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Effect of low and medium intensity cardiac circuit exercises on selected anthropometric measures among obese male students

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Abstract
The purpose of present study was to find out the effect of low and medium intensity cardiac circuit exercises on selected anthropometric measures among obese male students. To achieve this purpose, forty five obese male students, studying in various classes and departments of Annamalai University, Annamalai Nagar, Chidambaram, Tamil Nadu, in the age group of 21 - 25 years were selected as subjects. The selected 45 subjects were divided into three equal groups, in which, group – I (n = 15) underwent low intensity cardiac circuit exercise with 50% of heart rate, group – II (n = 15) underwent medium intensity cardiac circuit exercise with 55% of heart rate, group – III (n = 15) acted as control which did not participate in any special training. The training programme was carried three days per week for twelve weeks (alternative days). Prior to and after the training period the subjects were tested for, body mass index and percentage of body fat. Body mass index (BMI) was measured by using Deurenberg *et al.* formula and percentage of body fat was measured by using Quetelet index. The collected data were statistically analyzed by using Analysis of Covariance (ANCOVA) and Scheffĕ' s Post-Hoc Test. The result of the study was a significant decrease on percentage of body fat and body mass index after twelve weeks of low and medium intensity cardiac circuit programme. However the decrease was favour of experimental group. There was a significant difference was occurred between medium intensity cardiac circuit exercises and control group after twelve weeks of medium intensity cardiac circuit programme.

Keywords: Low, medium intensity, cardiac circuit, anthropometric measures, obese male students

Introduction
Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduced life expectancy and/or increased health problems [1]. People are considered as obese when their body mass (BMI), a measurement obtained by dividing a person's weight in kilograms by the square of the person's height in meters, exceeds 30 kg/m² [2].

It is a metabolic disorder which is affecting the people throughout the world and commonly caused by a combination of excessive food energy intake, lack of physical activity, genetic susceptibility, and other psychological problems, although a few cases are caused primarily by genes, endocrine disorders, medications or psychiatric illness [3]. The negative health (obesity) consequences are less or more insulin resistance, chances of occurring type 2 diabetes, asthma, hyper tension, increase in high total cholesterol, low density lipoproteins, triglycerides and lowering the triglycerides in blood, become sleep apnea, attaining early puberty, etc [4].

Indexes associated with high risk in obese persons often return to normal with appropriate physical activities, dietary habits, and a small weight loss even when body weight and percentage body fat remain above recommended amounts [5]. Circuit training is the most effective way to build muscles and improve cardio fitness, which makes it ideal for those who are overweight. Completing a circuit is no easy feat, as there is little or no rest between workouts, which means some level of fitness, is required [6].

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Methodology

To achieve this purpose, forty five obese male students, studying in various classes and departments of Annamalai University, Annamalai Nagar, Chidambaram, Tamil Nadu, in the age group of 21 - 25 years were selected as subjects. The selected 45 subjects were divided into three equal groups, in which, group – I (n = 15) underwent low intensity cardiac circuit exercise with 50% of heart rate, group – II (n = 15) underwent medium intensity cardiac circuit exercise with 55% of heart rate, group – III (n = 15) acted as control which did not participate in any special training. The training programme was carried out three days per week for twelve weeks (alternative days). Prior to and after the training period the subjects were tested for body mass index and percentage of body fat. Body mass index (BMI) was measured by using Deurenberg *et al.* formula and percentage of body fat were measured by using Quetelet index.

Analysis of Data

The data collected prior to and after the experimental periods on percentage of body fat and body mass index on low and medium intensity cardiac circuit exercises and control group were analyzed and presented in the following table -1.

Table 1: Analysis of covariance and 'f' ratio for percentage of body fat and body mass index on low and medium intensity cardiac circuit exercises and control group

Variable Name	Group Name	Control Group	Low intensity Group	Medium intensity Group	F ratio
Percentage of Body Fat	Pre-test Mean ± S.D	22.65 ± 1.32	23.15 ± 1.82	23.55 ± 1.82	3.01
	Post-test Mean ± S.D.	23.19 ± 0.85	21.62 ± 1.52	20.62 ± 1.52	8.56*
	Adj. Post-test Mean ± S.D.	21.42	22.98	24.78	131.15
Body Mass Index	Pre-test Mean ± S.D	29.52 ± 1.40	30.25 ± 1.65	30.37 ± 1.65	2.17
	Post-test Mean ± S.D.	30.75 ± 1.45	28.46 ± 1.99	27.78 ± 1.99	8.93*
	Adj. Post-test Mean ± S.D.	31.56	29.56	28.02	85.25

* Significant at .05 level of confidence.
(The table value required for significance at .05 level of confidence with df 2 and 43 and 2 and 42 were 3.21 and 3.22 respectively).

Further to determine which of the paired means has a significant improvement, Scheffẽ S test was applied as post-hoc test. The result of the follow-up test is presented in Table - 2.

Table 2: Scheffẽ S Test for the Difference between the Adjusted Post-Test Mean of percentage of body fat and body mass index on low and medium intensity cardiac circuit exercises and control group

Medium intensity Group	Low intensity Group	Control Group	Mean Difference	Confidence interval at .05 level
Adjusted Post-test Mean of percentage of body fat				
24.78		21.42	3.36*	0.601
24.78	22.98		1.88*	0.601
	22.98	21.42	1.56*	0.601
Body mass index				
28.02		31.55	3.53*	0.057
28.02	29.56		1.54*	0.057
	29.56	31.55	1.99*	0.057

* Significant at 0.05 level of confidence.

Results

The analysis of covariance (ANCOVA) was used to find out the significant difference if any, among the experimental groups and control group on selected criterion variables separately. In all the cases, .05 level of confidence was fixed to test the significance, which was considered as an appropriate. Since there was three groups were involved in this study, the Scheffẽ S test was used as pos-hoc test and it was shown in Table - 2.

Table - 1 showed that the results of the study there was a significant difference between medium intensity, low intensity and control group percentage of body fat and body mass index. Further the results of the study showed that there was a significant decrease on percentage of body fat and body mass index due to twelve weeks of programme. However the improvement was in favour of experimental group. The results of the study also shown that there was a significant difference between medium intensity, low intensity and control group percentage of body fat and body mass index.

Conclusions

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

1. There was a significant difference due to low and medium intensity cardiac circuit exercises on percentage of body fat and body mass index when compared with the control group.
2. The improvement in criterion variable such as percentage of body fat was higher for the medium intensity cardiac circuit exercises group than the low intensity cardiac circuit exercises group.
3. The improvement in criterion variable such as body mass index was higher for the medium intensity cardiac circuit exercises group than the low intensity cardiac circuit exercises group.
4. Significant improvements noticed on selected anthropometric measures such as percentage of body fat and body mass index due to low and medium intensity cardiac circuit exercises.

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