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## Exploration and effect of resistance and endurance training on leg strength and cardiorespiratory endurance of sportspersons

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### Abstract

The purpose of the present study was to find the effect of resistance and endurance training on leg strength and cardio-respiratory endurance. For this purpose, forty five female players from the Department of Physical Education and Sports Sciences, Chaudhary Charan Singh University representing in various games and sports in the age group of 18–25 years were selected. They were divided into three equal groups, each group consisted of fifteen subjects, in which Group – I underwent resistance training, Group–II underwent endurance training and Group–III acted as control group who did not participate in any special training and underwent their regular respective training sessions. The training period for this study was three days in a week for twelve weeks. Prior to and after the training period the subjects were tested for leg strength and cardio-respiratory endurance. Leg strength was assessed by using dynamometer and cardio-respiratory endurance was assessed by administering Cooper’s 12 minutes run/walk test. The result of the study has shown that the resistance training group has significantly improved the leg strength but not in cardio-respiratory endurance and endurance training group has significantly improved their cardio-respiratory endurance and also in leg strength after twelve weeks of training when compared with the control group. Moreover, there was a significant difference has occurred between the training groups on leg strength in favour of resistance training.

**Keywords:** endurance training, cardiorespiratory endurance, sportspersons

### Introduction

Human beings have consistently tried to run faster, jump higher and exhibit greater strength, endurance and skill. We are naturally competitive and ambitious of excellence in athletic performances. As a result of practical experience, observation and scientific experimentation, old method of conditioning, though fascinating and rich in tradition, have been discarded and replaced by new methods based on insight and understanding. For centuries, this evaluation towards better methods of conditioning was slow, but in the recent years the dramatic changes that have taken place have brought about some astounding results in performance. New advances in science make it possible to run faster and jump higher than ever before. Plyometrics is a form of exercise, which links strength with speed of movement. There are two phases of muscle contraction during the running or jumping motion. Muscles go through a stretch phase, and then a contraction phase. Plyometric exercises are designed to shorten the cycle time between the two phases.

A rapid cycle time allows maximum energy transfer between stretch and contraction phases. The new frontal platform shoes have been shown to dramatically improve the efficiency of plyometric exercises. Training in frontal platform shoes is increasingly becoming the method of choice for serious sprinters and jumpers. No other method develops as quickly, the specific muscle groups and neural connections essential for running, speed and jumping height. Strengthening one’s muscles through resistance training offers many benefits and makes it easier to do one’s daily routine. One can find that carrying your briefcase, doing laundry and hauling groceries becomes easier when one’s arm and chest muscles are toned. Leg strength is very essential for sports persons, especially athletes. The strength of a muscle is related to its cross sectional area or girth. The larger the muscle, the stronger it is. Strength training increased the contractile protein that gives the muscle its pulling power. By comparing strength to performance, it is possible to determine if more strength is needed. If an athlete’s performance improves with increased strength then strength training is to be recommended.

Cardio-respiratory endurance is the ability work close to one's maximum aerobic capacity for a prolonged period of time. To increase one's endurance is depend upon increasing the ability to work at high, relative work load for extended periods of time.

### Materials and Methods

This study under investigation involves the experimentation of resistance and endurance training on leg strength and cardio-respiratory endurance. Only forty-five female players from various games and sports those who were studying in the Department of Physical Education and Sports Sciences, Chaudhary Charan Singh University from various classes and aged between 18 and 25 years were selected as subjects. The selected forty-five subjects were randomly divided into three groups of fifteen each, out of which Group- I (n = 15) underwent resistance training, Group-II (n = 15) underwent endurance training and Group- III (n = 15) remained as control, which did not participate any special activities. The

training programme was carried out for three days per week during morning session only (6 am to 8 am) for twelve weeks. Leg strength was assessed by using dynamometer and cardio-respiratory endurance was assessed by administering Cooper's 12 minutes run/walk test. The analysis of covariance (ANCOVA) was used to find out the significant difference if any, between the experimental groups on selected criterion variables separately. In all the cases, 0.05 level of confidence was fixed to test the significance, which was considered as an appropriate. Since, there were three groups involved, the Scheffé S test was applied as post hoc test

### Analysis of data

The data collected prior to and after the experimental periods on leg strength and cardio-respiratory endurance on resistance training group, endurance training group and control group were analysed and presented in the following Table 1.

**Table 1:** Analysis of Covariance and 'F' ratio for Leg strength and Cardio-respiratory endurance for Resistance Training Group, Endurance Training Group and Control Groups

Variable Name	Group Name	Resistance Training Group	Endurance Training Group	Control Group	'F' Ratio
Leg strength (in kgs.)	Pre-test Mean $\pm$ S.D	46.31 $\pm$ 1.86	45.81 $\pm$ 2.16	46.11 $\pm$ 1.861	1.019
	Post-test Mean $\pm$ S.D.	48.883 $\pm$ 1.98	47.11 $\pm$ 1.193	45.86 $\pm$ 1.123	5.112*
	Adj. Post-test Mean	49.121	47.86	45.315	12.883*
Cardiorespiratory Endurance (Meters)	Pre-test Mean $\pm$ S.D	1286.3 $\pm$ 25.12	1281.9 $\pm$ 30.71	1287.6 $\pm$ 29.55	1.598
	Post-test Mean $\pm$ S.D.	1289.5 $\pm$ 26.88	1301.5 $\pm$ 28.26	1288.9 $\pm$ 27.46	9.213*
	Adj. Post-test Mean	1288.71	1312.65	1286.198	21.923*

\*Significant at .05 level of confidence. (The table value required for significance at .05 level of confidence with df 2 and 42 and 2 and 41 were 3.22 and 3.23 respectively).

**Table 2:** Scheffé S Test for the Difference Between the Adjusted Post-Test Mean of Selected Criterion Variables Adjusted Post-test Mean on Leg Strength

Resistance Training Endurance	Control	Mean	Confidence
<b>Group Training</b>	<b>Group Difference interval at .05 Level</b>		
49.121	45.315	3.806*	2.18167
49.121	47.86	1.231*	1.18167
	47.86	45.315	2.545*
<b>Adjusted Post-test Mean on Leg strength</b>			
1288.71	1286.198	2.512	18.37256
1288.71	1312.65	23.94*	18.37256
	1312.65	1286.198	26.452*

\* Significant at .05 level of confidence.

### Results

Table 1 showed that there was a significant difference among resistance training group, endurance training group and control group on leg strength and cardio-respiratory endurance.

Table 2 shows that the Scheffe S Test for the difference between adjusted post-test mean difference in leg strength between resistance training group and control group (3.806), endurance training group and control group (2.545) and resistance training group and endurance training group (1.231) were significant at .05 level of confidence. Table 2 also shows that the Scheffe S Test for the difference in cardiorespiratory endurance between adjusted post-test mean of resistance training group and endurance training group (23.94) and endurance training group and control group (26.452), which were significant at .05 level of confidence. And there was no significant difference between

resistance training group and control group (2.512) on cardio-respiratory endurance after the training programme.

### Discussion on the findings

Based on the results of the study, the following findings were drawn:

Both the training groups have significant increase in leg strength when compared with control group. Moreover, the resistance training group has better improvement in leg strength than the endurance training group. This result is in line with the findings of K. Spanos *et al.* (2007)<sup>[8]</sup>, and W.J. Kraemer *et al.* (2001)<sup>[10]</sup> were found that there was a significant increase in leg strength after the resistance training. Hennesay and Watson (1994)<sup>[9]</sup> have found that combined training (resistance and endurance training) have improved the strength significantly.

There was a significant improvement in cardio-respiratory endurance after the endurance training when compared with resistance training and control groups. But there was no significant improvement in cardiorespiratory endurance after the resistance training. This result is in line with the findings of Raja (1992) and Uppal (1980)<sup>[12]</sup> found that there was a significant improvement in cardio-respiratory endurance after the endurance training.

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