

Effects of aerobic training and circuit training on muscular strength and muscular endurance

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ABSTRACT

The study was designed to investigate the effects of aerobic training and circuit training on muscular strength and muscular endurance. For this investigation 45 school boys were selected randomly from Thanjavur Arunachalam Chettiar Govt. Higher Secondary School, Kottaiyur, Karaikudi, Tamilnadu as subjects. Their age ranged from 15 to 17 years. They were divided into three equal groups namely. Experimental group I, II and control group. In a week five days the Experimental group I underwent aerobic training practice, Experimental group II underwent circuit training practice and control group was not given any specific training. Muscular strength and muscular endurance were chosen as a criterion variables. They assessed before and after the training period of eight weeks. The analysis of covariance was used to determine if any significant difference was present among the three groups of the dependent variables. The study revealed that the selected criterion variables were significantly improved due to the influence of aerobic training and circuit training.

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Aerobic means with oxygen and refers to the use of oxygen in the body's metabolic system or energy generating process. An aerobic exercise refers to exercise that involves or improves oxygen consumption by the body. Many types of exercise are aerobic, and by definition are performed at moderate levels of intensity for extended periods of time (Dick, 1980).

To obtain the best results, an aerobic exercise session involves a warming up period, followed by at least 20 minutes of moderate to intense exercise involving large muscle groups, and a cooling down period at the end. Circuit training is a method of physical conditioning that employed both apparatus resistance training and calisthenics conditioning exercise (Scholich, 1979). It provides a means of achieving optimal fitness in a systematized controlled fashion. The intensity and vigour of circuit training are indeed challenging and enjoyable to the performer. This system produces positive changes in motor performance, general fitness, muscular power endurance and speed. In this study an attempt has been made to findout the effects of aerobic training and circuit training on muscular strength and muscular endurance.

METHODOLOGY

The experimental group I served aerobic training practice and experimental group -II served circuit training practice. Both experimental groups performed

respective training programme for five days in a week upto eight weeks. And control group was not given any specific training. The data were collected at prior to and after the training programme of eight weeks. Muscular strength was measured by push-up test for 60 sec. and muscular endurance was measured by bent knee sit-ups for 60 sec. The analysis of covariance (ANCOVA) was used to analyze the data. The .05 level of confidence was used to test the level of significance (Anderson, 1971). Training was given in the morning session. The training session included warming up and limbering down. Every day the workout lasted for 45 to 60 min approximately. The subjects underwent their respective training programmes as per the schedules under the strict supervision of the investigator.

OBSERVATIONS AND DISCUSSION

Table 1 shows that the pre-test mean values on muscular strength of aerobic training, circuit training and control group were 22.67, 22.60 and 22.07, respectively. The obtained "F" ratio of 0.05 for pre-test scores was less than the table value of 3.222 for df 2 and 42 required for significance at .05 level of confidence on muscular strength.

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Experimental group I (Aerobic training)			
Weeks	Exercises	Intensity	Repetitions
1 to 2 weeks	Slow continuation run – 5-6 KM	40% THR <140bpm	Single
3 to 4 weeks	Slow continuation run – 4-5 KM	60% THR <150 bpm	Single
5 to 6 weeks	Slow continuation run – 3-4 KM	70% THR <170 bpm	Single
7 to 8 weeks	Slow continuation run – 2-3 KM	80% THR <180/max bpm	Single

Experimental group II (Circuit training)						
Weeks	Exercises	Reps per Stn.	Intensity	Rec. Inb. Stn	No of set	Rec. Inb. Set
1 to 2 weeks	8 Stations	6-8	Low	1 min	3	7-10 min
		6 at 1 st wk. 8 at 2 nd wk.	(THR<140bpm)			
3 to 4 weeks	8 Stations	6-8	Medium	1 min	3	7-10 min
		6 at 3 rd wk. 8 at 4 th wk.	(THR<150bpm)			
5 to 6 weeks	8 Stations	6-8	Medium -High	1 min	3	7-10 min
		6 at 5 th wk. 8 at 6 th wk.	(THR<170bpm)			
7 to 8 weeks	8 Stations	6-8	High THR	1 min	3	7-10 min
		6 at 7 th wk. 8 at 8 th wk.	180bpm/max)			

muscular strength. The post-test mean values on muscular strength of aerobic training, circuit training and control group were 26.07, 30.73 and 22.20, respectively. The obtained “F” ratio of 8.06 for post test scores was more than the table value of 3.222 for df 2 and 42 required for significance at .05 level of confidence on muscular strength. The adjusted post-test means of aerobic training, circuit training and control group are 25.85, 30.58 and 22.57, respectively on muscular strength. The obtained “F” ratio of 376.45 for adjusted post-test means is more than the table value of 3.226 for df 2 and 41 required for significance at .05 level of confidence on muscular strength. The results of the study indicated that there was a significant difference between the adjusted post-test means of aerobic training, circuit training and control group

on muscular strength.

Table 2 shows that the pre-test mean values on muscular endurance of aerobic training, circuit training and control group were 26.67, 28.87 and 28.40, respectively.

The obtained “F” ratio of 0.50 for pre-test scores was less than the table value of 3.222 for df 2 and 42 required for significance at .05 level of confidence on muscular endurance. The post-test mean values on muscular endurance of aerobic training, circuit training and control group were 31.80, 38.00 and 28.53, respectively. The obtained “F” ratio of 9.80 for post test scores was more than the table value of 3.222 for df 2 and 42 required for significance at .05 level of confidence on muscular endurance. The adjusted post-test means of

Table 1: Analysis of covariance of the data on muscular strength of pre and post tests scores of aerobic training, circuit training and control group (Scores in numbers per minute)

Test	Group I	Group II	Control group	Source of variance	Sum of squares	d.f.	Mean squares	Obtained ‘F’ ratio
Pre-test								
Mean	22.67	22.60	22.07	Between	3.24	2	1.62	0.05
S.D.	6.13	5.10	5.84	within	1463.87	42	34.85	
Post-test								
Mean	26.07	30.73	22.20	Between	547.73	2	273.87	8.06*
S.D.	5.54	5.36	5.97	Within	1426.27	42	33.96	
Adjusted post-test								
Mean	25.85	30.58	22.57	Between	512.35	2	256.18	376.45*
				Within	27.90	41	0.68	

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 2 and 42 and 2 and 41 are 3.222 and 3.226, respectively)

Table 2: Analysis of covariance of the data on muscular endurance of pre and post tests scores of aerobic training, circuit training and control group (Scores in numbers per minute)

Test	Group I	Group II	Control group	Source of variance	Sum of squares	d.f.	Mean squares	Obtained 'F' ratio
Pre-test								
Mean	26.67	28.87	28.40	Between	40.31	2	20.16	0.50
S.D.	5.57	4.84	7.63	Within	160.67	42	40.25	
Post-test								
Mean	31.80	38.00	28.53	Between	693.64	2	346.82	9.80*
S.D.	5.11	4.05	7.52	Within	1486.13	42	35.38	
Adjusted post-test								
Mean	33.01	37.18	28.14	Between	418.34	2	209.17	34.38*
				Within	249.46	41	6.08	

* indicates significance of value at P=0.05

(The table values required for significance at .05 level of confidence for 2 and 42 and 2 and 41 are 3.222 and 3.226, respectively).

aerobic training, circuit training and control group were 33.01, 37.18 and 28.14, respectively on muscular endurance. The obtained "F" ratio of 34.38 for adjusted post-test means was more than the table value of 3.226 for df 2 and 41 required for significance at .05 level of confidence on muscular endurance. The results of the study indicated that there was a significant difference between the adjusted post-test means of aerobic training, circuit training and control group on muscular endurance.

Conclusion:

- Muscular strength and muscular endurance were significantly improved due to the influence of aerobic training and circuit training among school students.
- Muscular strength significantly improved due to the influence of circuit training greater than that of aerobic training and control group.
- Muscular endurance significantly improved due to the influence of aerobic training greater than that of circuit training and control group.

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