

## Effect of Low and Medium Intensities of Resistance Training on Leg Strength and Strength Endurance

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### Abstract

The objective of the study was to find out the effect of medium and low intensities of resistance training on leg strength and strength endurance. 45 college level male students who were not participated in any sports and games were randomly selected as subjects from S.N. College, Kannur, Kerala State. The age of the subjects were ranged from 18 to 21 years. The subjects were further classified at random into three equal groups of 15 subjects each in which group - I underwent low intensity resistance training (starts with 20% and end with 50%) for three days per week for twelve weeks, group - II underwent medium intensity resistance training (starts with 40% and ends with 70%) for three days per week for twelve weeks and group – III acted as control who were not undergo any special activities other than normal curricular activities. The selected criterion variables such as leg strength and strength endurance were assessed before and after the training period. Leg strength was assessed by using dynamometer and strength endurance was measured by administering sit – ups test. The collected data were statistically analysed by using Analysis of Covariance (ANCOVA). Since, three groups were involved in the present study, the Scheffe *S* post-hoc test was utilized. From the results of the study it was found that there was a significant improvement in leg strength and strength endurance for low and high intensity resistance training groups when compared with the control group.

**KEYWORDS:** low and high intensity resistance training, leg strength, strength endurance, ANCOVA and Scheffe *S* post-hoc test.

### INTRODUCTION

The word training implies various things in various fields. In sports the word training is by and large comprehended to be an equivalent of doing exercise. Sports medicine and exercise physiologists comprehend training to do physical exercise for development of performance or of independent performance factors.[1] Training includes building an activity program to foster a competitor for a specific event. This expanding expertise and energy limits are equivalent thought.[2] In exercises were execution is most directly and unbiasedly quantifiable, like in athletics and competitive swimming, training for physical conditioning is a fundamental pre-essential.[3]

Physical training alludes to the process utilized to foster the segments of physical fitness concerning model, how to improve vigorous perseverance, to extend and loosen up muscles, to build arm and shoulder solidarity to related exercise and projects to explicit necessities or individual games.[4] Training increasing skill and energy capacities are equal consideration.[5] Without contest, training is unimportant to-day. Every country is attempting to accomplish high level execution and to win shrubs in global rivalries.

Strengthening one's muscles through resistance training offers numerous advantages and makes it simpler to do one's every day schedule. One can find that

conveying the briefcase, doing laundry and pulling groceries supplies becomes simpler when one's arm and chest muscles are conditioned.[6]

Resistance training is the utilization of resistance from muscular constriction to develop the strength, anaerobic endurance, and size of skeletal muscles. There are various strategies for resistance training, the most widely recognized being the utilization of gravity or elastic/hydraulic powers to go against muscle constriction. When appropriately performed, resistance can give huge useful advantages and improvement in overall wellbeing and prosperity, including increased bone, muscle, ligament and tendon strength and sturdiness, improved joint capacity, decreased potential for injury, expanded bone thickness, an impermanent expansion in digestion, improved heart capacity, and raised HDL (good) cholesterol.

Varieties of a resistance training program, for example, rest interval, frequency, volume, and intensity can be controlled to actuate muscular adaptations.[7-8] Concerning to intensity, training with loads associating to 65–85% of most extreme dynamic strength (1RM) has been prescribed to expand strength and muscle mass. On the other hand, a few investigations have shown that low to moderate intensities (30–50% 1RM) promote comparative gains in muscle mass contrasted with training with higher intensities.[9-12] On the other hand, high intensity resistance training brought about better strength gains compared than low-intensity work out.[13] Numerous examinations have sought to contrast muscular adaptations and low-versus high intensity resistance training. Some have discovered more prominent expansions in muscle hypertrophy with heavier intensity[14-16], while others showed no critical contrasts among low and high intensity.[17-21]

During resistance training, the increase in muscle strength in the early phase is attributable to neural adaptation rather than from changes in the muscle size. Any further increase thereafter is mostly attributable to muscular hypertrophy,[22] as well as nerve root mobilization[23] during resistance training.

## **MATERIALS & METHODS**

This study under investigation involves the experimentation of low and medium intensity resistance training on leg strength and strength endurance. Only college aged male students studying in various departments of S.N. College, Kannur, Kerala and aged between 18 and 21 years were selected. The average age in the experimental and control groups were 20.1 years. The selected forty-five subjects were randomly divided into three groups of fifteen each, out of which group - I (n = 15) underwent low intensity resistance training (starts with 30% and end with 45%, (increased 5% by every week)), group - II (n = 15) underwent medium intensity resistance training (starts with 45% and end with 60% (increased 5% by every week)) and group - III (n = 15) remained as control. The training programme was carried out for three days per week during morning session only (6 am to 8 am) for twelve weeks. The 1RM testing procedure was conducted according to the Brown and Weir (2001)[24] and the load was fixed accordingly. The participant of the study were interrogated about their involvement of physical exercise during previous years and confirmed that there was no participation in any type of physical activity for past one year. All participants provided their written informed consent to participate in this study prior to enrollment. The experimental groups underwent training programme under the guidance of well-trained

gym instructors. Attendance of the participants was taken at each training sessions and the training groups attendance was 99%.

The researcher selected following criterion variables: 1. Leg Strength, and 2. Strength Endurance. Leg strength was measured by using dynamometer and strength endurance was assessed by administering sit and reach test. For the purpose of collection of data, the subjects were asked to report at early morning, one day prior and one day after experimental period.

#### DATA ANALYSIS

The Analysis of covariance (ANCOVA) was applied to find out the significant difference if any, among the experimental group 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 appropriate. Since there were three groups were involved in the present study, Scheffe *S* test was applied as post-hoc test.

The data collected prior to and after the experimental periods on leg strength and strength endurance on low and medium intensity resistance training and control group were analysed and presented in the following table - I.

**Table – I**

**Analysis of covariance and ‘f’ ratio for leg strength and strength endurance among low and medium intensity resistance training and control groups**

Variable Name	Mean and Standard Deviation Values	Low Intensity Resistance Training Group	Medium Intensity Resistance Training Group	Control group	‘F’ - ratio
Leg Strength (in Kg)	Pre-test Mean $\pm$ S.D	53.90 $\pm$ 4.067	49.90 $\pm$ 6.367	52.60 $\pm$ 5.95	1.351
	Post-test Mean $\pm$ S.D.	56.20 $\pm$ 4.45	52.90 $\pm$ 6.89	51.40 $\pm$ 5.33	2.189
	Adj. Post-test Mean	54.517	54.027	50.955	9.329*
Muscular Strength (in Nos./min)	Pre-test Mean $\pm$ S.D	25.40 $\pm$ 6.132	24.70 $\pm$ 4.03	25.60 $\pm$ 3.27	0.104
	Post-test Mean $\pm$ S.D.	29.30 $\pm$ 7.15	26.90 $\pm$ 4.26	24.00 $\pm$ 4.13	2.45
	Adj. Post-test Mean	29.128	17.449	43.622	12.89*

\* 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).

#### Results

After analysis of data, it was found that there was a positive change in selected criterion variables. Moreover, there was a significant difference occurs between the experimental and control groups on leg strength and muscular strength. Further to determine which of the paired means has a significant difference, Scheff $\ddot{e}$  *S* test was applied as post-hoc test. The result of the follow-up test is presented in Table - II.

**Table - II**

**Scheffé s test for the difference between the adjusted post-test mean of flexibility, vital capacity and blood pressure (systolic and diastolic)**

Low Intensity Resistance Training Group	Medium Intensity Resistance Training Group	Control group	Mean difference	Confidence interval at .05 level
<b>Adjusted Post-test Mean of Leg Strength</b>				
54.517	54.027		0.49	2.841
	54.027	50.955	3.072*	2.841
54.517		50.955	3.562*	2.841
<b>Adjusted Post-test Mean of Strength Endurance</b>				
49.128	47.449		1.679	2.883
49.128		43.622	5.506*	2.883
	47.449	43.622	3.827*	2.883

\* Significant at 0.05 level of confidence.

### Conclusions

From the analysis of the data, it was inferred from the results that there was a significant improvement on selected criterion variables such as back strength and strength endurance due to the various intensities (i.e. low and medium intensities). And also there was no significant improvement after the low and medium intensity resistance training groups on selected criterion variables. Moreover the low and medium intensity resistance group was better improvement after the respective training programme on selected criterion variables when compared with the control group. The increase in leg strength was expected and is consistent with the results from a recent meta-analysis conducted by Lima *et al.*(2013)[25,26]. Fujita *et al* [27] found that the muscle mass and strength was changed following 6-day (12 sessions) of low-intensity resistance training requires blood flow restriction to produce responses comparable to the effect of several weeks of high-intensity resistance training.

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