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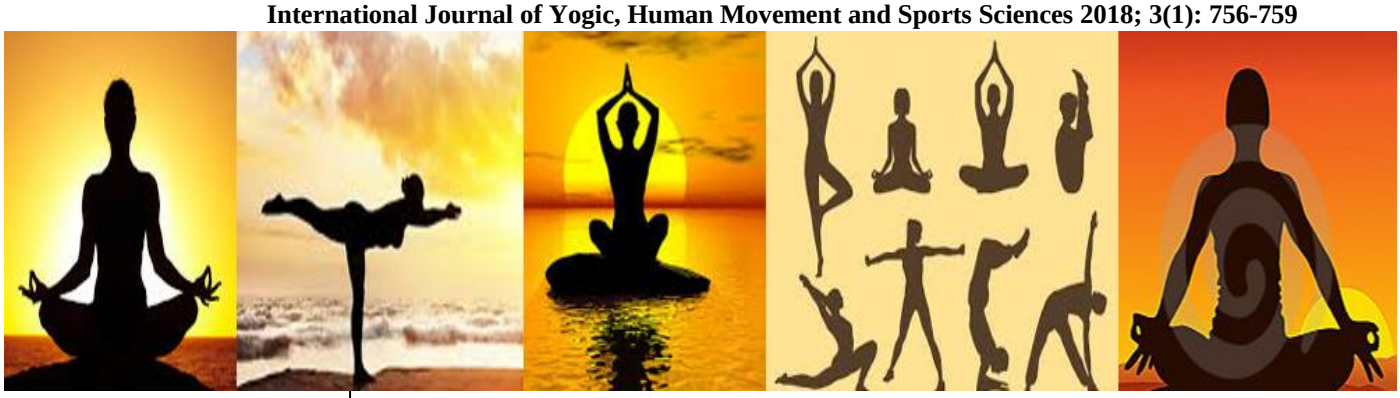

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Effect of aerobic cross training and aerobic training on vital capacity and strength endurance among male students

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Abstract
The aim of this study was to find out Effect of Aerobic Cross Training and Aerobic Training on Vital Capacity and Strength Endurance among College Male Students Forty five male college students (n = 45) were randomly selected from the Department of Physical Education and Sports Sciences. The ages were ranged between 18 and 22 years. The selected subjects were randomly assigned into three equal groups with fifteen subjects each (n = 15) as aerobic cross training group (ACTG) Aerobic training group (ATG) and control group (CG). The experimental groups underwent their respective experimental treatment for twelve weeks 3 days per week and session on each day. The control group (CG) did not expose any special training apart from their regular activities. The vital capacity and strength endurance were taken as criterion variables and was measured by wet spirometer and bent knee sit ups respectively. Analysis of covariance (ANCOVA) was used to analyze the collected data. The result revealed that the aerobic cross training and aerobic training was made significant improvement ($p \leq 0.05$) on selected subjects. The level of confidence was fixed at 0.05 levels.

Keywords: Wet Spirometer, bent knee sit ups

Introduction
Aerobic cross training refers to training for more than one sport at the same time or training for several different components at one time. The athlete who trains by swimming, running and cycling in preparation for competing in a triathlon. Aerobic cross training refers to using two to three different types of aerobic exercises at the same exercise session. Aerobic exercises is any type of rhythmic movement activities which involves same group of muscles repeatedly for the entire duration of exercise or activity that uses the body's larger muscles groups, the legs and arms for a continuous period of time from 10 minutes to an hour and more (Sreedhar, 2007).

Vital capacity is the total volume of air that can be forcibly expired after a maximal aspiratory. Vital capacity represents the total volume air volume moved in one breath from inspiration to maximum expiration or vice versa (Heyward, 2006).

Strength endurance is the ability of neuro muscular system to overcome resistance with high speed of contractions, which the skeletal lever system accepts and expels at a high velocity (Dick, 1978).

Materials and Methods
The aim of this study was to find out Effect of Aerobic Cross Training and Aerobic Training on Vital Capacity and Strength Endurance among College Male Students Forty five male college students (n = 45) were randomly selected from the Department of Physical Education and Sports Sciences. The ages were ranged between 18 and 22 years. The selected subjects were randomly assigned into three equal groups with fifteen subjects each (n = 15) as aerobic cross training group (ACT) Aerobic training group (ATG) and control group (CG). The experimental groups underwent their respective experimental treatment for twelve weeks 3 days per week and session on each day. The control group (CG) did not expose any special training apart from their regular activities. The vital capacity and strength endurance were

taken as criterion variables and was measured by wet spirometer and bent knee sit ups respectively. The moderate tension was also maintained for 10 to 15 seconds in the stretch, arm stretch, camel stretch, shoulder stretch, triceps stretch, side bend, supine trunk stretch, quadriceps stretch and back stretch and then allowed to relax.

Data Analysis

Mean and standard deviation were calculated for vital capacity and strength endurance for each training group. And the data were analyzed by using analysis of covariance (ANCOVA). Wherever the 'F' value was found to be significant for adjusted post-test mean, Scheffe's test was applied as post hoc test to determine the significant difference between the paired mean. Statistical significance was set to priority at 0.05 levels.

Results and Discussion

Analysis Of Covariance Of The Data On Vital Capacity Of Pre Post And Adjusted Post-tests Scores Of Aerobic Cross Training Aerobic Training And Control Groups

Table 1

Test	Aerobic cross training group	Aerobic training group	Control Group	SOV	Sum of squares	df	Mean Squares	'F' ratio
Pre-test								
Mean	3.165	3.155	3.157	B	0.001	2	0.0005	.045
S.D.	0.100	0.104	0.090	W	0.408	42	0.010	
Post-test								
Mean	3.597	3.734	3.168	B	2.624	2	1.312	72.244*
S.D.	0.104	0.175	0.113	W	0.763	42	0.018	
Adjusted Post-test								
Mean	3.593	3.738	3.170	B	2.615	2	1.308	100.373*
				W	0.534	41	0.013	

* Significant at 0.05 level of confidence

The Table 1 shows that the pre-test mean values on Vital Capacity of aerobic cross training group, aerobic training group and control group were 3.165, 3.155 and 3.157respectively. The obtained 'F' ratio of 0.04 for pre-test scores was less than the table values of 3.22 for df 2 and 42 required for significance at 0.05 level of confidence on Vital Capacity.

The post-test mean values on Vital Capacity of aerobic cross training group, aerobic training group and control group were 3.597, 3.734 and 3.168 respectively. The obtained 'F' ratio of 72.24 or post-test scores was greater than the table values of 3.22 for df 2 and 42 required for significance at 0.05 level of confidence on Vital Capacity.

The adjusted post-test mean values on Vital Capacity of aerobic cross training group, aerobic training group and control group were 3.593, 3.738 and 3.170 respectively. The obtained 'F' ratio of 100.373 for adjusted post-test scores was greater than the table value of 3.23 for df 2 and 41 required for significance at 0.05 level of confidence on Vital Capacity.

The results of the study indicated that there was a significant difference between the adjusted post-test means of aerobic cross training group, aerobic training group and control group on Vital Capacity.

Since, the obtained 'F' ratio for the adjusted post-test mean was found to be significant, the Scheffe's test was applied to find out the paired mean differences, if any, among the groups and the results are presented is Table 2

Table 2: The Scheffe's Test for the Differences between Paired Means on Vital Capacity

Aerobic cross training group	Aerobic Training group	Control group	Mean Differences	Confidence interval value
3.593	3.738		0.145*	0.104
3.593		3.170	0.423*	0.104
	3.738	3.170	0.568*	0.104

*Significant at 0.05 level of confidence.

The Table 2 shows that the adjusted post-test paired mean differences on percent body fat between aerobic cross training and aerobic training groups, aerobic cross training and control groups and aerobic training and control groups were 0.145, 0.423 and 0.568 respectively. Which are higher than the confidence interval of 0.104 required for significance at 0.05 level of confidence.

It is inferred that the twelve weeks of aerobic across training and aerobic training groups have significantly decreased the percent body fat as compared to the control group. The result also reveals that the increase in Vidal Capacity is significantly more for aerobic training group was higher than aerobic cross training group.

The adjusted post-test mean values of aerobic cross training group, aerobic training group and control group on Vital Capacity are graphically represented in Figure 1.

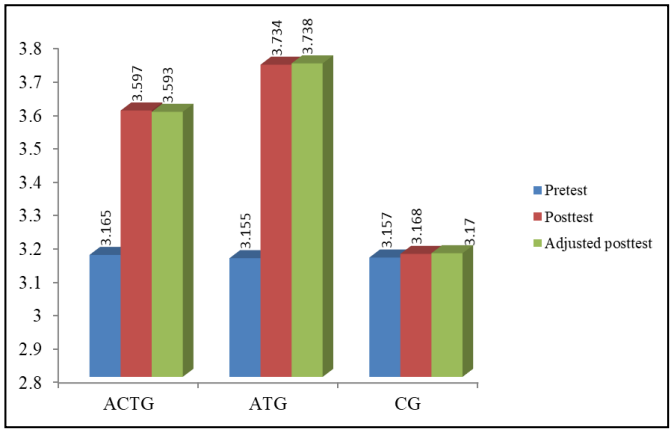

Fig 1: The pre, post and adjusted post-test mean values of experimental groups and control group on vital capacity.

Analysis Of Covariance Of The Data On Strength Endurance Of Pre Post And Adjusted Post-tests Scores Of Aerobic Cross Training, Aerobic Training And Control Groups

Table 3

Test	Aerobic cross training group	Aerobic training group	Control Group	SOV	Sum of squares	df	Mean Squares	'F' ratio
Pre-test								
Mean	32.33	32.40	31.66	B	4.93	2	2.467	0.46
S.D.	2.267	2.354	2.288	W	222.26	42	5.292	
Post-test								
Mean	40.86	36.66	31.53	B	655.51	2	327.75	26.43*
S.D.	4.015	4.011	2.231	W	520.80	42	12.40	
Adjusted Post-test								
Mean	40.72	36.48	31.83	B	581.93	2	290.96	28.74*
				W	415.02	41	10.12	

* Significant at 0.05 level of confidence

The Table 3 shows that the pre-test mean values on Strength Endurance of aerobic cross training group, aerobic training group and control group were 32.33, 32.40 and 31.66 respectively. The obtained 'F' ratio of 0.46 for pre-test scores was less than the table values of 3.22 for df 2 and 42 required for significance at 0.05 level of confidence on Strength Endurance.

The post-test mean values on Strength Endurance of aerobic cross training group, aerobic training group and control group were 40.86, 36.66 and 31.53 respectively. The obtained 'F' ratio of 26.43 for post-test scores was greater than the table values of 3.22 for df 2 and 42 required for significance at 0.05 level of confidence on Strength Endurance.

The adjusted post-test mean values on Strength Endurance of aerobic cross training group, aerobic training group and control group were 40.72, 36.48 and 31.83respectively. The obtained 'F' ratio of 28.74 for adjusted post-test scores was greater than the table value of 3.23 for df 2 and 41 required for significance at 0.05 level of confidence on Strength Endurance.

The results of the study indicated that there was a significant difference between the adjusted post-test means of aerobic cross training group, aerobic training group and control group on Strength Endurance.

Since, the obtained 'F' ratio for the adjusted post-test mean was found to be significant, the Scheffe's test was applied to find out the paired mean differences, if any, among the groups and the results are presented is Table 4.

Table 4: The Scheffe's Test for the Differences between Paired Means on Strength Endurance

Aerobic cross training group	Aerobic Training group	Control group	Mean Differences	Confidence interval value
40.72	36.48		4.24	2.91
40.72		31.83	8.89	2.91
	36.48	31.83	4.65	2.91

*Significant at 0.05 level of confidence.

The Table 4 shows that the adjusted post-test paired mean differences on percent body fat between aerobic cross training and aerobic training groups, aerobic cross training and control groups and aerobic training and control groups were 4.24, 8.89 and 4.65 respectively. Which are higher than the confidence interval of 2.91 required for significance at 0.05 level of confidence.

It is inferred that the twelve weeks of aerobic across training and aerobic training groups have significantly decreased the percent body fat as compared to the control group. The result also reveals that the increase in Strength Endurance is significantly more for aerobic cross training group was higher than aerobic training group.

The adjusted post-test mean values of aerobic cross training group, aerobic training group and control group on Strength Endurance are graphically represented in Figure 2

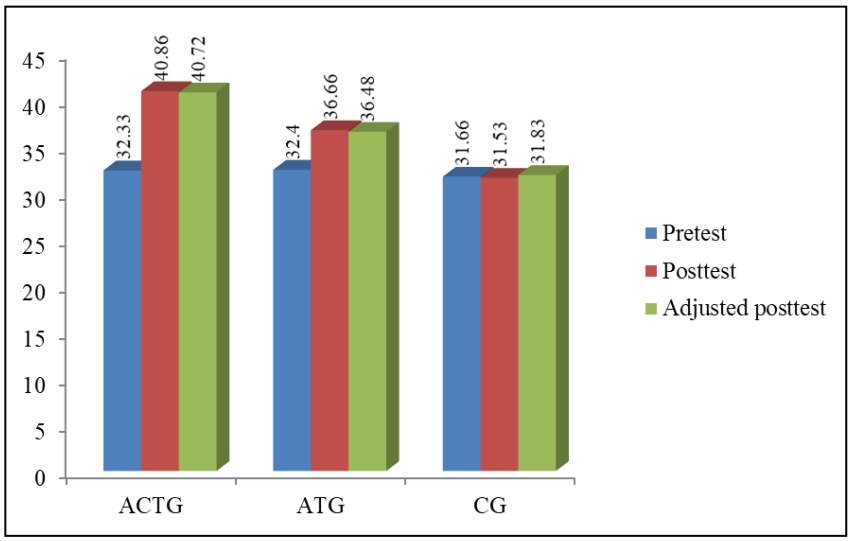

Fig 2: The pre, post and adjusted post-test mean values of experimental groups and control group on strength endurance.

Discussion

The result of the present study pointed out that there was a significant difference in vital capacity due to twelve weeks of aerobic cross training. Ghosh AK (1985) conducted a study on pulmonary functional capacities, vital capacity maximum voluntary ventilation (MVC), forced expiratory volume in 1

seconds and FEV 1.0 (percent VC) of 168 sportsmen belonging to different sports activities and of 10 sedentary individuals. Jones (1993) was conducted same study that aerobic training improves exercise tolerance and ultimately improves the performance of young athletes. Syeda (2013) also reached the conclusion of positive improvement in strength endurance among male students after the systematic practice of aerobic training

Conclusion

Aerobic cross training (ACT) and Aerobic training (AT) used to increase factors associated with vital capacity and strength endurance. In summary, vital capacity and strength endurance can be improved during the age between 18 and 22 years among male students, and the favour the prescription of aerobic cross training and aerobic training. The result of the study concluded that there was a significant difference between two experimental groups. It can be concluded from the results that aerobic cross training is best method to improve vital capacity and strength endurance.

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