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Effect of concurrent aerobic and circuit resistance training sequence on selected physiological parameters of untrained men

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Abstract
The purpose of the study was to find out the effect of concurrent aerobic and circuit resistance training on selected physiological parameters of untrained men. For this purpose, thirty (N=30) untrained men were selected from S.T. Hindu College, Nagercoil, Tamil Nadu, India. The participants' age ranged between 18 to 22 years. The selected participants were divided into two groups of n=15 participants Treatment group (TG) and Control group (CG). Group I underwent concurrent aerobic and circuit resistance training for 6 weeks and 3 days Monday, Wednesday & Friday (Alternate) per week. Group II didn't participate in any vigorous activity during the research duration. The selected physiological variables for this study are resting heart rate and peak flow rate. The selected outcome variables were assessed by using the standardized tests. The collected data on the selected outcome variables were treated with Univariate Analysis of Covariance at 0.05 level of significant. The results of the study indicate that there was significant difference on improvement of physiological parameters due to the effect of 6 weeks concurrent aerobic and circuit resistance training.

Keywords: Concurrent aerobic and circuit resistance training, untrained men.

Introduction
The combined nature of Aerobic & Circuit resistance training may provide an effective well-rounded exercise program to improve the overall fitness (Takeshima, Rogers, Islam, Yamauchi, Watanabe, & Okada, 2004) [5]. Aerobic training is characterized by the execution of cyclic exercises, carried out with large muscle groups contracting at mild to moderate intensities for a long (Howley, 2001) [2].
Concurrent aerobic and resistance training has been used to enhance athletic performance in a variety of sports, but its use as a health-promoting strategy for the general population should not be overlooked. By combining endurance and strength exercise modes, Concurrent aerobic and resistance training stresses both the cardiovascular and the neuromuscular systems. Besides traditional adaptation in endurance parameters (e.g. maximal aerobic capacity, lactate threshold, exercise economy) and skeletal muscle function (maximal strength, muscle power, muscular endurance, etc.), Concurrent aerobic and resistance training can also influence body composition, as well as traditional and non-traditional cardiometabolic risk factors. This paper aimed to find out the effects of Concurrent aerobic and resistance training on physiological outcomes, with an emphasis on resting heart rate and peak flow rate.
On the other hand, resistance training (also called weight or strength training) is characterized by the execution of exercises in which muscles from a specific body segment are contracted against a force that opposes the movement period of time (Cardoso Gomides, Queiroz, Pinto, Lobo, Tinucci, & Forjaz, 2010; Howley, 2001) [1, 2].

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Methodology
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Analysis of Data

Table 1: Analysis of covariance for pre and post data on Resting Pulse rate

Test	TG	CG	Source of variance	Sum of Squares	DF	Mean square	F
Pre-test mean	54.26	54.30	Between	20.47	1	20.47	0.02
			Within	30124.45	28	1075.87	
Post-test Mean	48.47	54.22	Between	1564.65	1	1564.65	4.27*
			Within	10243.45	28	365.83	
Adjusted mean	49.11	54.25	Between	1643.48	1	1643.48	4.74*
			Within	9345.69	27	346.88	

*Significant at 0.05 level of confidence. (The table value required for significance at 0.05 level of confidence with DF 1 and 28 and 1 and 27 were 4.19 and 4.21 respectively).

The obtained F value (Table 1) on pre test scores $0.002 < 4.19$ with DF $F_{(1,28)}$, Pre test scores $4.27 > 4.19$ with DF $F_{(1,28)}$, and Adjusted mean scores $4.74 > 4.21$ with DF $F_{(1,27)}$.

Table 2: Analysis of covariance for pre and post data on Peak Flow Rate

Test	TG	CG	Source of variance	Sum of Squares	DF	Mean square	F
Pre-test mean	430.45	430.41	Between	10.78	1	10.78	0.008
			Within	1324.17	28	1324.17	
Post-test Mean	490.79	431.98	Between	15643.65	1	15643.65	42.51*
			Within	10243.45	28	365.83	
Adjusted mean	489.45	430.86	Between	14264.86	1	14264.86	39.02*
			Within	9869.97	27	365.55	

*Significant at 0.05 level of confidence. (The table value required for significance at 0.05 level of confidence with DF 1 and 28 and 1 and 27 were 4.19 and 4.21 respectively).

The obtained F value (Table 1) on pre test scores $0.008 < 4.19$ with DF $F_{(1,28)}$, Pre test scores $42.51 > 4.19$ with DF $F_{(1, 28)}$, and Adjusted mean scores $39.02 > 4.21$ with DF $F_{(1,27)}$.

Discussion on findings

The results from Table 1 the obtained F value of pre test scores shows here was no significant difference between the groups at initial stage and the randomization at the initial stage was equal. The post test scores analysis proved that there was significant difference between the groups. The obtained adjusted post test scores shows that treatment group found significance difference between TG and CG on resting heart rate.

The results from Table 2 the obtained F value of pre test scores shows here was no significant difference between the groups at initial stage and the randomization at the initial stage was equal. The post test scores analysis proved that there was significant difference between the groups. The obtained adjusted post test scores shows that treatment group found significance difference between TG and CG on peak flow rate.

The present findings of the study is confirmed by the studies conducted already related this area such as Okamoto, Masuhara, & Ikuta, (2007); Lox, C. L., McAuley, E., & Tucker, R. S. (1996) [4, 3].

Conclusions

From the statistical analysis the following conclusions were drawn

1. TG found significant improvement on resting heart rate due to 6 weeks of concurrent aerobic and circuit resistance training among untrained men.
2. TG found significant improvement on peak flow rate due to 6 weeks of concurrent aerobic and circuit resistance training among untrained men.
3. CG did not find any significant improvement on resting heart rate and peak flow rate among the untrained men.
4. Significant difference on improvement exists between TG and CG on physiological parameters among the untrained men.

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