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## Effect of varied resistance circuit weight training on cardiovascular fitness

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### Abstract

The purpose of the study was to find out the effect of varied resistance circuit weight training on cardiovascular fitness. To achieve the purpose sixty male students studying Bachelor degree in Government Arts College, Manalmedu were selected at random as subjects for this study. Their age, height and weight ranged between 18 and 22 years, 154 cms and 174 cms, and 50 kg and 71 kg respectively. They were randomly divided into four groups and each group consisted of fifteen subjects. Group I underwent high intensity circuit weight training, Group II underwent moderate intensity circuit weight training, Group III underwent low intensity circuit weight training, Group IV acted as control group. The criterion variables selected for the study were Cardio Respiratory Endurance and it is measured by coopers 12 minutes run/walk test. The experimental groups participated in their respective training for a period of twelve weeks. The data were collected on cardio vascular endurance of varied resistance circuit weight training groups and control group before and after the training programme. The collected data were analyzed statistically by analysis of covariance (ANCOVA) and Scheffe's post-hoc test was used to test the paired mean differences.

**Keywords:** Circuit weight training, high intensity, low intensity, medium intensity

### Introduction

Circuit training is a method of resistance training, or weight training that maximizes the volume of work done in a short period of time. Circuit training consists of performing multiple exercises on multiple body parts in a row with little rest in between exertions. Circuit training is also a convenient way to exercise. It maximizes the total exercise volume (number of sets, repetitions, and amount of weight) completed in a period of time. Exercises are completed in a row, and therefore, the time spent exercising is condensed. All body parts are trained in one session, and therefore, exercisers do not need to work out every day. Due to the lack of rest that circuit training demands, exercisers maintain elevated heart rates for the entire period of exercise. The combination of weight training and increased cardiovascular effort makes circuit training a beneficial type of cross training.

Resistance training as an exercise programme where free or stationary weights are used for the purpose of increasing muscular strength, muscular endurance and power and body composition through which skills can be improved Moran and McGlynn (1990). Hurely *et al.*, (1987) <sup>[2]</sup> found that by doing exercises like jogging and weight training one can reduce the body fat, foster neuromuscular relaxation, and decrease the risk of cardiovascular diseases and perhaps the other diseases too. Lombardi (1989) <sup>[4]</sup> describes weight training as the most effective way for improving multiple components of fitness. Resistance training is the most important ingredient in the process of "making" an athlete and it enhances performance along with success not only in rehabilitation, but also in preventing injuries as well. Proper resistance training yields benefit for any athlete young or old. As a result, he is stronger, faster, more flexible, more enduring and less likely to suffer from injury. Resistance training is used directly to improve maximum strength, elastic strength, strength endurance and it leads to intensive demands on muscles, tendons, ligaments and joints.

### Methodology

The purpose of the study was to find out the effect of varied resistance circuit weight training on cardiovascular fitness.

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To achieve the purpose sixty male students studying Bachelor degree in Government Arts College, Manalmedu were selected at random as subjects for this study. Their age, height and weight ranged between 18 and 22 years, 154 cms and 174 cms, and 50 kg and 71 kg respectively. They were randomly divided into four groups and each group consisted of fifteen subjects. Group I underwent high intensity circuit weight training, Group II underwent moderate intensity circuit weight training, Group III underwent low intensity circuit weight training, Group IV acted as control group. The criterion variables selected for the study are Cardio Respiratory Endurance and it is measured by coopers 12 minutes run/walk test. The experimental groups participated in their respective training for a period of twelve weeks. The data were collected on cardio vascular endurance of varied resistance circuit weight training groups and control group before and after the training programme. The collected data were analysed statistically by analysis of covariance (ANCOVA) and Scheffe's post-hoc test was used to test the paired mean differences. The intensity of training was given in the table-1

**Table 1:** Change of resistance in different intensities for high, medium and low groups for twelve weeks

Group Sets × Repetition	I -III	IV-VI	VII - IX	X-XII
<b>High intensity group</b>				
3 Sets × 4 Repetition	80	85	90	95
<b>Medium intensity group</b>				
3 Sets × 6 Repetition	70	75	80	85
<b>Low intensity group</b>				
3 Sets × 9 Repetition	60	65	70	75

5% intensity increase once in three weeks.

**Rest period**

One minute between sets and

Two minutes between exercises.

The number of exercises, sets, respective repetitions and rest period remained the same throughout the experimental period.

**Analysis of the data**

**Cardio respiratory endurance**

The data collected before and after experimental period on cardio respiratory endurance of high, medium, low intensity circuit weight training groups and control group are analysed statistically and presented in table 2.

**Table 2:** Analysis of covariance for pre-and post-test data on cardio respiratory endurance among high, medium, low intensity groups and control group

	High intensity group	Medium intensity group	Low intensity group	Control group	SOV	Sum of squares	df	Mean square	'F' ratio
<b>Pre-Test</b>									
Mean	1332.66	1357.33	1374.00	1322.66	B:	24493.33	3	8164.44	.396
SD	144.393	144.393	156.012	128.922	W:	1154840.00	56	20622.14	
<b>Post-Test</b>									
Mean	1510.66	1442.66	1412.00	1442.66	B:	78240.0	3	26080.0	1.30
SD	145.20	128.08	160.05	138.433	W:	1120520.0	56	20009.28	
<b>Adjusted Post-Test</b>									
Mean	1522.09	1433.96	1389.68	1462.25	B:	136537.46	3	45512.48	7.130
					W:	351066.82	55	6383.03	

\* Significant at 0.05 level of confidence.

The table value required for significance at 0.05 levels with df 3 & 56, and 3 & 55 are 2.776 and 2.78 respectively.

Table 2 indicates that the pretest mean in cardio respiratory endurance of high intensity groups is 1332.66, medium intensity group is 1357.33, low intensity group is 1374.00 and control group is 1322.66 The 'F' ratio of 0.396 indicates that there is statistically no significant difference among the four groups in the pre-test. The post-test mean of high intensity group is 1510.66, medium intensity group is 1442.66, low intensity group is 1412.00 and control group is 1442.66 and resulted in an 'F' ratio of 1.30 which is not significant at 0.05 level of confidence. The adjusted post-test means of high

intensity group is 1522.09, medium intensity is 1433.96, low intensity group is 1389.68 and control group is 1462.25. The resulted 'F' ratio of 7.130 is significant at 0.05 level of confidence. The table value for significance at 0.05 levels with f 3 & 56 and 3 & 55 are 2.776 and 2.78. The results of the study reveal that there is significant variation in cardio vascular endurance among the four groups after the training period. Further, to determine which of the paired means had a significant difference, Scheffe's test was applied and the results of the follow-up test are presented in table 3.

**Table 3:** Scheffe's test for the adjusted posttest paired means differences on cardio- respiratory endurance

Adjusted Post-Test Means				Means Differences
High intensity group	Medium intensity group	Low intensity group	Control group	
1522.09	1433.96	-	-	88.13*
1522.09	-	1389.68	-	132.41*
1522.09	-	-	1462.25	59.84
-	1433.96	1389.68	-	44.28
-	1433.96	-	1462.25	28.29
-	-	1389.68	1462.25	72.57

\* Significant at 0.05 level.

The confidence interval required for significance at 0.05 level is 79.68.

Table 3 shows that the adjusted post-test mean difference in cardio vascular endurance between control group and high intensity group, control group and medium intensity group

and between control group and low intensity group are 59.84, 28.29 and 72.57, which are not significant at 0.05 levels as the required confidence interval is 79.68. The difference between

adjusted post-test mean of high intensity group and medium intensity group and between high intensity group and low intensity group are 88.13 which is significant and 59.84 respectively which are lower than the confidence interval required for significance at 0.05 level of confidence which is insignificant. The difference between adjusted post-test mean of medium intensity group and low intensity group is 44.28 which are statistically insignificant as the required confidence interval value is 79.68.

It may be concluded from the result of the study that all intensity groups improved their cardio vascular endurance as compared to control group due to the respective training programme. The high intensity group developed the cardio vascular endurance more than the medium and low intensity groups, but there is no significant difference between medium and low intensity groups.

### Discussion on findings

Hurely *et al.*, (1987) <sup>[2]</sup> found that by doing exercises like jogging and weight training one can reduce the body fat, foster neuromuscular relaxation, and decrease the risk of cardiovascular diseases and perhaps the other diseases too. Lombardi (1989) <sup>[4]</sup> describes weight training as the most effective way for improving multiple components of fitness. Maiorana *et al.* (2000) <sup>[3]</sup> examined the effect of a novel circuit weight training (CWT) program on cardio respiratory fitness, muscular strength, and body composition Peak exercise oxygen uptake (VO<sub>2</sub> peak) increased after the 8-wk CWT program. Vaidhiyanathan (1988) <sup>[6]</sup>, that practise of circuit training after twelve weeks had significant effect for increasing muscular strength, muscular endurance and cardio-respiratory endurance. Simmons (1997) documented that circuit training up on cardio vascular condition and motor performance showed statistically significant mean improvement in nine or fourteen cardiovascular variables. Stewart (1989) experimented that resistive training using heavy loads with few repetitions increases little to improve cardio vascular endurance. Circuit weight training, a form of resistive training using moderate loads with frequent repetitions, is used to improve cardiovascular fitness. Studies of circuit weight training in healthy adults and athletes have shown increases of 20-45% of cardiovascular improvement. The results of the above study are in line with the results of the present study. It may be concluded from the result of the study that all intensity groups improved their cardio vascular endurance as compared to control group due to the respective training programme.

### Conclusions

Based on the results of the study,

1. It was concluded that high, medium and low intensity circuit weight training groups showed significant improvement on cardio vascular fitness variable such as cardio vascular endurance compared to control group.
2. The high intensity circuit weight training programme significantly increased cardio vascular endurance as compared to the other two training programmes and the medium intensity circuit weight training programme improved better than the low intensity training programme.

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