

Variation of Maximal Strength and Cross Training Scores in Series Groups, Parallel Groups, and Control Groups during Speed Endurance Pre and Post-Testing

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Abstract- Approximately forty-five women (N=45) were recruited from West Godavari District, Andhra Pradesh, India, in order to achieve the purpose of this research study. These subjects were ranging in age between 17 to 20 years, from 158 to 163 cms tall and weighing between 58 and 62 kilograms each. Three equal groups of fifteen (n=15) subjects each were randomly selected from the selected subjects and distributed at random to three equal groups. Two empirical groups and a control group were randomly selected from the recruited subjects. Empirical Group-I, Group-II and Group-III acted as maximal strength and cross training scores in series groups (SG =15), and parallel groups (PG =15) respectively, and control group (CG=15), in this group no one participated in any specified training, but only participated in the daily workouts. All the two empirical group (SG and PG) women's voluntarily and actively engaged in their allotted group's specific training for twelve weeks. Analysis of covariance (ANCOVA) was used to analyze selected dependent variables. Where the F ratio adjusted for post-test level of confidence at 0.05 was significant. In order to identify the most effective training method and to improve the performance of women players, we conducted multiple comparisons of paired adjusted means and used Scheffe's confidence interval test.

Keywords – Speed Endurance, Strength Training, Cross Training

I. INTRODUCTION

Maximum strength is the extreme force of the neuro-muscular system which is able of exerting in a single maximum voluntary contraction. It denotes execution in most events where prominent resistance has to be overcome [1, 2]. Cross training is when you use another sport, activity, or training method to help you improve your performance in your primary sport or activity [3, 4]. The number of athletes who use cross training to assist them improve their primary sport performance and maintain overall conditioning has exploded since the early 1990s [5]. Cross training for many has become a byword for training. Over the last few years, a myriad of new cross training activities, techniques, and devices have been introduced, making it extremely difficult for the average athlete to distinguish between what is valid and safe and what is ineffectual or even dangerous [6, 7]. Hardhayal Singh (1993) [8] defined speed endurance as the ability to continue doing sports movements in spite of fatigue.

II. ANALYSIS OF THE DATA

The primary goal of this study was to look at the variation in maximal strength and cross training scores in women's speed endurance in series, parallel, and control groups. From a total of 150 students, 45 women (N=45) studying Sagi Ramakrishnam Raju Engineering College, Bhimavaram, West Godavari (Dist.), A.P., India, to achieve this objective, subjects were chosen randomly. The subjects' ages, heights, and weights ranged from 17 to 20 years old, 158 to 163 centimetres tall, and 58 to 62 kilogrammes each. Subject selection was done at random by dividing each group of 15 (n=15) into three equal groups. For the first six weeks, Group I (series group) did maximal strength

training four days a week and cross training four days a week for the following six (6) weeks. Group II (parallel group) did maximal strength and cross training for four days a week in alternate sessions for twelve (12) weeks. In Group III, only their regular curriculum was taught, and they did not participate in any training programs. There was no force driving the participants to participate in the training program; they signed a written consent form. Table I shows the results of the covariance analysis on speed endurance of the pre and post-test scores of maximal strength and cross training scores in series groups, parallel groups, and the control group.

Table -1 Speed Endurance Data (Speed Endurance in Seconds)

Groups/Tests	Pre- Test		Post- Test		Adjusted Post Test	
	Mean	SD	Mean	SD		
SG	17.83	0.25	16.42	0.25		16.54
PG	18.09	0.31	16.26	0.45		16.68
CG	17.89	0.48	18.25	0.35		18.42
SOC	B	W	B	W	B	W
Sum of Squares	0.112	7.765	20.978	10.4	21.978	6.254
df	2	42	2	42	2	41
Mean Squares	0.054	0.179	10.748	0.284	10.976	0.153
Obtained F ratio	0.29		44.57*		73.82*	

* Significant at 0 .05 level of confidence. SD=Standard Deviation
 (The table "F" ratio values for df 2 and 42 = 3.222, and 2 and 41 = 3.226).

The pre-test mean values for speed endurance of maximal strength and cross training in series, maximal strength and cross training in parallel, and control groups are 17.83, 18.09 and 17.89 seconds, respectively, according to table I. At the 0.05 level of confidence, the computed "F" ratio of 0.29 for pre-test results is lower than the table value of 3.222 for df 2 and 42, which is necessary for statistical significance to be reached on speed endurance. In all three post-test groups on speed endurance, the mean post-test results were respectively 16.42, 16.26, and 18.25 seconds for maximal strength and cross training in parallel, and 16.54, 16.68, and 18.42 seconds for control groups. A "F" ratio of 44.62, based on the post-test scores, is greater than the table value of 3.222 for df 2 and 42, which is needed to be significant for the speed endurance outcome at the 0.05 level of confidence.

The corrected post-test mean values for maximal strength and cross training in series, maximal strength and cross training in parallel, and control groups on speed endurance are 16.54, 16.68, and 18.42 seconds, respectively. As for speed endurance, the adjusted post-test means "F" ratio of 73.82 is higher than the table value of 3.226 for df 2 and 41, which is required for significance by the 0.05 level of confidence. Using the adjusted post-test averages from two groups of maximal strength and cross training in series and in parallel, and between the control group and the first group, there was a significant difference in speed endurance. When it was determined that the F-ratio for the adjusted post-test was significant for three groups, the Scheffe's test was used to calculate the paired mean differences, as shown in Table 2.

Table-2 Evaluation of Paired Means for Speed Endurance Focusing on the Scheffe Test (Speed Endurance in Seconds)

Adjusted Post Test Means			Mean Differences	Confidence Interval
SG	PG	CG		
16.54	16.68	-	0.14	0.32
16.54	-	18.42	1.88*	
-	16.68	18.42	1.74*	

* Significant at 0 .05 level of confidence.

The mean difference values were obtained on speed endurance between maximal strength and cross training in series and control groups is 1.88, whereas maximal strength and cross training in parallel and control groups is 1.74, the confidence interval value was less than the significance level of 0.32. Table 2 also demonstrates that the mean difference in speed endurance between the series and parallel groups of maximal strength and cross training was 0.14, the confidence interval value was less than the significance level of 0.32.

According to the findings of this study, a significant difference was observed in speed endurance between the maximal strength and cross training in series and control groups, as well as the maximal strength and cross training in parallel and control groups. Furthermore, it was discovered that there was no statistically significant difference in speed endurance between maximal strength and cross training in series and maximal strength and cross training in

parallel groups. Figure 1 represents the pre, post, and adjusted post-test mean values of maximal strength and cross training in series group, parallel group, and control group on speed endurance.

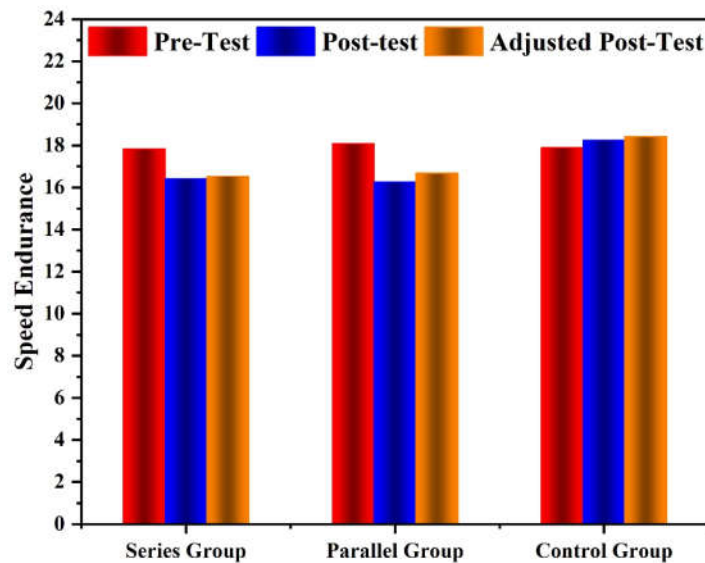


Figure 1. The variation of speed endurance pre- and post-test, and the adjusted post-test mean values

III. CONCLUSIONS

The significant difference was observed between the maximal strength and cross training scores in series groups, parallel groups, and control groups during speed endurance pre- and post-testing.

- The results presented in figure 1 on speed endurance proved that 12 weeks of maximal strength and cross training scores in series groups, parallel groups, and control groups pre- and post-testing significantly improved and the calculated F value was greater than the required values at a 0.05 significance level.
- Speed endurance proved that comparing to control group all the three experimental protocols significantly improved speed endurance of the Engineering College students.
- Comparisons between treatment groups proved that maximal strength and cross training scores in series groups was significantly better than maximal strength and cross training scores in parallel group.

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