

Effect of Circuit and Parcourse Training on Leg Strength and Selected Biochemical Variables

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Abstract

The purpose of the present study was to find the effect of circuit training and parcourse training on resting pulse rate and selected biochemical variables. For this purpose, forty-five subjects studying bachelor degree in the age group of 19 – 21 years were selected. They were divided into three equal groups, each group consisted of fifteen subjects, in which group – I underwent circuit-training, group – II underwent parcourse training and group – III acted as control group who did not participate in any special training. 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 strength endurance. It was concluded after the circuit and parcourse training, that both training improved all the criterion variables.

Keywords: Circuit training, Parcourse training, Leg strength, Cardio-respiratory endurance, Strength endurance.

Introduction

In this modern hectic world, everything is uncertain and inconsistent as today's world is a world of competitions and this is very true in the case of sports and games. In fact, it is the result of fame, health and wealth that they earn by participating and / or winning medals at the international level in sports and games. This has resulted in countries spending millions of dollars on research projects to invent new techniques and technology to achieve excellence in their goal.

Phenomenal progress registered in performance in different sports disciplines are attributable to several factors, the most important of which include better training methods, improved nutrition, better equipment and play fields and better selection of athletes. Of these factors, training methods and procedures to select athletes to sports that are suitable to them have been markedly revolutionized. The rapid progress made in the understanding of the mechanism involved in the adaptation of athletes to different training procedures has significantly contributed to the development of interval training, circuit training, parcourse training and resistance training. Variations in these training methods have been introduced to make them appropriate and to achieve specific performance objectives. Therefore, training methods and techniques are generally used according to the degree of the involvement of different elements of fitness in any sports performance.

Fitness is the ability to live a full and balanced life. The totally fit person has a healthy and happy outlook on life. Fitness is the young man's absolute necessity. It breeds self-reliance and keeps man mentally alert. Physical fitness is essential for human beings to adjust well to his environment whose mind and body are in complete harmony. The physical fitness components are the basic prerequisites.

Sports' training is a process of preparation of sportsman, based on scientific and pedagogical principles, for higher performance. (Hardayal Singh, 1984). Fox and Mathews (1974) opined that the training should construct an exercise programme to develop an athlete for a particular event. This helps in increasing skill and energy capacities.

Circuit training was developed by R.E. Morgan and G.T. Anderson in 1957 at the University of Leeds in England. Further, he explained that the term circuit refers to a number of carefully selected exercises arranged consecutively. In the original format, 9 to 12 stations comprised the circuit. This number may vary according to the design of the program. Each participant moves from one station to the next with little (15 to 30 seconds) or no rest, performing a 15 to 45 seconds work out of 8 to 20 repetitions at each station (using a resistance of about 40% to 60% of one-repetition maximum). The program may be performed with exercise machines, hand-held weights, elastic resistance, calisthenics or any combination.

Pollock *et al* (1998) explained that circuit training is proven to be one of the best ways to make a resistance and strength training workout which also is challenging for one's heart and lungs. This workout is a 20 to 30 minute one that will take a person maximum physical effort as well as your maximum target heart rate. The object of a circuit workout is not to rest in between exercises. The particular exercise will burn out the targeted muscle group as well as increase one's heart rate to a fat and sugar burning zone.

A new concept of circuit training developed in Europe has been adopted recently in the United States and Canada called 'parcourse'. 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). Circuit training is probably the most common training regime used by a wide variable of sports activities in order to improve performances. A circuit consists of a number of different stations at which the athlete performs a given exercise as many times as possible within a given time period. When the time is completed, the individual moves on to next station and performs a different exercise for a similar period of time and so on around the various stations (Christopher Connolly and Hetty Einzing, 1986).

Methods

In this study, the effect of two training programmes, namely circuit training and parcourse training on leg strength, cardio-respiratory endurance and strength endurance have been examined. The pulse rate and selected criterion variables for this study was leg strength, cardio-respiratory endurance and strength endurance.

Forty-five subjects were randomly selected and divided into three equal groups of fifteen subjects each, out of which group - I ($n = 15$) underwent circuit training, group - II ($n = 15$) underwent parcourse training and group - III ($n = 15$) remained as control.

For the purpose of collection of data on leg strength, cardio-respiratory endurance and strength endurance, the subjects were asked to report early morning, one day prior to the commencement of training and one day after the training. It was ensured that the subjects did not taken any food or beverages for the past 9 to 10 hours. The post-test data was taken after 48 hours after the completion of 12 weeks training period. For collection of data on leg strength the leg lift with dynamometer was used, Cooper's 12 minutes run/walk test was administered to collect the data on cardio-respiratory endurance and sit-ups was used to measured strength endurance.

Training Programme

The control group was not exposed to any specific training programme. The experimental group - I and group - II were subjected to twelve weeks of circuit and parcourse training programmes respectively. The training was given for three days per week. The intensity of the training for both the groups were given below:

Circuit Training

In circuit training, a subject moved from one station to another and performed the prescribed exercise with in the fixed duration at each station. The duration of the exercise varied between 45 to 50 seconds with seven exercises per circuit and the number of circuits varied between two-and-three for twelve weeks. The recovery time between circuits varied between five and four minutes.

Table - I
Training Intensity for Circuit Training

Week	Duration of exercise (in seconds)	Number of circuits	Recovery time between circuit (in minutes)
I - II	45	2	5
III - IV	45	2	4
V - VI	50	2	5
VII - VIII	50	2	4
IX - X	45	3	5
XI - XII	50	3	4

Parcourse Training

A series of seven exercise stations was framed in a standard 400 meters track. A subject should move from one station to another by jogging within a distance of 150 meters. In between sets the subjects continue their exercise without any rest period. In parcourse training, the exercise stations were same as in circuit training.

Table - II

Training Intensity for Parcourse Training

Week	Duration of exercise in a station (in seconds)	Number of sets
I - II	45	2
III - IV	45	3
V - VI	50	2
VII - VIII	50	3
IX - X	55	2
XI - XII	55	3

The subjects underwent the training programme alternatively for three days in a week, excluding Saturdays and Sundays for twelve weeks between 5.00 and 6.00 p.m.

Analysis of the Data

The data collected prior to and after the experimental period on leg strength, cardio-respiratory endurance and strength endurance on circuit training group, parcourse training group and control group were analysed and presented in the following table -3.

Table - III

Analysis of Covariance and 'F' ratio for Leg Strength, Cardio-respiratory Endurance and Strength Endurance for Circuit training, Parcourse Training and Control Groups

Variable name	Group name	Circuit training	Parcourse training	Control group	'F' ratio
Leg strength	Pre-test Mean $\pm$ S.D	101.73 $\pm$ 6.83	97.93 $\pm$ 5.69	100.47 $\pm$ 7.51	1.24
	Post-test Mean $\pm$ S.D.	104.87 $\pm$ 7.61	98.53 $\pm$ 5.42	99.73 $\pm$ 7.64	3.49*
	Adj. Post-test Mean $\pm$ S.D.	103.16	100.66	99.31	20.36*
Cardio-respiratory endurance	Pre-test Mean $\pm$ S.D	2473.33 $\pm$ 59.00	2462.67 $\pm$ 58.12	2446.67 $\pm$ 46.09	0.90
	Post-test Mean $\pm$ S.D.	2488.67 $\pm$ 53.03	2541.33 $\pm$ 64.90	2382.00 $\pm$ 95.56	18.36*
	Adj. Post-test Mean $\pm$ S.D.	2477.58	2539.75	2394.67	25.31*
Strength endurance	Pre-test Mean $\pm$ S.D	34.00 $\pm$ 4.75	36.20 $\pm$ 3.03	33.80 $\pm$ 3.91	1.70
	Post-test Mean $\pm$ S.D.	36.60 $\pm$ 5.30	40.07 $\pm$ 2.66	33.20 $\pm$ 4.07	10.24*
	Adj. Post-test Mean $\pm$ S.D.	37.18	38.74	33.95	15.02*

* 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 3.219 respectively).

Table – IV

Scheffe's Test for the Difference between the Adjusted Post-Test Mean of Leg Strength, Cardio-respiratory Endurance and Strength Endurance

Adjusted Post-test mean				
Circuit training group	Parcourse training group	Control group	Mean difference	Confidence interval at .05 level
103.16		99.31	3.85*	1.91
103.16	100.66		2.5*	1.91
	100.66	99.31	1.35	1.91
Cardio-respiratory endurance				
2477.58		2394.67	82.91*	62.82
2477.58	2539.75		62.17	62.82
	2539.75	2394.67	145.08*	62.82
Strength endurance				
37.18		33.95	3.23*	2.72
37.18	38.74		1.56	2.72
	38.74	33.95	4.79*	2.72

Results

The training intensity for circuit and parcourse training was shown in Table – I and II. Before applying the experiment all the subjects of the circuit training, parcourse training and control groups attended the pre-test, which was conducted a day prior to the commencement of the training and the data were collected on resting leg strength, cardio-respiratory endurance and strength endurance. After twelve weeks of training the post-test was conducted one day after the training period to find out any changes in the criterion variables.

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 0.5level 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 Scheffe's test was used as pos-hoc test and it was shown in Table - IV.

After applying the analysis of covariance, comparing the adjusted post-test means of the entire criterion variables leg strength, cardio-respiratory endurance and strength endurance, both the training groups were significantly increased the performance after the training period. Among the three criterion variables, leg strength was having significant difference between circuit training and parcourse training but in favor of circuit training. Basically the circuit and parcourse training has tremendously improves the strength and endurance.

Discussion

The results of the study reveal that there was a significant changes after the circuit training and parcourse training in resting pulse rate (Vaithianathan, 1988). Basically any type of physical activities may alter the endurance and strength in a positive manner.

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