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Effect of Concurrent Strength and Aerobic Endurance Training on Selected Physical Variables among College Men

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Abstract

The purpose of the study was to find out the effect of concurrent strength and aerobic endurance training on selected physical variables among college men. The study was formulated as a pre and post test random group design, in which forty five men students were randomly assigned into three equal groups and each group consisting of 15 subjects. Group I acted as aerobic endurance training group (AETG, n = 15), Group II acted as concurrent strength and aerobic endurance training group (CSAETG, n = 15) and Group III acted as control group (CG, n = 15). Pre – test was conducted. After assessing the pre – test performance on criterion variables, the subjects were treated with their respective training programme for twelve weeks. After twelve weeks of their training programme, again the subjects were tested (Post-test) on selected criterion variables as such in the pre – test. Analysis of covariance (ANCOVA) was computed because the subjects were selected random, but the groups were not equated in relation to the factors to be examined. Hence the difference between means of the three groups in the pre-test had to be taken into account during the analysis of the post-test differences between the means. This was achieved by the application of the analysis of covariance, where the final means were adjusted for differences in the initial means, and the adjusted means were tested for significance. Whenever the adjusted post-test means were found significant, the Scheffe's post-hoc test was administer to find out the paired means difference. To test the obtained results on variables, level of significance 0.05 was chosen and considered as sufficient for the study. The concurrent strength and aerobic endurance training improved better than aerobic endurance training and control groups on selected physical variables among college men.

Keywords: Concurrent Strength and Aerobic Endurance Training, College Men.

Introduction

Concurrent strength and endurance training is undertaken by numerous athletes in various sports in an effort to achieve adaptations specific to both forms of training. Literature findings to date, investigating the neuromuscular adaptations and performance improvements associated with concurrent strength and endurance training (referred to as concurrent training) have produced inconsistent results. Some studies have shown that concurrent training inhibits the development of strength and power, but does not affect the development of aerobic fitness when compared to either mode of training alone. Other studies have shown that concurrent training has no inhibitory effect on the development of strength and endurance. Rather like Posh and Becks, weight training and endurance training appear to be two halves of a perfect sports conditioning marriage. But, as with any good relationship, there will always be the occasional conflict and element of discord.

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This article examines the pitfalls for this partnership and recommends ways to maximize its harmony. It takes forward the themes of a previous *PP* article on the same subject by examining sport-by-sport considerations, the use of sport-specific weight training workouts and the effects of combined training on elite and experienced sports performers Let's begin with the logical assumption that weight training benefits endurance athletes, by focusing on the sport of rowing. Rowing requires an anaerobic contribution of about 30% to the 2k Olympic race distance. In consequence, rowers often train their lactic anaerobic systems with high-intensity, short duration intervals (lasting from 30 seconds to five minutes), with very short – often 1:1 – recoveries. These workouts target slow and fast-twitch muscle fibers – the latter providing much of the power needed for these turbocharged efforts. Logic says that weight training these fibers will be beneficial, especially when you consider that the actual rowing race is completed in about six minutes, using 200-240-plus strokes – an amount of 'repetitions' that could easily be accrued in a standard power (70-80% of 1 repetition maximum) weight-training workout, comprising 4x10 repetitions of six exercises. However, logic does not always apply, and this type of weight training (and indeed other types) may actually offer little direct benefit to rowers when it comes to improving their endurance. Bell and associates looked at the effects of three different weight-training programmes on 18 varsity rowers during their winter training. One group performed 18-22 high-velocities, low-resistance repetitions, while another did low-velocity, high-resistance repetitions (6-8 reps) and a third did no resistance training at all. All resistance exercises were rowing-specific and were performed on variable-resistance hydraulic equipment four times a week for five weeks, while the subjects continued with their normal endurance rowing training (Bell et al. 2000).

Methodology

The purpose of the study was to find out the effect of concurrent strength and aerobic endurance training on selected physical variables among college men. The study was formulated as a pre and post test random group design, in which forty five men students were randomly assigned into three equal groups and each group consisting of 15 subjects. Group I acted as aerobic endurance training group (AETG, n = 15), Group II acted as concurrent strength and aerobic endurance training group (CSAETG, n = 15) and Group III acted as control group (CG, n = 15). Pre – test was conducted. After assessing the pre – test performance on criterion variables, the subjects were treated with their respective training programme for twelve weeks. After twelve weeks of their training programme, again the subjects were tested (Post-test) on selected criterion variables as such in the pre – test. Analysis of covariance (ANCOVA) was computed because the subjects were selected random, but the groups were not equated in relation to the factors to be examined. Hence the difference between means of the three groups in the pre-test had to be taken into account during the analysis of the post-test differences between the means. This was achieved by the application of the analysis of covariance, where the final means were adjusted for differences in the initial means, and the adjusted means were tested for significance. Whenever the adjusted post-test means were found significant, the Scheffe’s post-hoc test was administer to find out the paired means difference. To test the obtained results on variables, level of significance 0.05 was chosen and considered as sufficient for the study.

Results

Table 1
Computation of analysis of covariance of mean of aerobic endurance training, concurrent strength and aerobic endurance training and control group on maximum strength

	AETG	CSAETG	CG	Source of Variance	Sum of Squares	df	Means Squares	F-ratio
Pre-Test Means	76.80	76.46	75.53	BG	12.93	2	6.46	0.37
				WG	717.86	42	17.09	
Post-Test Means	85.20	89.53	75.73	BG	1494.17	2	747.08	82.77*
				WG	379.06	42	9.02	
Adjusted Post-Test Means	85.14	89.51	75.81	BG	1451.18	2	725.59	80.18*
				WG	371.02	41	9.04	

** Significant at 0.05 level of confidence*

An examination of table - 1 indicated that the pre test means of aerobic endurance training, concurrent strength and aerobic endurance training and control group were 76.80, 76.46 and 75.53 respectively. The obtained F-ratio for the pre-test was 0.37 and the table F-ratio was 3.22. Hence the pre-test mean F-ratio was insignificant at 0.05 level of confidence for the degree of freedom 2 and 42. This proved that there were no significant difference between the experimental and control group indicating that the process of randomization of the groups was perfect while assigning the subjects to groups. The post-test means of the aerobic endurance training, concurrent strength and aerobic endurance training and control group were 85.20, 89.53 and 75.73 respectively. The obtained F-ratio for the post-test was 82.77 and the table F-ratio was 3.22. Hence the post-test mean F-ratio was significant at 0.05 level of confidence for the degree of freedom 2 and 42. This proved that the differences between the post test means of the subjects were significant. The adjusted post-test means of the aerobic endurance training, concurrent strength and aerobic endurance training and control group were 85.14, 89.51 and 75.81 respectively. The obtained F-ratio for the adjusted post-test means was 80.18 and the table F-ratio was 3.23. Hence the adjusted post-test mean F-ratio was significant at 0.05 level of confidence for the degree of freedom 2 and 41. This proved that there was a significant difference among the means due to the experimental trainings on maximum strength.

Table 2
The scheffe's test for the differences between the adjusted post test paired means on maximum strength

Adjusted Post-test means			Mean Difference	Required CI
AETG	**CSAETG**	**CG**		
85.14	89.51	---	4.37*	2.78
85.14	---	75.81	9.33*	
---	89.51	75.81	13.70*	

* *Significant at 0.05 level of confidence*

The multiple comparisons showed in Table 2 proved that there existed significant differences between the adjusted means of concurrent strength and aerobic endurance training with aerobic endurance training (4.37), concurrent strength and aerobic endurance training with control group (9.33), aerobic endurance training with control group (13.70) at 0.05 level of confidence with the confidence interval value of 2.78.

Figure I
Pre post and adjusted post test differences of the, aerobic endurance training, concurrent strength and aerobic endurance training and control group on maximum strength

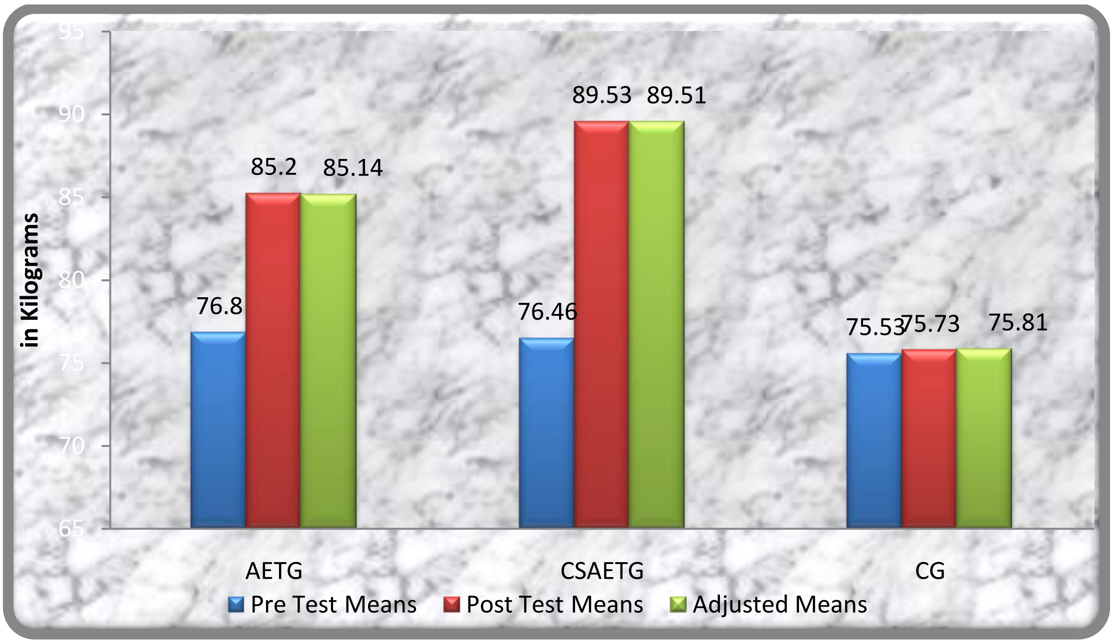


Table 3
Computation of analysis of covariance of mean of aerobic endurance training, concurrent strength and aerobic endurance training and control group on muscular strength

	AETG	CSAETG	CG	Source of Variance	Sum of Squares	df	Means Squares	F-ratio
Pre-Test Means	6.33	6.20	6.00	**BG**	0.84	2	0.42	0.89
				WG	19.73	42	0.47	
Post-Test Means	8.33	9.80	6.06	**BG**	106.13	2	53.06	107.84*
				WG	20.66	42	0.49	
Adjusted Post-Test Means	8.31	9.79	6.08	**BG**	102.83	2	51.42	102.95*
				WG	20.47	41	0.49	

** Significant at 0.05 level of confidence*

An examination of table - 3 indicated that the pre test means of aerobic endurance training, concurrent strength and aerobic endurance training and control group were 6.33, 6.20 and 6.00 respectively. The obtained F-ratio for the pre-test was 0.89 and the table F-ratio was 3.22. Hence the pre-test mean F-ratio was insignificant at 0.05 level of confidence for the degree of freedom 2 and 42. This proved that there were no significant difference between the experimental and control group indicating that the process of randomization of the groups was perfect while assigning the subjects to groups. The post-test means of the aerobic endurance training, concurrent strength and aerobic endurance training and control group were 8.33, 9.80 and 6.06 respectively. The obtained F-ratio for the post-test was 107.84 and the table F-ratio was 3.22. Hence the post-test mean F-ratio was significant at 0.05 level of confidence for the degree of freedom 2 and 42. This proved that the differences between the post test means of the subjects were significant. The adjusted post-test means of the aerobic endurance training, concurrent strength and aerobic endurance training and control group were 8.31, 9.79 and 6.08 respectively. The obtained F-ratio for the adjusted post-test means was 102.95 and the table F-ratio was 3.23. Hence the adjusted post-test mean F-ratio was significant at 0.05 level of confidence for the degree of freedom 2 and 41. This proved that there was a significant difference among the means due to the experimental trainings on muscular strength.

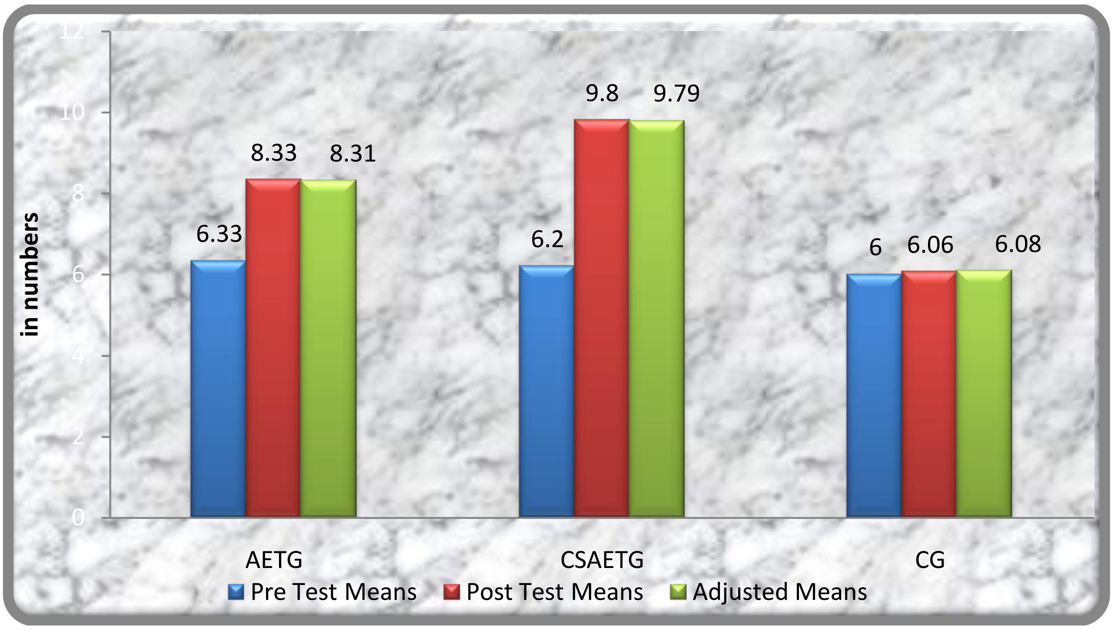
Table 4
The scheffe's test for the differences between the adjusted post test paired means on muscular strength

Adjusted Post-test means			**Mean Difference**	**Required CI**
AETG	**CSAETG**	**CG**		
8.31	9.79	---	1.48*	0.64
8.31	---	6.08	2.23*	
---	9.79	6.08	3.71*	

** Significant at 0.05 level of confidence*

The multiple comparisons showed in Table 4 proved that there existed significant differences between the adjusted means of concurrent strength and aerobic endurance training with aerobic endurance training (1.48), concurrent strength and aerobic endurance training with control group (2.23), aerobic endurance training with control group (3.71) at 0.05 level of confidence with the confidence interval value of 0.64.

Figure II
Pre post and adjusted post test differences of the, aerobic endurance training, concurrent strength and aerobic endurance training and control group on muscular strength



Conclusions

From the analysis of the data, the following conclusions were drawn:

1. The aerobic endurance training improved the selected physical variables among college men.
2. The concurrent strength and aerobic endurance training improved the selected physical variables among college men.
3. The concurrent strength and aerobic endurance training improved better than aerobic endurance training and control groups on selected physical variables among college men.

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