimental and control groups have been analyzed and presented in table 4.2.

Table - 4.2

Analysis of Covariance of Experimental and Control Groups on Speed

Adjusted Post Test Means			Sum of Squares	Sum of Squares	DF	Mean Squares	'F' Ratio	Sig.
Speed-Jump Training	Strength-Jump Training	Control Group						
8.75	8.75	9.02	B	1.42	2	0.71	30.69*	0.00
			W	1.99	86	0.02		

***Significant at 0.05 level of significance if p-value is < 0.05**

The adjusted post-test means of the speed-jump training, strength-jump training and control groups were 8.75, 8.75 and 9.02 respectively. The obtained "F" ratio for the adjusted post-test means was 30.69 ($p<0.05$). For degrees of freedom 2 and 86, it was shown to be statistically significant at the 0.05 level of confidence. The findings of speed showed that there was a significant difference in post-test means for female volleyball players in the speed-jump training group, strength-jump training group, and control group.

A post hoc analysis employing the LSD test is performed on the adjusted post-test means of speed, which demonstrate significant differences. In table - 4.3, post hoc results are presented.

Table - 4.3

LSD Post Hoc Test for Difference between Adjusted Post Test Paired Means on Speed

Speed-Jump Training	Strength-Jump Training	Control Group	Mean Difference	Sig.
8.75	8.75	-	0.00	0.93
8.75	-	9.02	0.27*	0.00
-	8.75	9.02	0.27*	0.00

***Significant at 0.05 Level of Significance if p<0.05.**

Table 4.3's multiple comparisons show that there are significant differences between the speed-jump training and control groups (0.27, $p<0.05$), as well as between the strength-jump training and control groups (0.27, $p<0.05$). The table also shows that there is no significant difference between speed-jump training and strength-jump training (0.00, $p>0.05$).

These findings suggested that eight weeks of speed-jump training led to a statistically significant improvement in the speed performance of female volleyball players compared to the strength-jump training and control groups.

The adjusted speed means are shown in the bar chart of Figure 4.2.

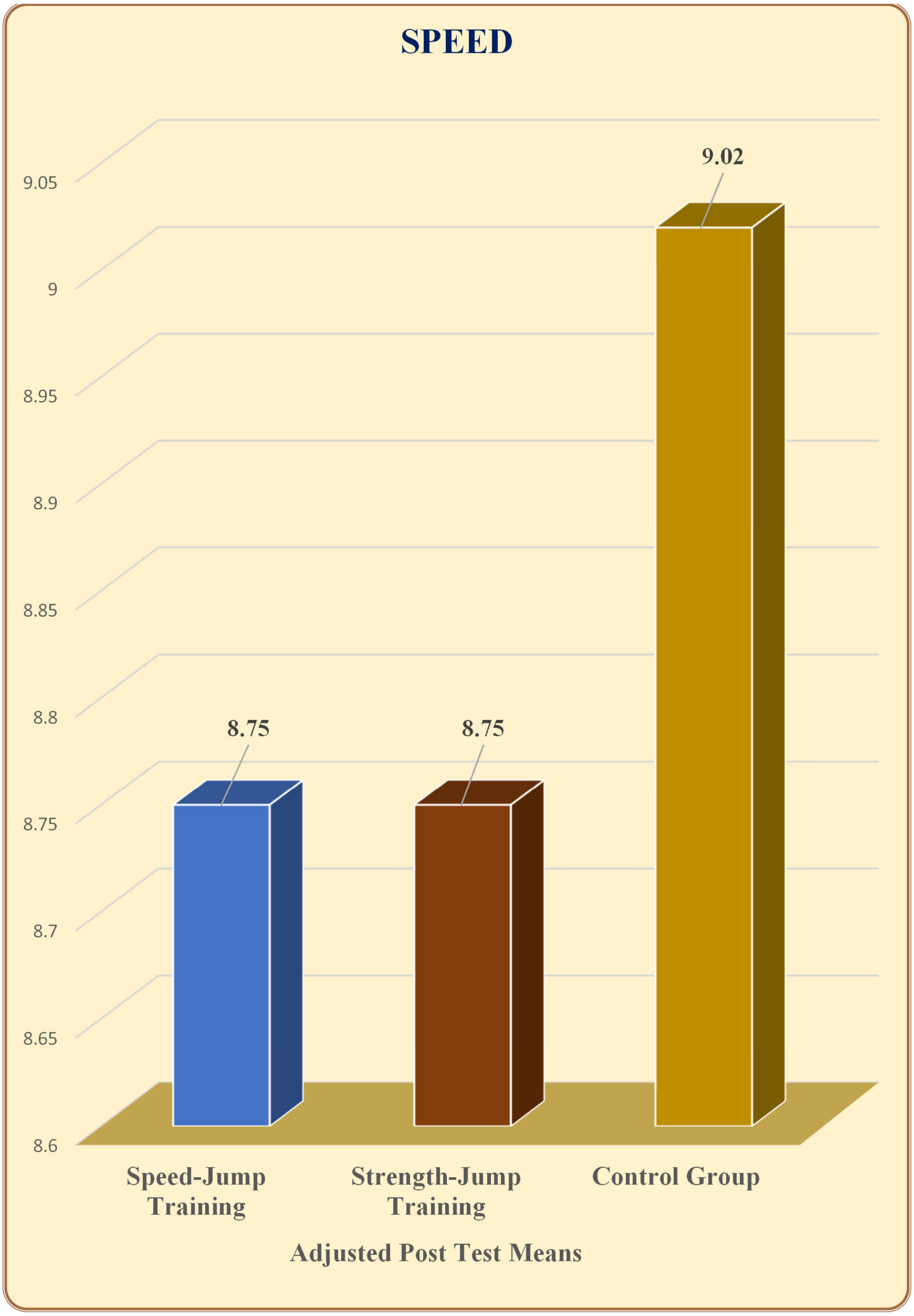

Figure 4.2: The Adjusted Post Test Mean Values of Experimental Group and Control Group on Speed

5.4.2 Cardio Respiratory Endurance

Table – 4.4

Means, Standard Deviations and Dependent 'T' Test Values on Cardio Respiratory Endurance of Experimental Group and Control Groups

Group	Pre Test		Post Test		't' test value	Sig. (2-tailed)
	Mean	SD	Mean	SD		
Speed-Jump Training	1841.33	134.62	1969.33	125.17	18.67*	0.00
Strength-Jump Training	1884.33	114.00	1994.33	98.39	14.07*	0.00
Control Group	1898.00	105.25	1904.00	100.09	1.15	0.26

***Significant at 0.05 level of significance if p-value is < 0.05**

According to Table 4.4, the 't' ratios for the cardio respiratory endurance of the speed-jump training group and the strength-jump training group are (18.67, $p<0.05$) and (14.07, $p<0.05$), respectively. It was determined that these ratios were statistically significant at the 0.05 level of confidence for degrees of freedom 1 and 29. Additionally, it was determined that the obtained 't' ratio between the pre- and post-test results for the control group (1.15, $p>0.05$) was not statistically significant.

The findings suggested that the cardio respiratory endurance of female volleyball players had significantly improved in both the speed-jump training group and the strength-jump training group.

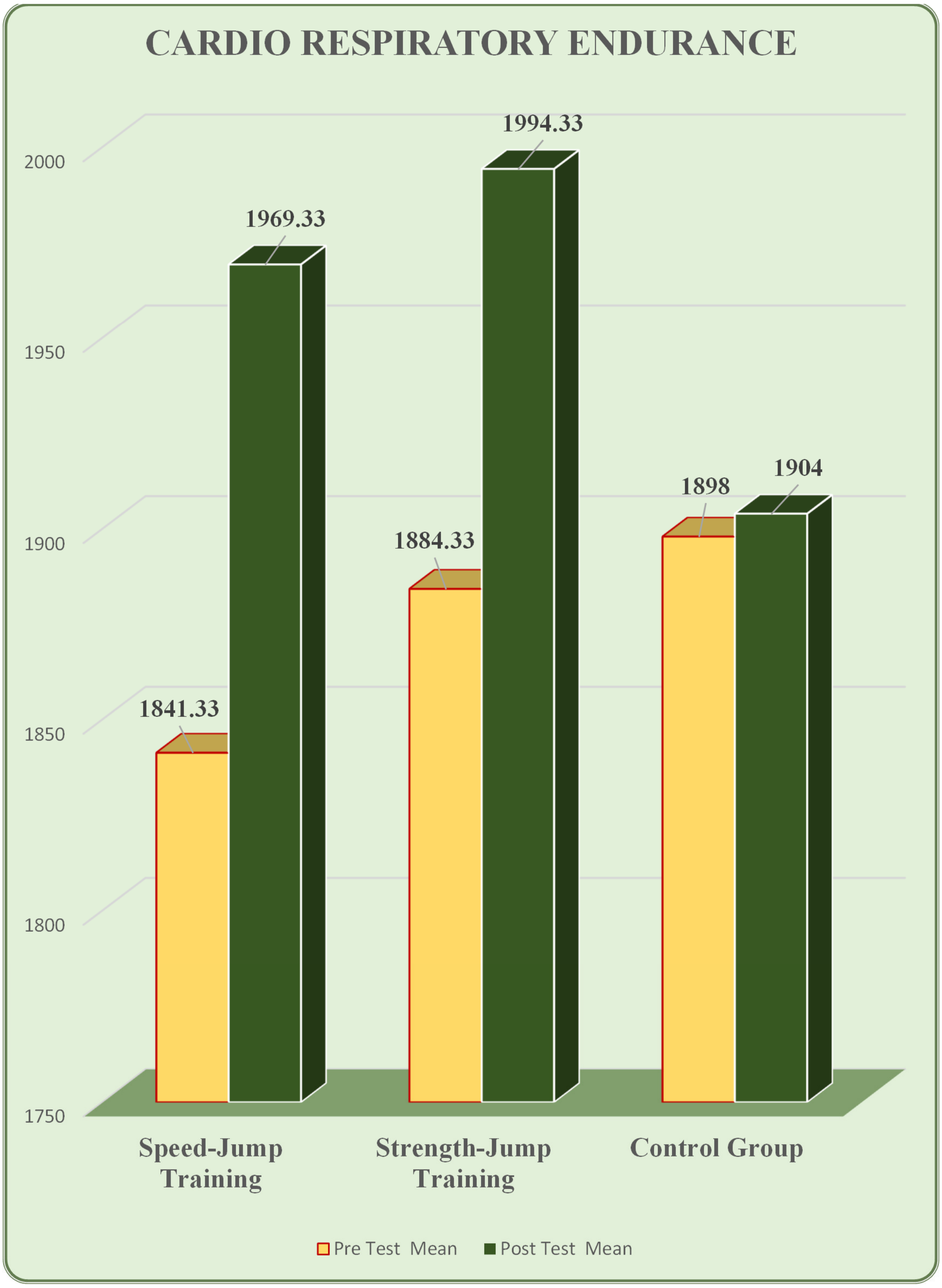

Figure 4.3:

Pre-test and Post-test Mean Values of Experimental Group and Control Groups on Cardio Respiratory Endurance.

The analysis of covariance (ANCOVA) on cardio respiratory endurance of experimental and control groups have been analyzed and presented in table 4.5.

Table - 4.5

Analysis of Covariance of Experimental and Control Groups on Cardio Respiratory Endurance

Adjusted Post Test Means			Sum of Squares	Sum of Squares	DF	Mean Squares	'F' Ratio	Sig.
Speed-Jump Training	Strength-Jump Training	Control Group						
1998.27	1985.82	1883.58	B	232042.76	2	116021.38	102.61*	0.00
			W	97236.77	86	1130.66		

***Significant at 0.05 level of significance if p-value is < 0.05**

The adjusted post-test means of the speed-jump training, strength-jump training and control groups were 1998.27, 1985.82 and 1883.58 respectively. The obtained "F" ratio for the adjusted post-test means was 102.61 ($p<0.05$). For degrees of freedom 2 and 86, it was shown to be statistically significant at the 0.05 level of confidence. The findings of cardio respiratory endurance showed that there was a significant difference in post-test means for female volleyball players in the speed-jump training group, strength-jump training group, and control group.

A post hoc analysis employing the LSD test is performed on the adjusted post-test means of cardio respiratory endurance, which demonstrate significant differences. In table - 4.6, post hoc results are presented.

Table - 4.6

LSD Post Hoc Test for Difference between Adjusted Post Test Paired Means on Cardio Respiratory Endurance

Speed-Jump Training	Strength-Jump Training	Control Group	Mean Difference	Sig.
1998.27	1985.82	-	12.45	0.16
1998.27	-	1883.58	114.69*	0.00
-	1985.82	1883.58	102.24*	0.00

***Significant at 0.05 Level of Significance if p<0.05.**

Table 4.6's multiple comparisons show that there are significant differences between the speed-jump training and control groups (114.69, p<0.05), as well as between the strength-jump training and control groups (102.24, p<0.05). The table also shows that there is no significant difference between speed-jump training and strength-jump training (12.45, p>0.05).

These findings suggested that eight weeks of speed-jump training led to a statistically significant improvement in the cardio respiratory endurance of female volleyball players compared to the strength-jump training and control groups.

The adjusted cardio respiratory endurance means are shown in the bar chart of Figure 4.4.

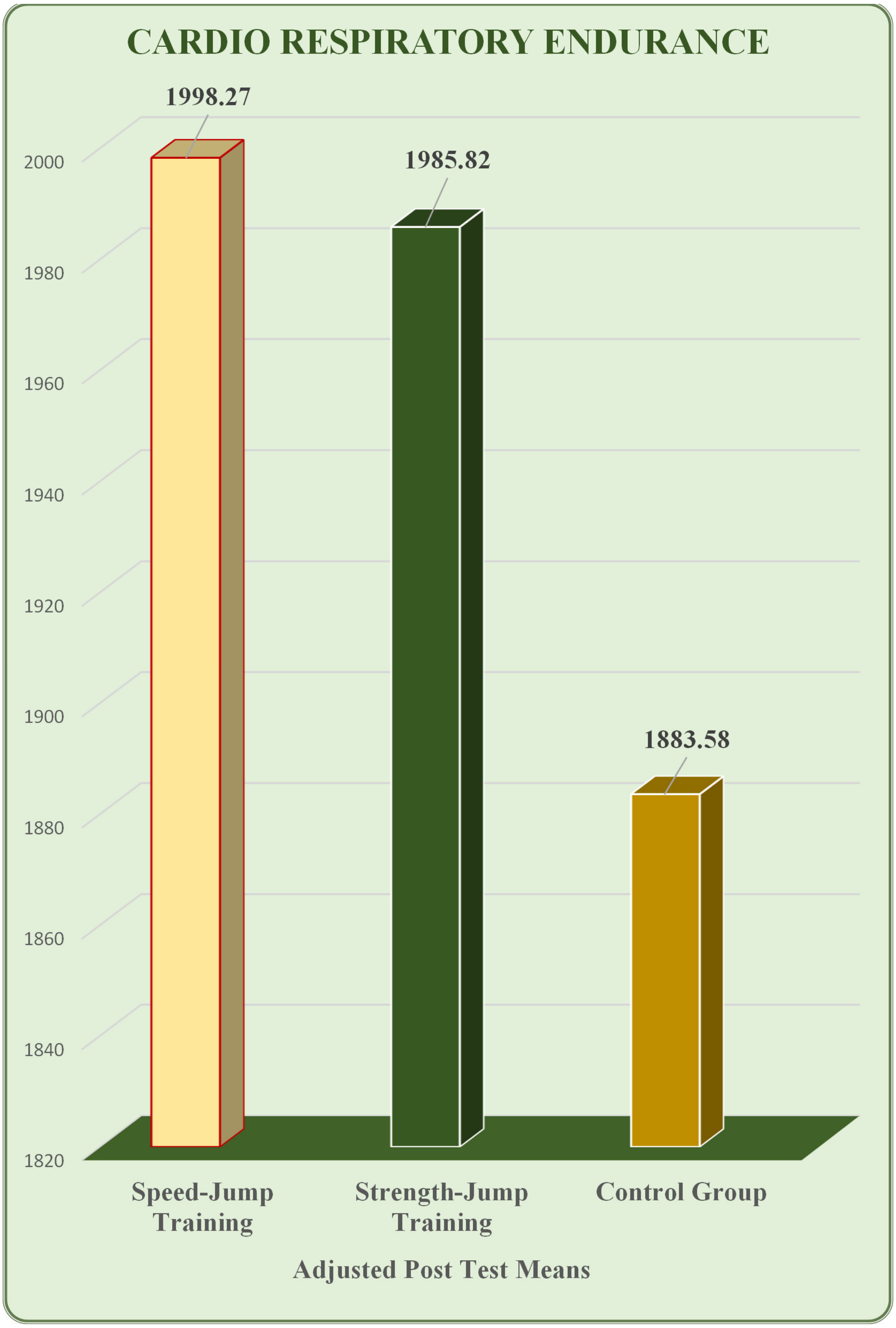

Figure 4.4: The Adjusted Post Test Mean Values of Experimental Group and Control Group on Cardio Respiratory Endurance

5.4.3 Explosive Power

Table – 4.7

Means, Standard Deviations and Dependent 'T' Test Values on Explosive Power of Experimental Group and Control Groups

Group	Pre Test		Post Test		't' test value	Sig. (2-tailed)
	Mean	SD	Mean	SD		
Speed-Jump Training	1.63	0.13	1.75	0.12	18.45*	0.00
Strength-Jump Training	1.70	0.09	1.83	0.08	14.78*	0.00
Control Group	1.67	0.08	1.68	0.08	1.83	0.08

***Significant at 0.05 level of significance if p-value is < 0.05**

According to Table 4.7, the 't' ratios for the explosive power of the speed-jump training group and the strength-jump training group are (18.45, $p<0.05$) and (14.78, $p<0.05$), respectively. It was determined that these ratios were statistically significant at the 0.05 level of confidence for degrees of freedom 1 and 29. Additionally, it was determined that the obtained 't' ratio between the pre and post-test results for the control group (1.83, $p>0.05$) was not statistically significant.

The findings suggested that the explosive power of female volleyball players had significantly improved in both the speed-jump training group and the strength-jump training group.

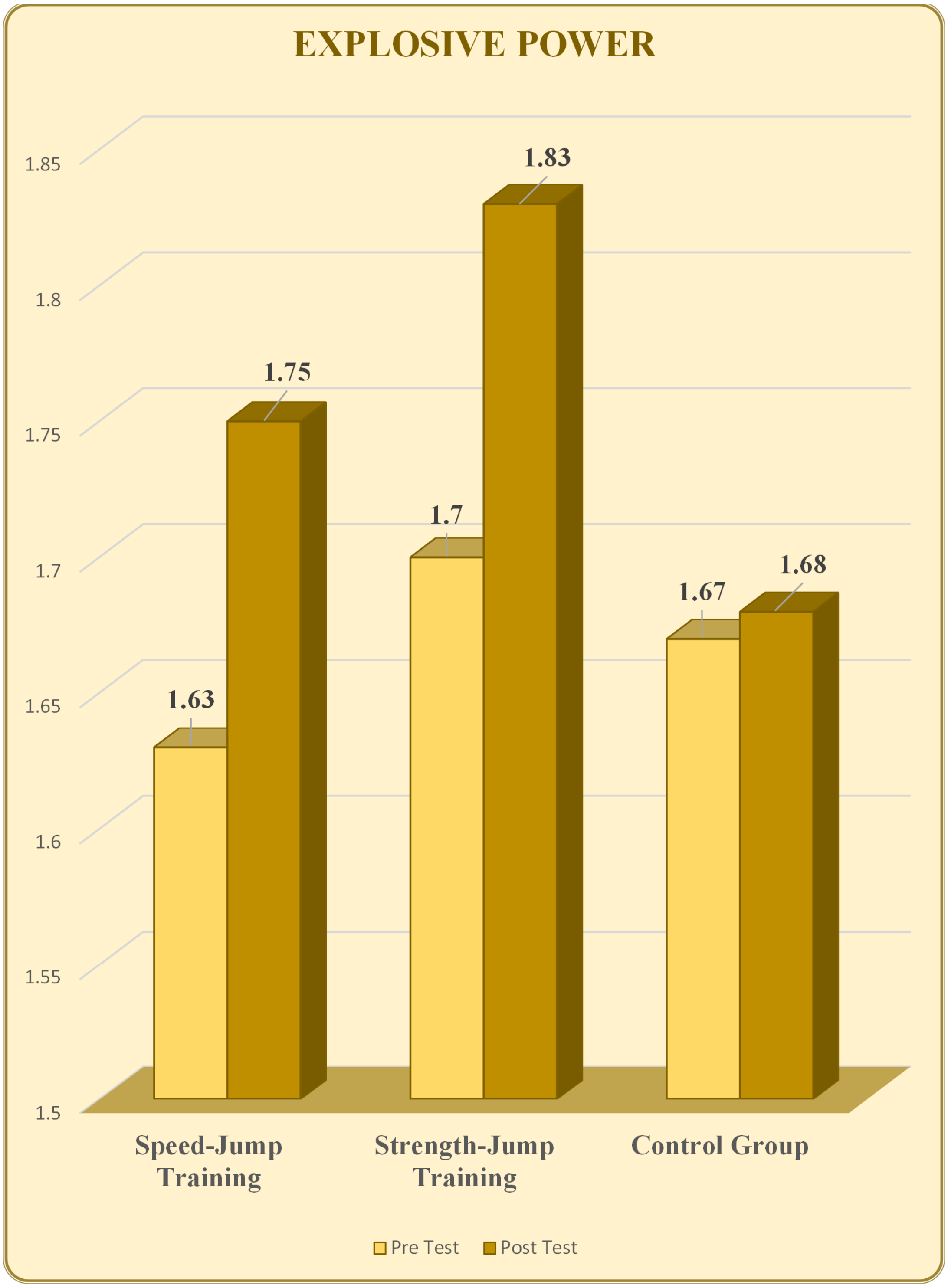

Figure 4.5:

Pre-test and Post-test Mean Values of Experimental Group and Control Groups on Explosive Power

The analysis of covariance (ANCOVA) on explosive power of experimental and control groups have been analyzed and presented in table 4.8.

Table - 4.8

Analysis of Covariance of Experimental and Control Groups on Explosive Power

Adjusted Post Test Means			Sum of Squares	Sum of Squares	DF	Mean Squares	'F' Ratio	Sig.
Speed-Jump Training	Strength-Jump Training	Control Group						
1.78	1.80	1.68	B	0.28	2	0.14	113.54*	0.00
			W	0.10	86	0.001		

***Significant at 0.05 level of significance if p-value is < 0.05**

The adjusted post-test means of the speed-jump training, strength-jump training and control groups were 1.78, 1.80 and 1.68 respectively. The obtained "F" ratio for the adjusted post-test means was 113.54 ($p<0.05$). For degrees of freedom 2 and 86, it was shown to be statistically significant at the 0.05 level of confidence. The findings of explosive power showed that there was a significant difference in post-test means for female volleyball players in the speed-jump training group, strength-jump training group, and control group.

A post hoc analysis employing the LSD test is performed on the adjusted post-test means of explosive power, which demonstrate significant differences. In table - 4.9, post hoc results are presented.

Table - 4.9

LSD Post Hoc Test for Difference between Adjusted Post Test Paired Means on Explosive Power

Speed-Jump Training	Strength-Jump Training	Control Group	Mean Difference	Sig.
1.78	1.80	-	0.02*	0.03
1.78	-	1.68	0.10*	0.00
-	1.80	1.68	0.12*	0.00

***Significant at 0.05 Level of Significance if p<0.05.**

Table 4.9's multiple comparisons show that there are significant differences between the speed-jump training and strength-jump training (0.02, $p<0.05$), speed-jump training and control groups (0.10, $p<0.05$), as well as between the strength-jump training and control groups (0.12, $p<0.05$).

These findings suggested that eight weeks of strength-jump training led to a statistically significant improvement in the explosive power of female volleyball players compared to the speed-jump training and control groups.

The adjusted explosive power means are shown in the bar chart of Figure 4.6.

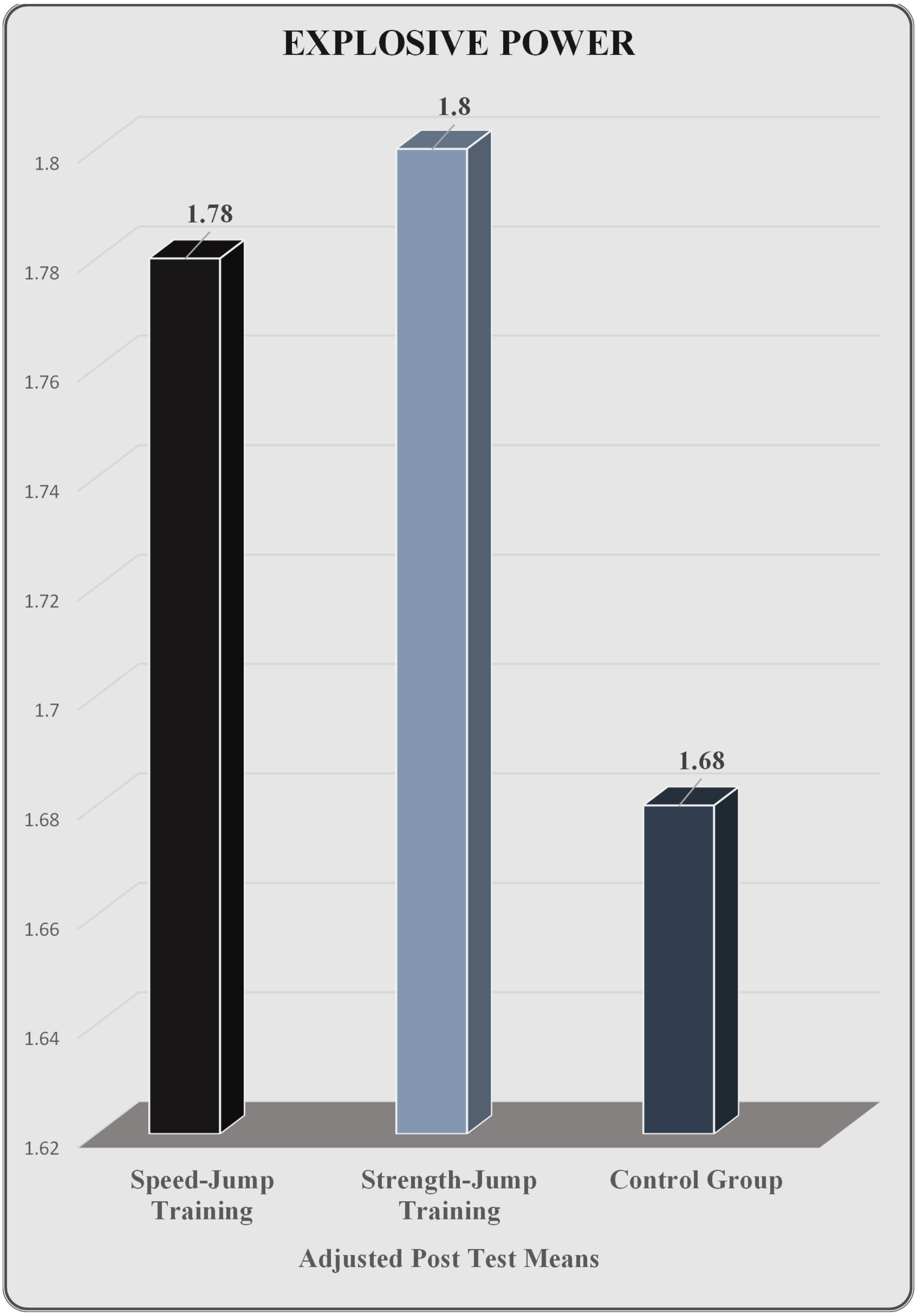

Figure 4.6: The Adjusted Post Test Mean Values of Experimental Group and Control Group on Explosive Power

5.4.4 Agility

Table – 4.10

Means, Standard Deviations and Dependent 'T' Test Values on Agility of Experimental Group and Control Groups

Group	Pre Test		Post Test		't' test value	Sig. (2-tailed)
	Mean	SD	Mean	SD		
Speed-Jump Training	11.70	0.44	11.21	0.42	16.40*	0.00
Strength-Jump Training	11.85	0.39	11.51	0.33	9.90*	0.00
Control Group	11.94	0.48	11.93	0.47	1.89	0.07

***Significant at 0.05 level of significance if p-value is < 0.05**

According to Table 4.10, the 't' ratios for the agility of the speed-jump training group and the strength-jump training group are (16.40, $p<0.05$) and (9.90, $p<0.05$), respectively. It was determined that these ratios were statistically significant at the 0.05 level of confidence for degrees of freedom 1 and 29. Additionally, it was determined that the obtained 't' ratio between the pre- and post-test results for the control group (1.89, $p>0.05$) was not statistically significant.

The findings suggested that the agility of female volleyball players had significantly improved in both the speed-jump training group and the strength-jump training group.

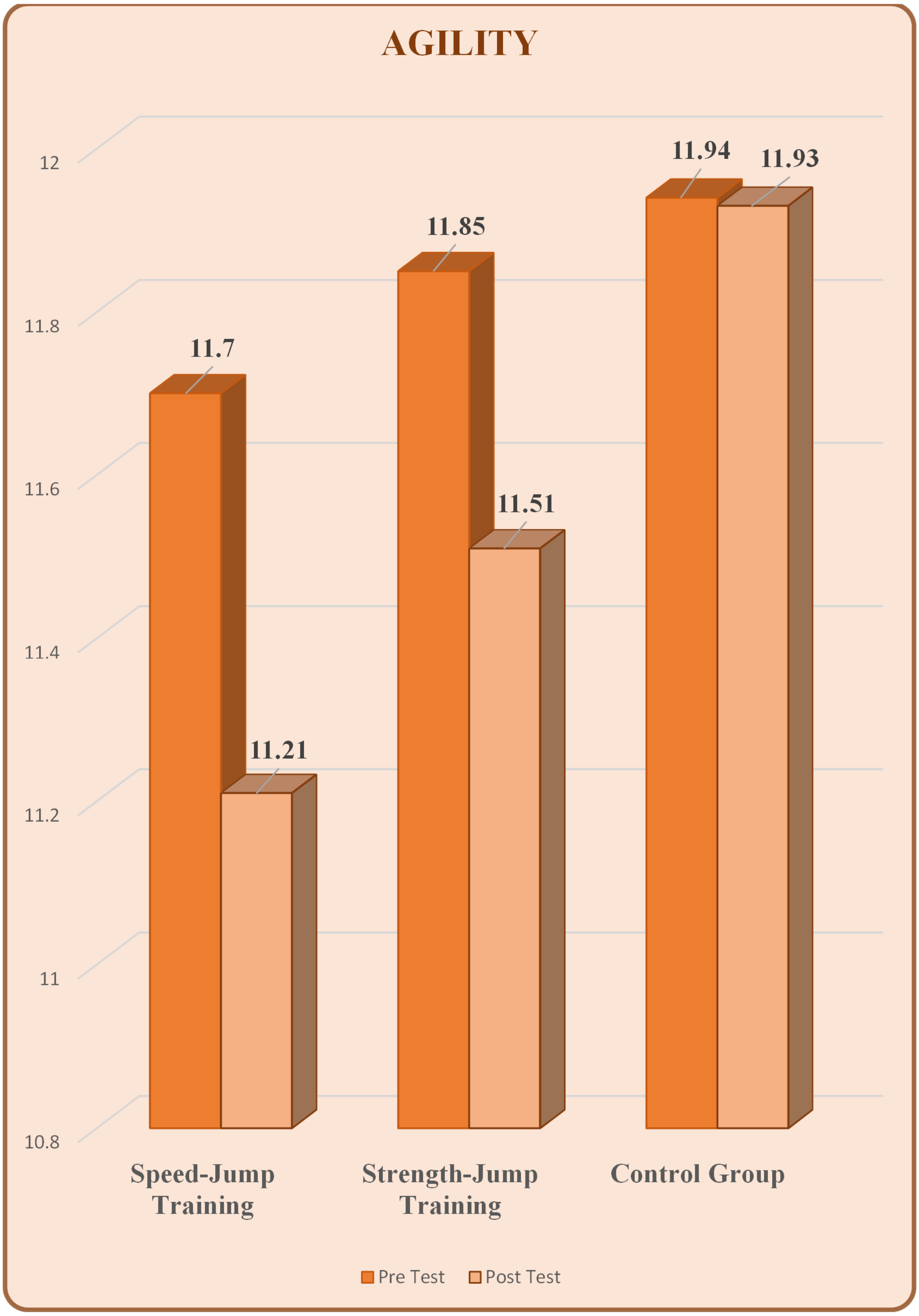

Figure 4.7:

Pre-test and Post-test Mean Values of Experimental Group and Control Groups on Agility

The analysis of covariance (ANCOVA) on agility of experimental and control groups have been analyzed and presented in table 4.11.

Table - 4.11

Analysis of Covariance of Experimental and Control Groups on Agility

Adjusted Post Test Means			**Sum of Squares**	**Sum of Squares**	**DF**	**Mean Squares**	**'F' Ratio**	**Sig.**
Speed-Jump Training	**Strength-Jump Training**	**Control Group**						
11.33	11.50	11.83	B	3.78	2	1.89	97.75*	0.00
			W	1.66	86	0.02		

***Significant at 0.05 level of significance if p-value is < 0.05**

The adjusted post-test means of the speed-jump training, strength-jump training and control groups were 11.33, 11.50 and 11.83 respectively. The obtained "F" ratio for the adjusted post-test means was 97.75 ($p<0.05$). For degrees of freedom 2 and 86, it was shown to be statistically significant at the 0.05 level of confidence. The findings of agility showed that there was a significant difference in post-test means for female volleyball players in the speed-jump training group, strength-jump training group, and control group.

A post hoc analysis employing the LSD test is performed on the adjusted post-test means of agility, which demonstrate significant differences. In table - 4.12, post hoc results are presented.

Table - 4.12

LSD Post Hoc Test for Difference between Adjusted Post Test Paired Means on Agility

Speed-Jump Training	Strength-Jump Training	Control Group	Mean Difference	Sig.
11.33	11.50	-	0.17*	0.00
11.33	-	11.83	0.50*	0.00
-	11.50	11.83	0.33*	0.00

***Significant at 0.05 Level of Significance if p<0.05.**

Table 4.12's multiple comparisons show that there are significant differences between the speed-jump training and strength-jump training (0.17, p<0.05), speed-jump training and control groups (0.50, p<0.05), as well as between the strength-jump training and control groups (0.33, p<0.05).

These findings suggested that eight weeks of speed-jump training led to a statistically significant improvement in the agility of female volleyball players compared to the strength-jump training and control groups.

The adjusted agility means are shown in the bar chart of Figure 4.8.

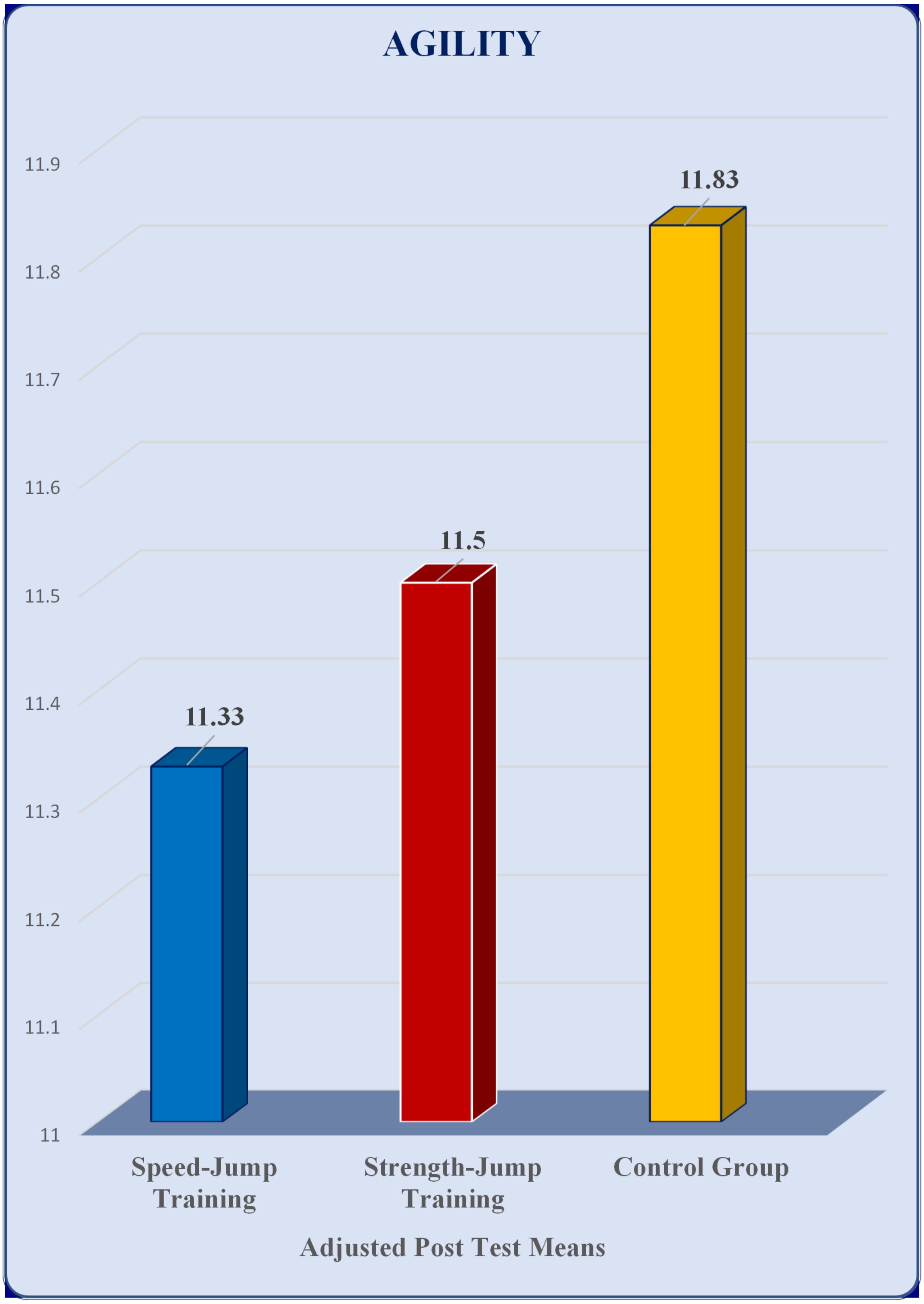

Figure 4.8: The Adjusted Post Test Mean Values of Experimental Group and Control Group on Agility

5.4.5 Standing Vertical Jump

Table – 4.13

Means, Standard Deviations and Dependent 'T' Test Values on Standing Vertical Jump of Experimental Group and Control Groups

Group	Pre Test		Post Test		't' test value	Sig. (2-tailed)
	Mean	SD	Mean	SD		
Speed-Jump Training	20.13	2.43	22.83	1.97	14.47*	0.00
Strength-Jump Training	20.83	1.91	23.70	1.66	21.50*	0.00
Control Group	20.20	1.74	20.50	1.28	1.51	0.14

***Significant at 0.05 level of significance if p-value is < 0.05**

According to Table 4.13, the 't' ratios for the standing vertical jump of the speed-jump training group and the strength-jump training group are (14.47, p<0.05) and (21.50, p<0.05), respectively. It was determined that these ratios were statistically significant at the 0.05 level of confidence for degrees of freedom 1 and 29. Additionally, it was determined that the obtained 't' ratio between the pre- and post-test results for the control group (1.51, p>0.05) was not statistically significant.

The findings suggested that the standing vertical jump of female volleyball players had significantly improved in both the speed-jump training group and the strength-jump training group.

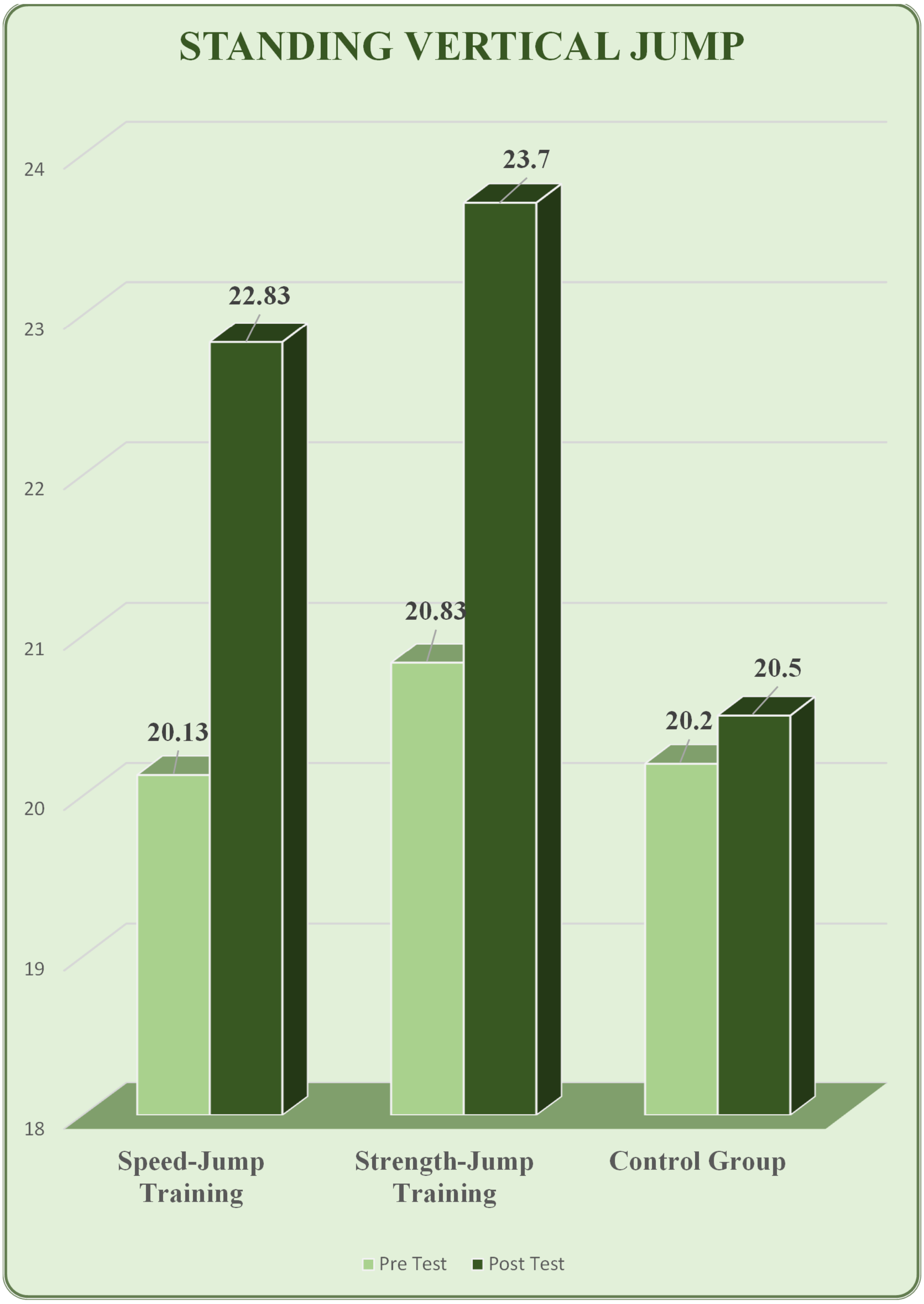

Figure 4.9:

Pre-test and Post-test Mean Values of Experimental Group and Control Groups on Standing Vertical Jump

The analysis of covariance (ANCOVA) on standing vertical jump of experimental and control groups have been analyzed and presented in table 4.14.

Table - 4.14

Analysis of Covariance of Experimental and Control Groups on Standing Vertical Jump

Adjusted Post Test Means			Sum of Squares	Sum of Squares	DF	Mean Squares	'F' Ratio	Sig.
Speed-Jump Training	**Strength-Jump Training**	**Control Group**						
23.85	24.21	18.66	B	375.57	2	187.79	166.86*	0.00
			W	96.79	86	1.13		

***Significant at 0.05 level of significance if p-value is < 0.05**

The adjusted post-test means of the speed-jump training, strength-jump training and control groups were 23.85, 24.21 and 18.66 respectively. The obtained "F" ratio for the adjusted post-test means was 166.86 ($p<0.05$). For degrees of freedom 2 and 86, it was shown to be statistically significant at the 0.05 level of confidence. The findings of standing vertical jump showed that there was a significant difference in post-test means for female volleyball players in the speed-jump training group, strength-jump training group, and control group.

A post hoc analysis employing the LSD test is performed on the adjusted post-test means of standing vertical jump, which demonstrate significant differences. In table - 4.15, post hoc results are presented.

Table - 4.15

LSD Post Hoc Test for Difference between Adjusted Post Test Paired Means on Standing Vertical Jump

Speed-Jump Training	Strength-Jump Training	Control Group	Mean Difference	Sig.
23.85	24.21	-	0.36	0.19
23.85	-	18.66	5.19*	0.00
-	24.21	18.66	5.55*	0.00

***Significant at 0.05 Level of Significance if $p<0.05$.**

Table 4.15's multiple comparisons show that there are significant differences between the speed-jump training and control groups (5.19, $p<0.05$), as well as between the strength-jump training and control groups (5.55, $p<0.05$). The table also shows that there is no significant difference between speed-jump training and strength-jump training (0.36, $p>0.05$).

These findings suggested that eight weeks of strength-jump training led to a statistically significant improvement in the standing vertical jump of female volleyball players compared to the speed-jump training and control groups.

The adjusted standing vertical jump means are shown in the bar chart of Figure 4.10.

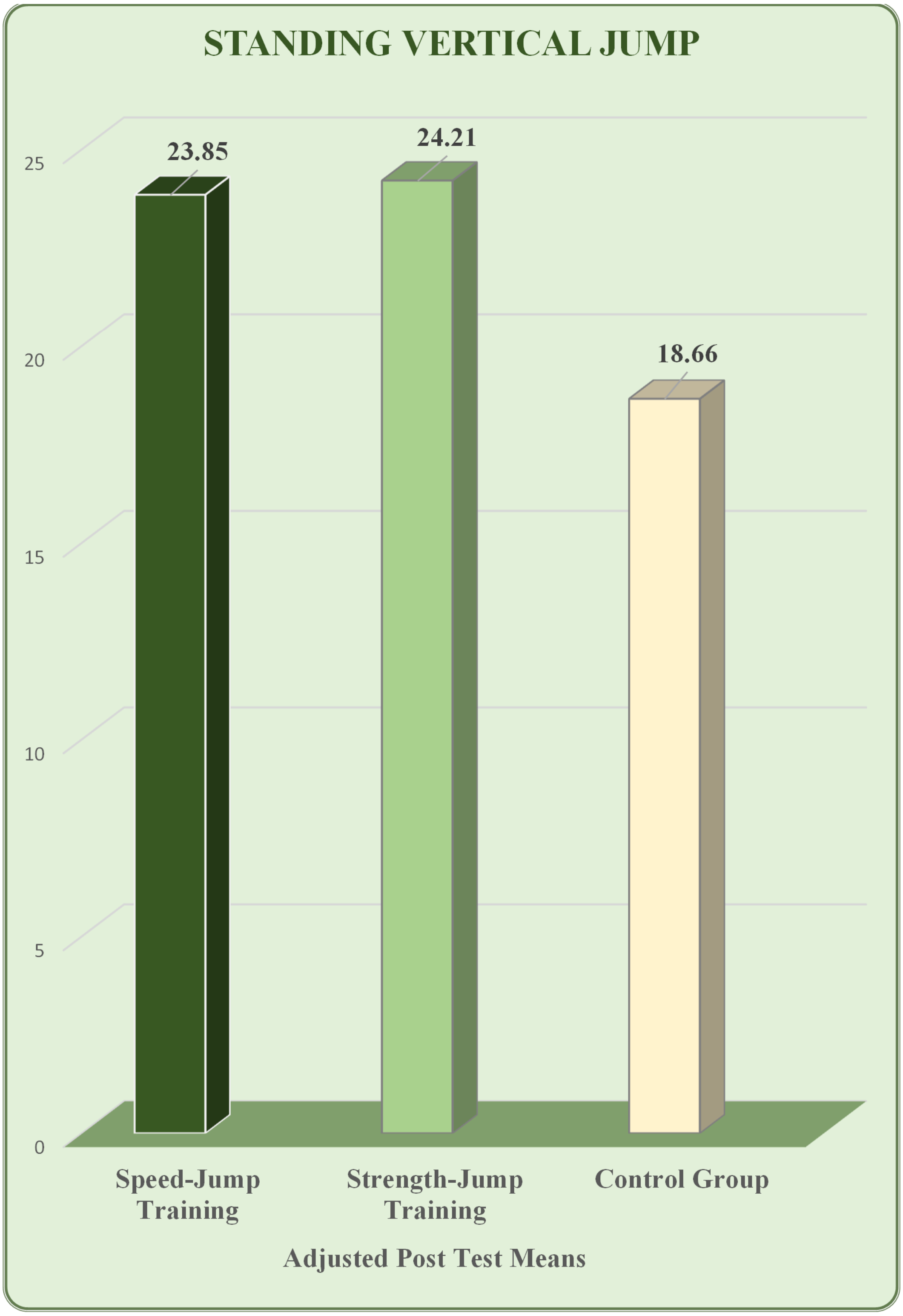

Figure 4.10: The Adjusted Post Test Mean Values of Experimental Group and Control Group on Standing Vertical Jump

5.4.6 Three Step Approach Vertical Jump

Table – 4.16

Means, Standard Deviations and Dependent 'T' Test Values on Three Step Approach Vertical Jump of Experimental Group and Control Groups

Group	Pre Test		Post Test		't' test value	Sig. (2-tailed)
	Mean	SD	Mean	SD		
Speed-Jump Training	30.13	3.65	34.30	3.32	14.67*	0.00
Strength-Jump Training	31.43	3.41	36.20	2.80	17.39*	0.00
Control Group	30.93	3.14	31.30	3.30	1.65	0.11

***Significant at 0.05 level of significance if p-value is < 0.05**

According to Table 4.16, the 't' ratios for the three step approach vertical jump of the speed-jump training group and the strength-jump training group are (14.67, $p<0.05$) and (17.39, $p<0.05$), respectively. It was determined that these ratios were statistically significant at the 0.05 level of confidence for degrees of freedom 1 and 29. Additionally, it was determined that the obtained 't' ratio between the pre- and post-test results for the control group (1.65, $p>0.05$) was not statistically significant.

The findings suggested that the standing three step approach vertical jump of female volleyball players had significantly improved in both the speed-jump training group and the strength-jump training group.

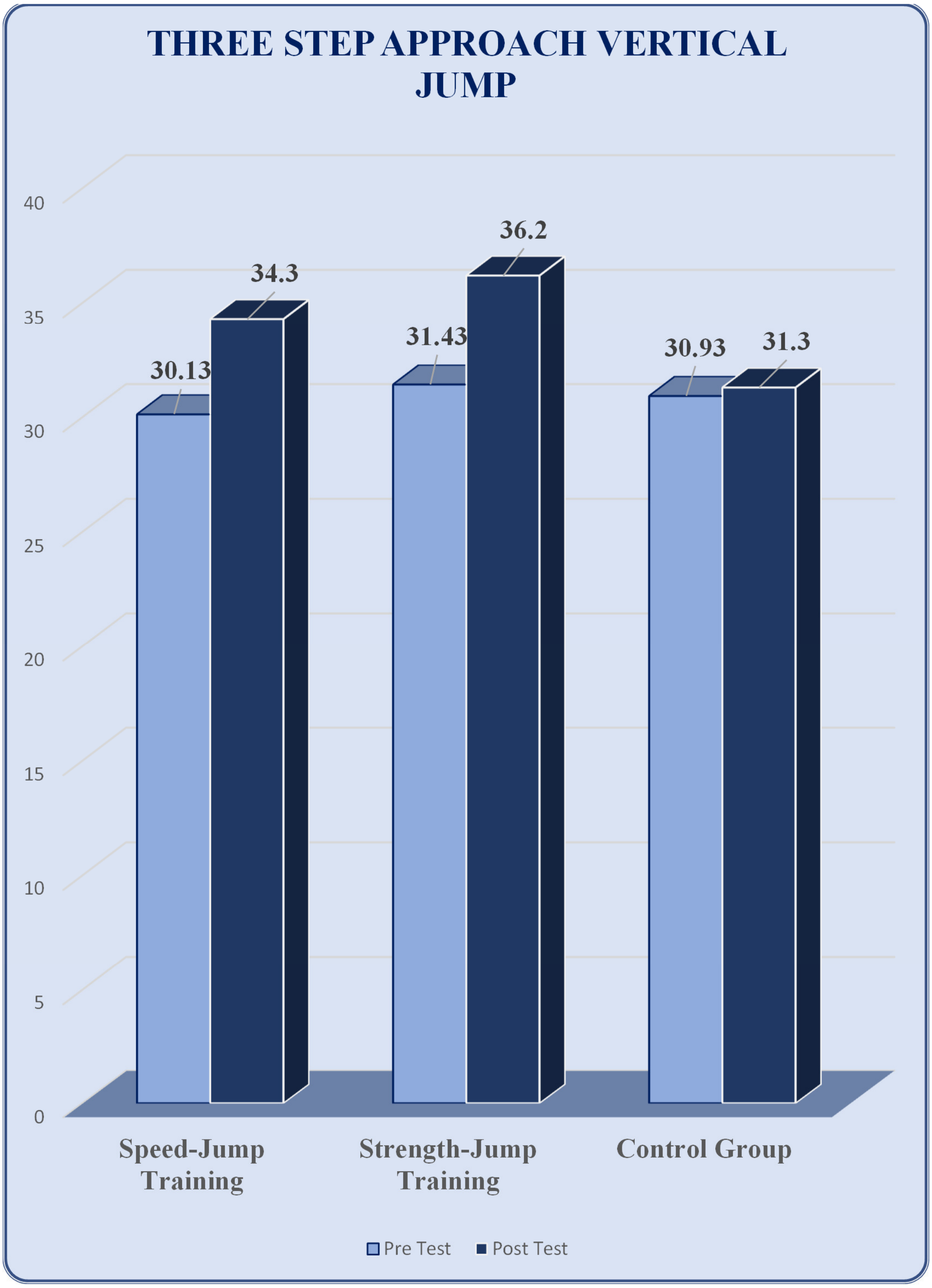

Figure 4.11:

Pre-test and Post-test Mean Values of Experimental Group and Control Groups on Three Step Approach Vertical Jump

The analysis of covariance (ANCOVA) on three step approach vertical jump of experimental and control groups have been analyzed and presented in table 4.17.

Table - 4.17

Analysis of Covariance of Experimental and Control Groups on Three Step Approach Vertical Jump

Adjusted Post Test Means			Sum of Squares	Sum of Squares	DF	Mean Squares	'F' Ratio	Sig.
Speed-Jump Training	Strength-Jump Training	Control Group						
34.90	35.69	31.22	B	341.99	2	171.00	94.49*	0.00
			W	155.63	86	1.81		

***Significant at 0.05 level of significance if p-value is < 0.05**

The adjusted post-test means of the speed-jump training, strength-jump training and control groups were 34.90, 35.69 and 31.22 respectively. The obtained "F" ratio for the adjusted post-test means was 94.49 ($p<0.05$). For degrees of freedom 2 and 86, it was shown to be statistically significant at the 0.05 level of confidence. The findings of three step approach vertical jump showed that there was a significant difference in post-test means for female volleyball players in the speed-jump training group, strength-jump training group, and control group.

A post hoc analysis employing the LSD test is performed on the adjusted post-test means of three step approach vertical jump, which demonstrate significant differences. In table - 4.18, post hoc results are presented.

Table - 4.18

LSD Post Hoc Test for Difference between Adjusted Post Test Paired Means on Three Step Approach Vertical Jump

Speed-Jump Training	Strength-Jump Training	Control Group	Mean Difference	Sig.
34.90	35.69	-	0.79*	0.02
34.90	-	31.22	3.68*	0.00
-	35.69	31.22	4.47*	0.00

***Significant at 0.05 Level of Significance if $p<0.05$.**

Table 4.18's multiple comparisons show that there are significant differences between the speed-jump training and strength-jump training (0.79, $p<0.05$), speed-jump training and control groups (3.68, $p<0.05$), as well as between the strength-jump training and control groups (4.47, $p<0.05$).

These findings suggested that eight weeks of strength-jump training led to a statistically significant improvement in the three step approach vertical jump of female volleyball players compared to the speed-jump training and control groups.

The adjusted three step approach vertical jump means are shown in the bar chart of Figure 4.12.

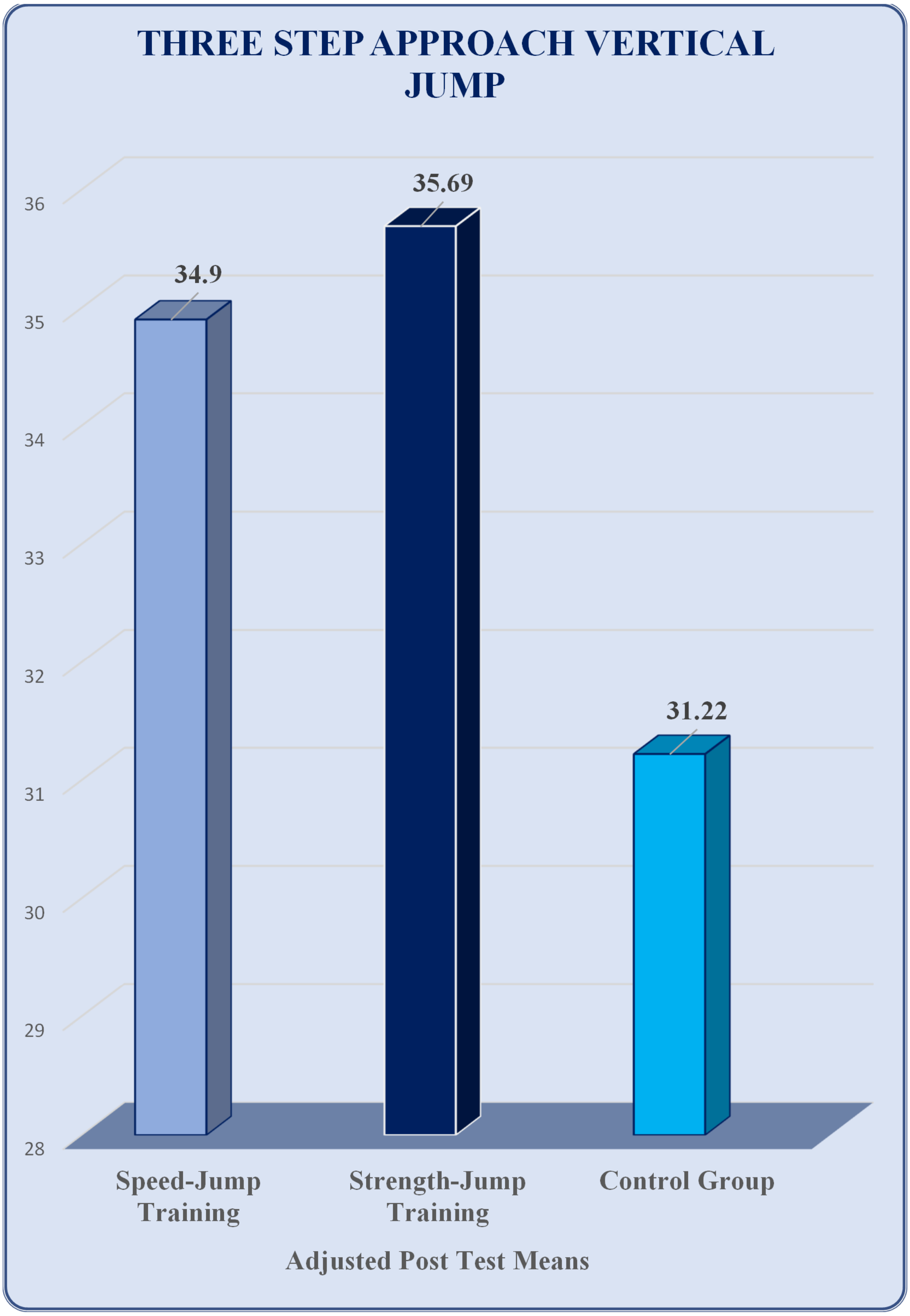

Figure 4.12: The Adjusted Post Test Mean Values of Experimental Group and Control Group on Three Step Approach Vertical Jump

5.4.7 Right Direction Side Step Jump

Table – 4.19

Means, Standard Deviations and Dependent 'T' Test Values on Right Direction Side Step Jump of Experimental Group and Control Groups

Group	Pre Test		Post Test		't' test value	Sig. (2-tailed)
	Mean	SD	Mean	SD		
Speed-Jump Training	25.03	2.71	29.53	2.87	18.50*	0.00
Strength-Jump Training	25.50	1.50	29.70	1.60	24.88*	0.00
Control Group	25.20	2.02	25.50	2.30	1.36	0.18

***Significant at 0.05 level of significance if p-value is < 0.05**

According to Table 4.19, the 't' ratios for the right direction side step jump of the speed-jump training group and the strength-jump training group are (18.50, $p<0.05$) and (24.88, $p<0.05$), respectively. It was determined that these ratios were statistically significant at the 0.05 level of confidence for degrees of freedom 1 and 29. Additionally, it was determined that the obtained 't' ratio between the pre- and post-test results for the control group (1.36, $p>0.05$) was not statistically significant.

The findings suggested that the right direction side step jump of female volleyball players had significantly improved in both the speed-jump training group and the strength-jump training group.

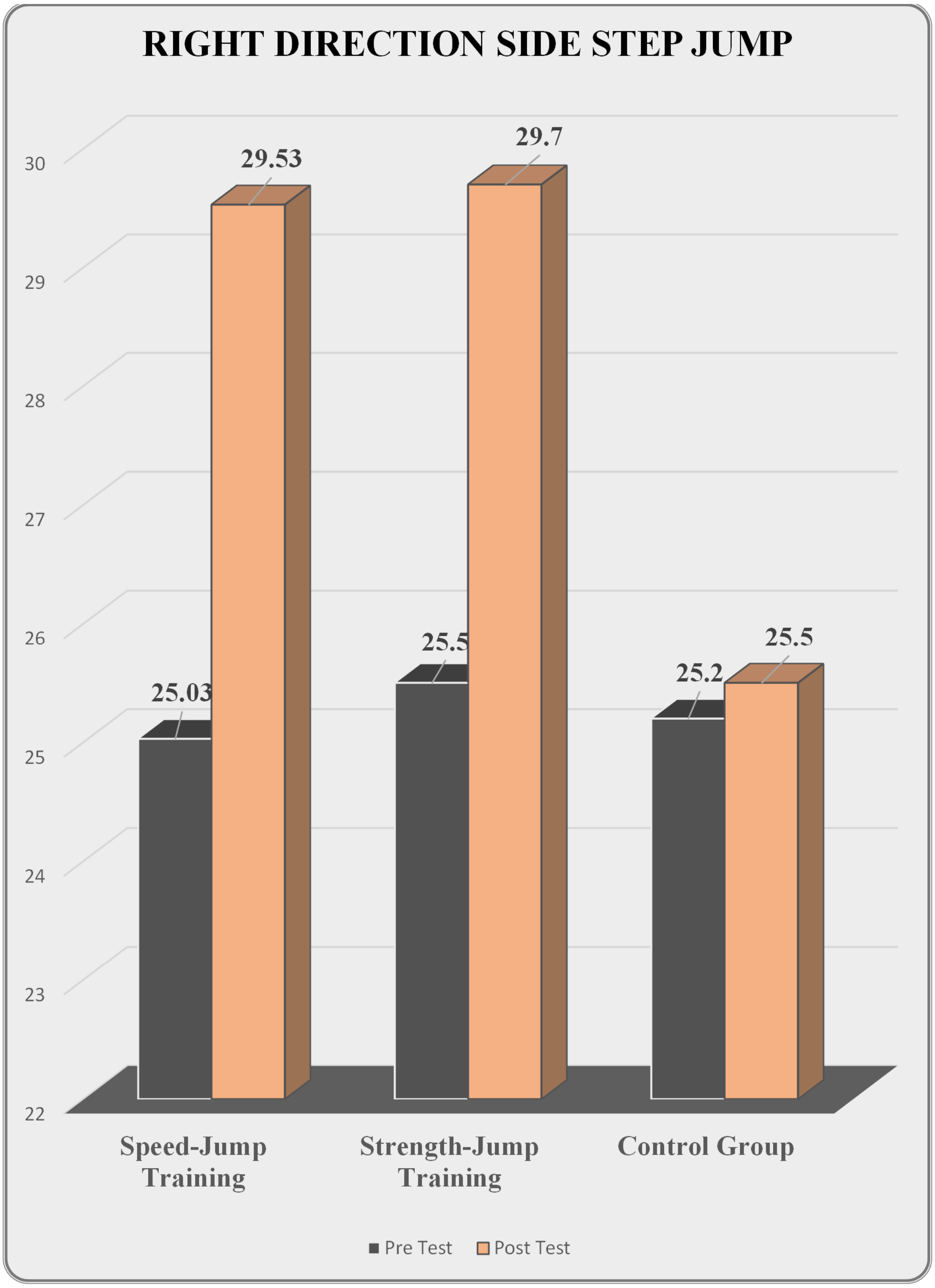

Figure 4.13:

Pre-test and Post-test Mean Values of Experimental Group and Control Groups on Right Direction Side Step Jump

The analysis of covariance (ANCOVA) on right direction side step jump of experimental and control groups have been analyzed and presented in table 4.20.

Table - 4.20

Analysis of Covariance of Experimental and Control Groups on Right Direction Side Step Jump

Adjusted Post Test Means			Sum of Squares	Sum of Squares	DF	Mean Squares	'F' Ratio	Sig.
Speed-Jump Training	**Strength-Jump Training**	**Control Group**						
29.73	29.46	25.54	B	329.79	2	164.89	121.09*	0.00
			W	117.11	86	1.36		

***Significant at 0.05 level of significance if p-value is < 0.05**

The adjusted post-test means of the speed-jump training, strength-jump training and control groups were 29.73, 29.46 and 25.54 respectively. The obtained "F" ratio for the adjusted post-test means was 121.09 ($p<0.05$). For degrees of freedom 2 and 86, it was shown to be statistically significant at the 0.05 level of confidence. The findings of right direction side step jump showed that there was a significant difference in post-test means for female volleyball players in the speed-jump training group, strength-jump training group, and control group.

A post hoc analysis employing the LSD test is performed on the adjusted post-test means of right direction side step jump, which demonstrate significant differences. In table - 4.21, post hoc results are presented.

Table - 4.21

LSD Post Hoc Test for Difference between Adjusted Post Test Paired Means on Right Direction Side Step Jump

Speed-Jump Training	Strength-Jump Training	Control Group	Mean Difference	Sig.
29.73	29.46	-	0.27	0.37
29.73	-	25.54	4.19*	0.00
-	29.46	25.54	3.92*	0.00

***Significant at 0.05 Level of Significance if p<0.05.**

Table 4.21's multiple comparisons show that there are significant differences between the speed-jump training and control groups (4.19, $p<0.05$), as well as between the strength-jump training and control groups (3.92, $p<0.05$). The table also shows that there is no significant difference between speed-jump training and strength-jump training (0.27, $p>0.05$).

These findings suggested that eight weeks of speed-jump training led to a statistically significant improvement in the right direction side step jump of female volleyball players compared to the strength-jump training and control groups.

The adjusted right direction side step jump means are shown in the bar chart of Figure 4.14.

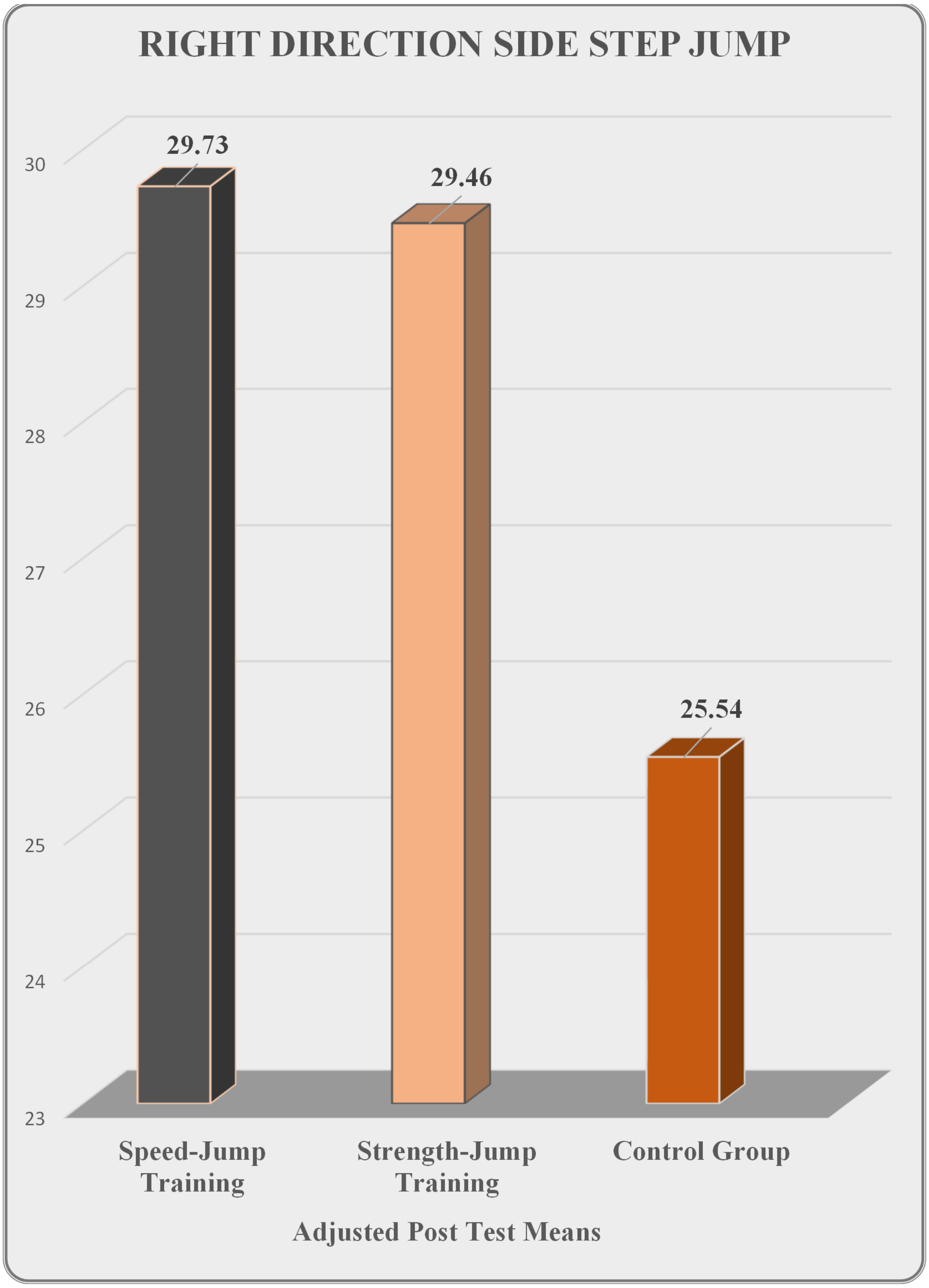

Figure 4.14: The Adjusted Post Test Mean Values of Experimental Group and Control Group on Right Direction Side Step Jump

5.4.8 Left Direction Side Step Jump

Table – 4.22

Means, Standard Deviations and Dependent 'T' Test Values on Left Direction Side Step Jump of Experimental Group and Control Groups

Group	Pre Test		Post Test		't' test value	Sig. (2-tailed)
	Mean	SD	Mean	SD		
Speed-Jump Training	24.63	2.70	28.70	2.57	22.72*	0.00
Strength-Jump Training	24.73	1.76	28.10	1.77	19.87*	0.00
Control Group	24.20	2.27	24.50	1.94	1.36	0.18

***Significant at 0.05 level of significance if p-value is < 0.05**

According to Table 4.22, the 't' ratios for the left direction side step jump of the speed-jump training group and the strength-jump training group are (22.72, $p<0.05$) and (19.87, $p<0.05$), respectively. It was determined that these ratios were statistically significant at the 0.05 level of confidence for degrees of freedom 1 and 29. Additionally, it was determined that the obtained 't' ratio between the pre- and post-test results for the control group (1.36, $p>0.05$) was not statistically significant.

The findings suggested that the left direction side step jump of female volleyball players had significantly improved in both the speed-jump training group and the strength-jump training group.

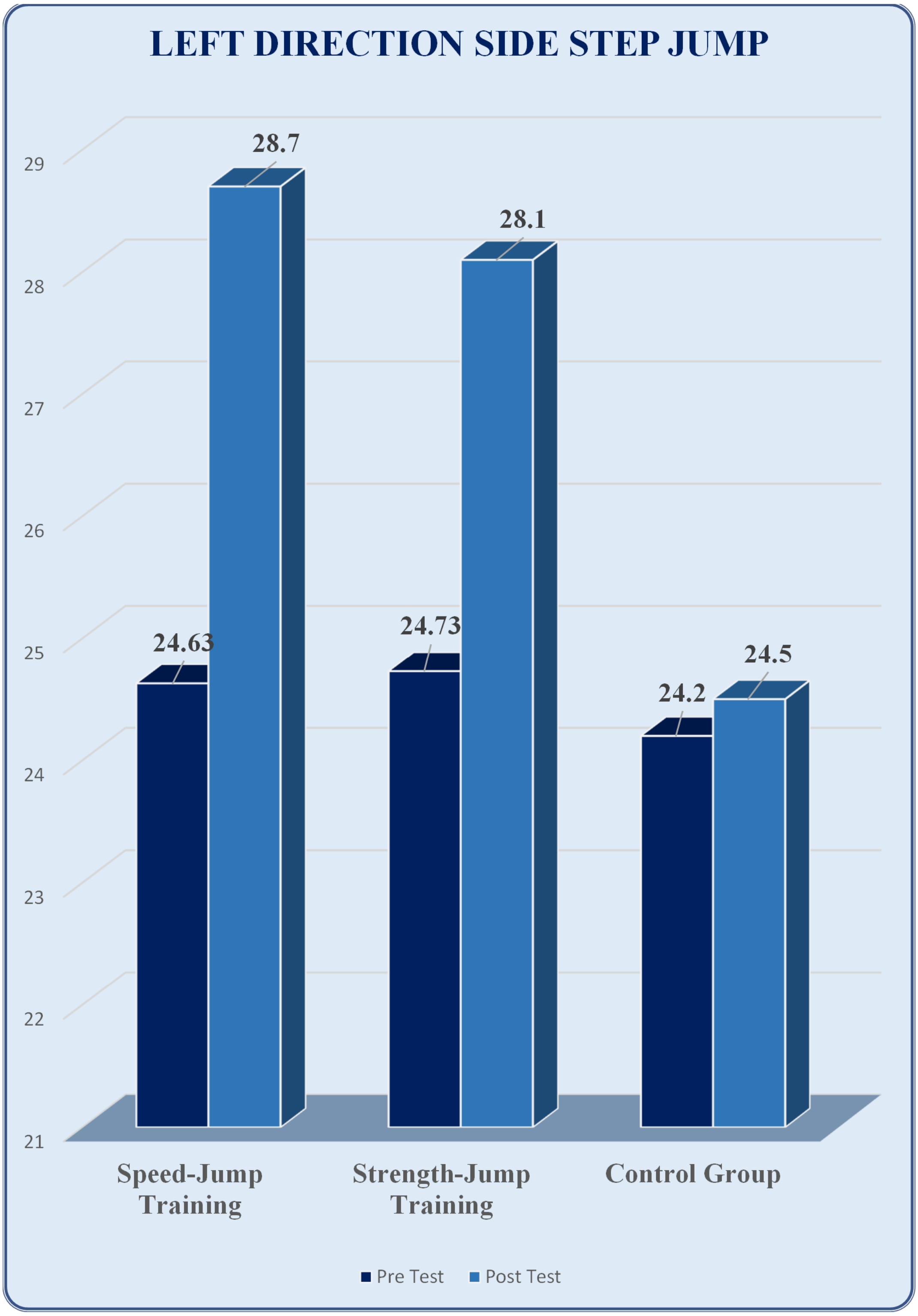

Figure 4.15:

Pre-test and Post-test Mean Values of Experimental Group and Control Groups on Left Direction Side Step Jump

The analysis of covariance (ANCOVA) on left direction side step jump of experimental and control groups have been analyzed and presented in table 4.23.

Table - 4.23

Analysis of Covariance of Experimental and Control Groups on Left Direction Side Step Jump

Adjusted Post Test Means			Sum of Squares	Sum of Squares	DF	Mean Squares	'F' Ratio	Sig.
Speed-Jump Training	**Strength-Jump Training**	**Control Group**						
28.61	27.93	24.77	B	249.42	2	124.71	130.41*	0.00
			W	82.24	86	0.96		

***Significant at 0.05 level of significance if p-value is < 0.05**

The adjusted post-test means of the speed-jump training, strength-jump training and control groups were 28.61, 27.93 and 24.77 respectively. The obtained "F" ratio for the adjusted post-test means was 130.41 ($p<0.05$). For degrees of freedom 2 and 86, it was shown to be statistically significant at the 0.05 level of confidence. The findings of left direction side step jump showed that there was a significant difference in post-test means for female volleyball players in the speed-jump training group, strength-jump training group, and control group.

A post hoc analysis employing the LSD test is performed on the adjusted post-test means of left direction side step jump, which demonstrate significant differences. In table - 4.24, post hoc results are presented.

Table - 4.24

LSD Post Hoc Test for Difference between Adjusted Post Test Paired Means on Left Direction Side Step Jump

Speed-Jump Training	Strength-Jump Training	Control Group	Mean Difference	Sig.
28.61	27.93	-	0.68*	0.00
28.61	-	24.77	3.84*	0.00
-	27.93	24.77	3.16*	0.00

***Significant at 0.05 Level of Significance if p<0.05.**

Table 4.24's multiple comparisons show that there are significant differences between the speed-jump training and strength-jump training (0.68, $p<0.05$), speed-jump training and control groups (3.84, $p<0.05$), as well as between the strength-jump training and control groups (3.16, $p<0.05$).

These findings suggested that eight weeks of speed-jump training led to a statistically significant improvement in the left direction side step jump of female volleyball players compared to the strength-jump training and control groups.

The adjusted left direction side step jump means are shown in the bar chart of Figure 4.16.

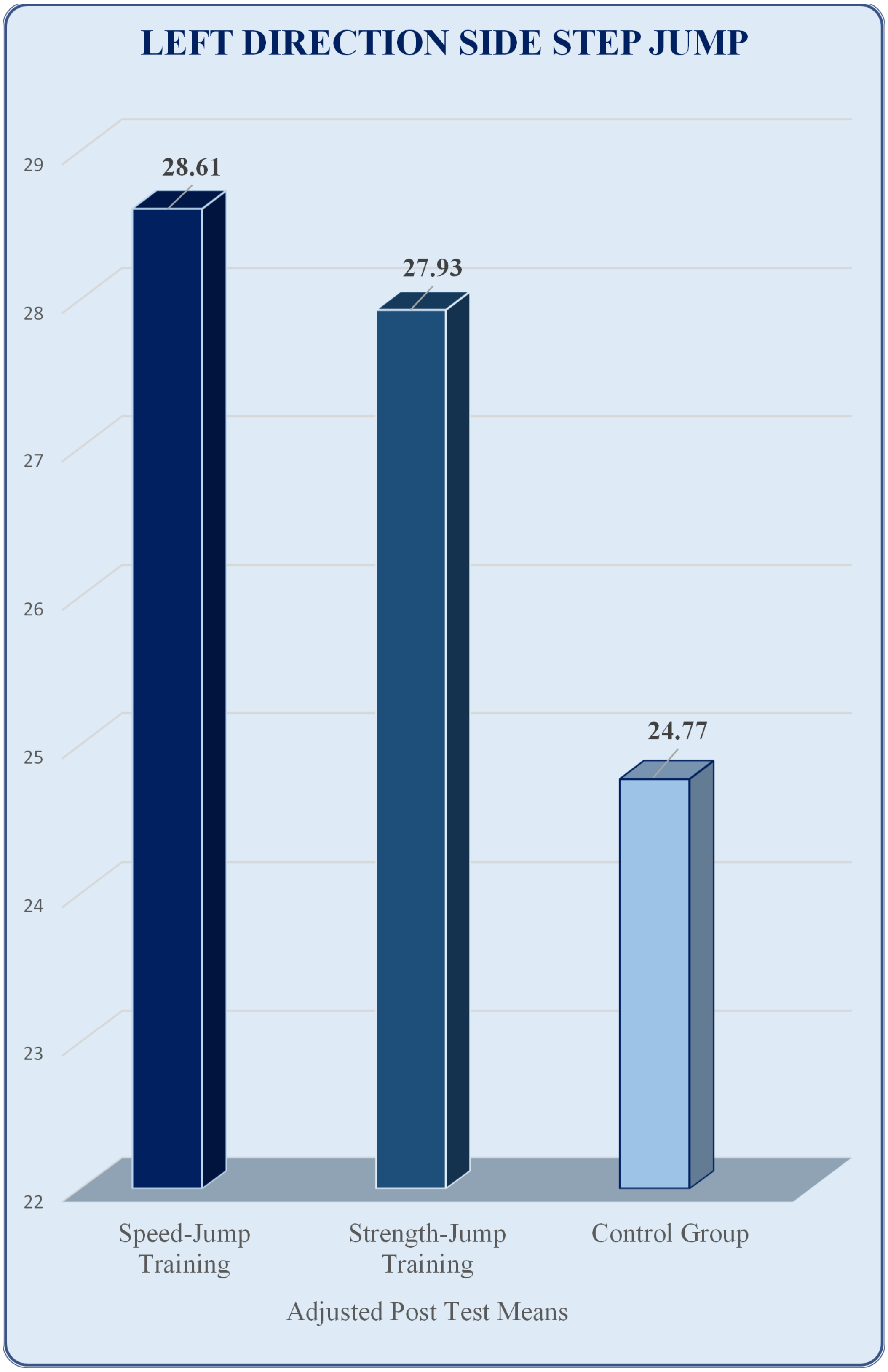

Figure 4.16: The Adjusted Post Test Mean Values of Experimental Group and Control Group on Left Direction Side Step Jump

4.5 Discussion on Findings

4.5.1 Physical Fitness Variables

The study's findings showed that all experimental groups considerably increased the selected physical fitness variables due to the influence of the selected training methods. It suggests that the selected training regimens, speed-jump training and strength-jump training, have significantly greatly enhanced the physical fitness variables, including speed, cardio respiratory endurance, explosive power, and agility, which are highly important for the volleyball players to exert their full effort during practice and competition.

Furthermore, it was found that when speed-jump training and strength-jump training were compared to one another, the trend was in favour of speed-jump training with regard to the improvement of physical fitness; specifically cardio respiratory endurance and agility, and the trend was in favour of strength-jump training with regard to the improvement of explosive power.

According to **Gandhi (2021)** findings from there were significant differences in the improvement of the chosen motor component characteristics, including speed, muscular endurance, agility, flexibility, and explosive power, between the groups that underwent weight training, plyometric training, and a combination of both.

Plyometric training appears to improve vertical jump performance, strength, horizontal jump performance, flexibility, and agility/speed in volleyball players, according to **Silva et al. (2019).** More research is needed, however, to better understand the effects of plyometric training on volleyball players' performance.

According to the findings of **Vivek and Sing's (2019)** study, there was a substantial improvement in upper and lower body explosive strength in the experimental group compared to the control group. The research also aids in the improvement of performance and the development of volleyball skills.

The results of **Raghvin (2019)** unmistakably showed that junior volleyball players' performance metrics improved following 12 weeks of plyometric training on various surfaces combined with SAQ drills. Speed, explosive power, agility, anaerobic capacity, cardio-respiratory endurance, muscular endurance, and balance all saw significant improvements as a result of the four training sessions that were chosen.

Pereira et al. (2015) discovered that 8 weeks of combined jump and ball throwing training can dramatically increase muscle performance in young female volleyball players.

According to **Kumarr's (2014)** research, volleyball players' anaerobic power, resting pulse rate, respiratory rate, VO2max, flexibility, co-ordination, and a number of other motor fitness variables were all significantly improved by high-intensity plyometric training, anaerobic training, and cross-training programmes.

As of 2014, **Nageswaran** Athletes' speed, explosive power, muscular strength, flexibility, balance, and agility were all significantly improved by plyometric and ladder training, according to study results.

Augustsson (2013) found that maximal squat strength is a significant predictor of jumping height in young female volleyball players. Female volleyball players may want to focus on maximum strength training to increase their jumping ability.

The program's research results, according to **Lehnert et al. (2009),** support the belief that plyometric workouts are beneficial aids in the development of explosive power and speed in young athletes.

4.5.2 Jumping Performance

The study's findings revealed that eight weeks of speed-jump and strength-jump training programmes increased jumping performance on volleyball players, namely standing vertical jump, three step approach vertical jump, right and left direction side step jump. This study also shown that the speed-jump training programme is far more significant and beneficial for volleyball players to enhance their right and left side step jumps when compared to the strength-jump training programme and control group. While the strength-jump training plan aids in the improvement of players' standing vertical jump and three-step approach vertical jump.

According to **Goudas et al. (2020),** implementing plyometric workouts in the form of circuit training might result in further favourable changes to the players' jumping abilities. Finally, as long as a maintenance training programme incorporating jumping exercises is followed, the bulk of the training adaptations may be maintained over the detraining phase.

The findings of the **Thattarauthodiyil et al. (2019)** study, dynamic stretching combined with plyometric activities can be a more beneficial training programme for improving vertical jump performance in female college student volleyball athletes.

Cankaya et al. (2018) It is possible to assert that the plyometric exercises performed on volleyball players had beneficial benefits and an inversely proportionate relationship with body fat, fat quantity, and vertical jump.

Kumaran and Sheikh (2018) discovered that plyometric exercise improved the jumping ability of the chosen volunteers significantly.

Kristicevic et al. (2016) find that completing a 5-week plyometric training programme enhanced selected vertical jump tests in young female volleyball players.

Results from this study, according to **Johson (2015),** demonstrate that following twelve weeks of volleyball-specific plyometric training, a player's leg explosive power, standing vertical jump and reach with both hands, and three stride vertical jump and reach with both hands all significantly increased.

Parekh et al. (2014) investigate the impact of plyometric and pilates training. Volley ball players improved their agility by performing exercises that improved their vertical jump height, block jump, and attack jump.

The results of the **Kesa (2014)** study revealed that speed-strength training boosted volleyball service velocity. The speed-strength training approach was successful in increasing the take-off height for spiking. The volleyball players' two-foot take-off height improved as a result of plyometric training.

According to **Radu et al. (2014),** a 10-week plyometric training plan enhances anaerobic power in terms of contact time, flight times, height jumps, and power jumps.

To the findings of **Karver's (2012)** study, both sand and ground plyometric training can be beneficial to volleyball players. Both the sand and ground groups improved their vertical jump heights, allowing them to play the game at a higher level. **Milic et al. (2008)** and **Tipsword (2006)** indicate that plyometric and recovery training had a substantial influence on high school volleyball players' vertical jump heights. **Nair (2005)** results of the study demonstrate a positive correlation between speed and volleyball players' block jumps from a standing position, after side stepping, and after cross stepping.

4.6 Discussion on Hypothesis

1. First hypothesis stated that there will be significant improvement on selected physical fitness variables due to the effect of speed-jump training and strength-jump training.

The study's results show that speed-jump training and strength-jump training have a significant positive impact on a selected physical fitness characteristic, including speed, cardio respiratory endurance, explosive power, and agility in female volleyball players. Therefore, for the aforementioned variables, the first hypothesis has been accepted.

2. Second hypothesis stated that there will be significant improvement on selected jumping performance due to the effect of speed-jump training and strength-jump training.

The study's results show that speed-jump training and strength-jump training have a significant positive impact on jumping performance including standing vertical jump, three step approach vertical jump, right and left direction side step jump in female volleyball players. Therefore, for the aforementioned variables, the second hypothesis has been accepted

3. Third hypothesis stated that there will be significant differences on the selected physical fitness variables and jumping performance of volleyball players among the experimental groups.

The results of the study show that the effects of speed-jump training and strength-jump training have a substantial impact on selected physical fitness characteristics and jumping performance. In the aforementioned variables, the third hypothesis has been accepted.