



EFFECT OF RESISTANCE TRAINING ENDURANCE TRAINING AND COMBINED TRAINING ON BACK STRENGTH MUSCULAR ENDURANCE AND RESTING PULSE RATE

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Abstract

The purpose of the study was to find out the effect of resistance training, endurance training and combined training on back strength, muscular endurance and resting pulse rate. Sixty male students aged between 17 and 22 years were selected for the study. They were divided into four equal groups, each group consisting of fifteen subjects in which Group I underwent resistance training, group II underwent endurance training, group III underwent combination training, three days per week for twelve weeks and group IV acted as control, which did not participate in any training. The subjects were tested on selected criterion variables such as back strength, muscular endurance and resting pulse rate at prior to and immediately after the training period. For testing the back strength, the dynamometer was used, muscular endurance was assessed by administering sit-ups test and to test the resting pulse rate, ask the subject to lie down (resting condition) and count the radial pulse for one minute. The analysis of covariance (ANCOVA) was used to find out the significant difference if any, between the experimental groups and control group on selected criterion variables separately. Since there were four groups involved in the present study, the Scheffé S test was used as post-hoc test. The selected criterion variables such as back strength, muscular endurance and resting pulse rate were improved significantly for all the training groups when compared with the control group and the leg and muscular endurance were improved significantly for combined training group and resistance training group, and in resting pulse rate, the endurance training group and combined training groups were significantly improved.

Key Words: *Resistance training, endurance training, physical fitness, back strength, muscular endurance and resting pulse rate.*

INTRODUCTION

Resistance training helps maintain and combat the loss of muscle mass by increasing muscular fitness. (<http://www.acsm.org/docs/brochures/resistance-training.pdf>) Resistance training - sometimes called weight training or strength training - is a

“specialized method of conditioning designed to increase muscle strength, muscle endurance and muscle power,” according to the American Sports Medicine Institute (ASMI) (Edward G. Mcfarland, www.google.com).

Endurance is a term widely used in sport and can mean many

different things to many different people. In sports it refers to an athlete's ability to sustain prolonged exercise for minutes, hours, or even days. Endurance requires the circulatory and respiratory systems to supply energy to the working muscles in order to support sustained physical activity

(www.busywomenfitness.com).

Back strength plays a vital role in the daily activities of man. It is an essential factor for including in almost all games and sports. Clarke (H. Harrison Clarke, *Application of measurement and Physical Education*, (New Jersey: Prentice Hall Inc., 1967), p. 184.) stated that endurance is basic in measuring organic capacity believing that if one is able to run or swim more than the normal distance without undue fatigue he is in good physical conditions. Resting pulse rate is a wave of increased pressure, which is felt at the arteries when blood is pumped out of the heart. (Evelyn C. Pearce, *Anatomy and Physiology for Nurses*, (New York: Oxford University Press, 1989), p. 156).

Methods

In this study it was aimed to find out the effect of resistance training, endurance training and combined training on back strength, muscular endurance and resting pulse rate. To achieve the purpose sixty male students from various faculties of Department of

Physical Education and Sports Sciences, Annamalai University were selected as subjects at random from the total population of 112 students. They were divided into four equal groups of fifteen each and further divided as three experimental groups and one control group, in which the group I (n=15) underwent resistance training, group II (n = 15) underwent endurance training and group III (n = 15) underwent the combination training for three days per week for twelve weeks, and group IV (n=15) acted as control which did not participate in any special training apart from the regular physical education programme of the curriculum.

For every training programme there would be a change in various structure and systems in human body. So, the researchers consulted with the experts and then selected the following variables as criterion variables: 1. Back strength, 2. Muscular endurance and 3. Resting pulse rate.

Analysis of the Data

Analysis of covariance was used to determine the differences, if any, among the adjusted post test means on selected criterion variables separately. Whenever the 'F' ratio for adjusted post test mean was found to be significant, the Scheffé *S* test was applied as post-hoc test. The level of significance was fixed at .05 level of confidence to test the 'F' ratio obtained by analysis of covariance.

Table – I

Analysis of Covariance and 'F' ratio for Back strength, Muscular endurance and Resting pulse rate of Resistance Training Group, Endurance Training Group and Combined Training Group and Control Group

Variable Name		Resistance Training Group	Endurance Training Group	Combined Training Group	Control Group	'F' Ratio
Back strength (in kgs.)	Pre-test Mean ± S.D.	66.88 ± 3.236	65.97 ± 2.976	65.87 ± 2.029	64.899 ± 3.109	0.997
	Post-test Mean ± S.D.	69.73 ± 3.167	68.79 ± 3.879	69.56 ± 2.513	64.399 ± 2.167	8.312*
	Adj. Post-test Mean	70.979	69.893	69.973	64.169	50.369*
Muscular endurance (in nos./min)	Pre-test Mean ± S.D.	65.13 ± 1.552	64.47 ± 1.807	64.13 ± 2.560	64.87 ± 2.356	0.654
	Post-test Mean ± S.D.	71.93 ± 2.434	66.13 ± 2.10	66.00 ± 2.591	64.87 ± 2.031	28.74*
	Adj. Post-test Mean	71.506	66.295	66.456	64.675	70.125*
Resting pulse rate (in nos./min)	Pre-test Mean ± S.D.	70.86 ± 2.21	71.31 ± 2.96	70.93 ± 3.11	71.31 ± 2.91	1.0939
	Post-test Mean ± S.D.	68.36 ± 2.26	68.86 ± 2.15	68.11 ± 2.31	72.59 ± 3.08	19.553*
	Adj. Post-test Mean	68.19	68.31	69.01	72.28	65.39*

* Significant at .05 level of confidence. (The table value required for significance at .05 level of confidence with df 3 and 56 and 3 and 55 were 2.77 and 2.78 respectively).

Table - II

Scheffé S Test for the Difference Between the Adjusted Post-Test Mean of Back strength Muscular endurance and Resting pulse rate

Adjusted Post-test Mean for Back strength					
Resistance Training Group	Endurance Training Group	Combined Training Group	Control Group	Mean Difference	Confidence Interval at 0.05 level
70.979	69.893			1.086*	1.00239
70.979		69.973		1.006*	1.00239

70.979			64.169	6.81*	1.00239
	69.893	69.973		0.008	1.00239
	69.893		64.169	5.721*	1.00239
		69.973	64.169	5.804*	1.00239
Adjusted Post-test Mean for Strength endurance					
71.506	66.295			5.211*	1.4364
71.506		66.456		5.05*	1.4364
71.506			64.675	6.831*	1.4364
	66.295	66.456		0.161	1.4364
	66.295		64.675	1.62*	1.4364
		66.456	64.675	1.781*	1.4364
Adjusted Post-test Mean for Resting pulse rate					
Resistance Training Group	Endurance Training Group	Combined Training Group	Control Group	Mean Difference	Confidence Interval at 0.05 level
68.19	68.31			0.12	28.1677
68.19		69.01		0.82	28.1677
68.19			72.28	4.09*	28.1677
	68.31	69.01		0.7	28.1677
	68.31		72.28	3.97*	28.1677
		69.01	72.28	3.27*	28.1677

* Significant at 0.05 level of confidence.

Results

Table – I shows that there was a significant difference among resistance training group, endurance training group, combined resistance and endurance and resistance training group and control group on back strength, muscular endurance and resting pulse rate.

Table – II shows that the Scheffé *S* Test for the difference between adjusted post-test mean of resistance training group and endurance training groups (1.086), resistance training group and combined training group (1.006), resistance training group and control group (6.81), endurance training group and control group (5.721) and combined training group and control

group (5.804), which were significant at .05 level of confidence. But there was no significant difference between endurance training group and combined training group (0.008) on back strength after the training programme.

Table – II also shows that the Scheffé *S* Test for the difference between adjusted post-test mean difference in muscular endurance between resistance training group and endurance group (5.211), resistance training group and combined training group (6.831), resistance training group and control group (1.62) combined training group and control group (1.781) were significant at .05 level of confidence. But there was no significant difference between endurance training group and

combined training groups (0.161) on muscular endurance after the training programme.

Table – II shows that the Scheffé *S* Test for the difference between adjusted post-test mean difference in resting pulse rate between resistance training group and control group (4.09), endurance training group and control group (3.97), combined training group and control group (3.27) were significant at .05 level of confidence. But there was no significant difference between resistance training group and endurance training group (0.12), resistance group and combined training group (0.82) and endurance training group and combined training group (0.7) on resting pulse rate after the training programme.

Conclusions

1. It was concluded from the results of the study that the leg strength and muscular endurance have improved significantly after the respective training programme. In the resting pulse rate, all the training groups significantly decreased.

2. When compared with the control group, all training groups has significantly differed in both the criterion variables, except in resting pulse rate.

3. It was also concluded that the resistance training group has improved their leg strength and muscular endurance better than the endurance training group and combined training group significantly. But the endurance training group and combined training group have also improved their performance significantly.

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