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Effect of par course training and interval training on leg strength cardio-respiratory endurance and vital capacity

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Abstract
The purpose of the present study was to find out the effect of par course training and interval training on leg strength, cardio-respiratory endurance and vital capacity. For this purpose, forty five male students of different match practice group from LNIPE Gwalior with age group of 19 to 23 years were selected as subjects. They were divided into three equal groups, each group consisted of fifteen subjects, in which group – I underwent par course training, group – II underwent interval training and group – III acted as control which did not participate in any special training, except their regular curricular activities. 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, cardio-respiratory endurance and vital capacity. The selected criterion variables, such as, leg strength, cardio respiratory endurance and vital capacity, were tested by using and administering, dynamometer, Cooper's 12 minutes run/walk test and wet spirometer. The Analysis of Covariance (ANCOVA) was applied as statistical tool. Where the post-test means found significant, the Scheffé's was applied as post-hoc test. In all cases, 05 level of confidence was fixed to test the significance, which was considered as an appropriate. It was concluded from the results of the study that the training groups have improved leg strength, cardio-respiratory endurance and vital capacity.

Keywords: course training, leg strength, cardio-respiratory

Introduction
Physical training is one of the most important ingredients in training to achieve high performance. The objectives of physical training are to increase the athlete's physiological potential and to develop biomotor abilities to the highest standards (Tudor O. Bompa, 1999) [4]. A new concept of circuit training developed in Europe has been adopted recently in the United States and Canada called 'par course'. It consists of a series of stations set up over a one to two and a half mile path, to provide a recreational exercise circuit for individuals of all ages and abilities. (William E. Prentice and Charles A. Bucher, 1988)

Interval training is a type of physical training that involves bursts of high-intensity work interspersed with periods of low-intensity work. The high-intensity periods are typically at or close to near-maximum exertion, while the recovery periods may involve either complete rest or activity of lower intensity. Interval training can refer to organization of any cardiovascular workout (e.g. cycling, running, rowing, etc.), and is prominent in many sports' training. It is a technique particularly employed by runners, but athletes from several backgrounds have been known to use this type of training. The endurance required resisting fatigue due to loading at sub maximum and maximum intensity (approximately 85–100% maximum intensity) and predominantly aerobic production of energy. It is essential in sports demanding this types of endurance that speed is not reduced due to fatigue or innovation inhibition.

Vital capacity is the maximum amount of air a person can expel from the lungs after a maximum inspiration. It is equal to the inspiratory reserve volume plus the tidal volume plus the expiratory reserve volume. A person's vital capacity can be measured by a spirometer which can be a wet or regular spirometer. In combination with other physiological measurements, the vital capacity can help make a diagnosis of underlying lung disease. The unit that is used to determine this vital capacity is the milliliter (ml). A normal adult has a vital capacity between 3 and 5 liters.

Methodology
The purpose of the present study was to find out the effect of par course training and interval training on leg strength, cardio-respiratory endurance and vital capacity. For this purpose, forty five male students of different match practice group from LNIPE Gwalior with age group of 19 to 23 years were selected as subjects. They were divided into three equal groups, each group consisted of fifteen subjects, in which group – I underwent par course training, group – II underwent interval training and group – III acted as control group. The training period for this study was three days in a week for twelve weeks.

For every training programme there would be a change in various structure and systems in human body. So, the researcher consulted with the experts, then selected the following variables as criterion variables: 1. leg strength, 2. cardio-respiratory endurance and 3.Vital capacity. The selected criterion variables such as, leg strength, cardio-respiratory endurance and vital capacity, were tested by using and administering, dynamometer, Cooper's 12 minutes run/walk test and wet spirometer.

Statistical Analysis
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 posttest 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.

Results

Table 1: Analysis of Covariance and 'F' ratio for Leg strength, Cardio-respiratory Endurance and Vital Capacity of Par course Training and Interval Training Groups and Control Group

variables	group	Parcourse Training Group	Interval Training Group	Control group	'F' Ratio
Leg Strength (in kg)	Pre-test Mean ±S.D	69.53±4.565	67.93±1.932	69.13±5.222	0.388
	Post-test Mean ±S.D.	72.60±5.962	69.20±5.647	68.07±5.092	2.683
	Adj. Post-test Mean ± S.D.	71.903	70.176	67.788	35.274*
Cardio-respiratory Endurance (in Mts.)	Pre-test Mean ±S.D	2856±63.56	2844±37.95	2838.3±45.3	0.304
	Post-test Mean ±S.D.	2892.7±63.5	2893.3±52.5	2838.7±50.3	4.755*
	Adj. Post-test Mean ± S.D.	2885.725	2896.523	284242	9.11*
Vital Capacity (liters)	Pre-test Mean ±S.D	4.5573±0.054	4.5453±0.04	4.574±0.039	1.619
	Post-test Mean ±S.D.	4.5747±0.058	4.5653±0.04	4.5693±0.05	0.136
	Adj. Post-test Mean ± S.D.	4.576	4.580	4.553	12.115*

* Significant at .05 level of confidence. (The table value required for significance at .05 level with df 2 and 42 and 2 and 41 are 2.21 and 3.22 respectively).

Table 2: Scheffe S Test for the Difference between the Adjusted Post-Test Mean of Leg Strength, Cardio respiratory endurance and Vital Capacity

Adjusted Post-test Mean on Leg Strength				
Parcourse Training Group	**Interval Training Group**	**Control group**	**Mean Difference**	**Confidence interval at .05 level**
71.903		67.788	4.115*	1.24839
71.903	70.176		1.727*	1.24839
	70.176	67.788	2.388*	1.24839
Adjusted Post-test Mean on Cardio-respiratory Endurance				
2885.725		2842.42	43.305*	34.013543
2885.725	2896.523		10.798	34.013543
	2896.523	2842.42	54.103*	34.013543
Adjusted Post-test Mean on Vital Capacity				
4.576		4.553	0.023*	0.014471
4.576	4.580		0.004	0.014471
	4.580	4.553	0.027*	0.014471

*Significant at .05 level of Confidence.

Discussion

Table – I showed that there was a significant difference among par course training group, interval training group and control group on leg strength, cardio-respiratory endurance and vital capacity. Table – II shows that the Scheffé's test on leg strength for the difference between adjusted post-test mean of between par course training group and control group (4.115), par course training group and interval training group (1.727) and interval training group and control group (2.388), which were significant at .05 level of confidence. Moreover, the par course training group was significantly increased the leg strength than the interval training group. Interval training group were better improvement than the control group. Table– II shows that the Scheffé's test on cardio-respiratory endurance for the difference between adjusted post-test mean difference of par course training group and control group (43.305), and interval training group and control group (54.103), which were significant at .05 level of confidence. Table – II shows that the Scheffé's test on vital capacity for the difference between adjusted post-test mean difference of par course training group and control group (0.023), and interval training group and control group (0.27), which were significant at .05 level of confidence. The result of the study also shown that there was a significant difference between the training groups on leg strength and there was no significant difference occurred between the training groups on cardio-respiratory endurance and vital capacity after the training programme.

Conclusions

It was concluded from the results of the study, the leg strength, cardio-respiratory endurance and vital capacity has improved significantly after the respective training programs. When compared with the control group, the training groups has significantly improved in selected criterion variables, such as, leg strength, cardio-respiratory endurance and vital capacity. There was a significant difference was found between the training groups on leg strength after the completion of twelve week training programme, in which par course training group have improved the leg strength than the interval training group.

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