



Effects of Weight Training and Circuit Weight Training on Selected Strength and Physiological Variables

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Abstract

The purpose of the present study was to find out the effect of weight training and circuit weight training on strength and physiological variables among male players of various games and sports. For this purpose, forty five male players studying in various colleges around Thiruvallur, Tamilnadu, were selected as subjects. The age of the subjects ranged from 18 to 23 years. They were divided into three equal groups, each group consisted of fifteen subjects, in which experimental group - I underwent weight training, experimental group - II underwent circuit weight training and group - III acted as control who did not participate in any special activities apart from their regular activities. The training period for the present study was three days (alternative days) in a week for twelve weeks. Prior to and after the experimental period, the subjects were tested on leg strength, strength endurance and vital capacity. Leg strength was assessed by administering dynamometer in kilograms, strength endurance was assessed by administering sit-ups test in numbers per minute and vital capacity was analysed by using wet spirometer in liters. The Analysis of Covariance (ANCOVA) was applied to find out any significant difference between the experimental groups and control group on selected criterion variables. Whenever the adjusted post-test mean was found to be significant, the Scheffé S was used as post-hoc test. The result of the study shows that the weight training and circuit weight training groups were increased the leg strength, strength endurance and vital capacity significantly ($P > .05$). It was concluded from the results of the study that weight training and circuit weight training has brought positive changes in leg strength, strength endurance and vital capacity as compared to the control groups. It was concluded that no significant difference was found between the weight training group and circuit weight training group on selected criterion variables.

Keywords: Weight training, Weight circuit training, Leg strength, Strength endurance, Vital capacity.

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Introduction

Weight training is a common type of strength training for developing the strength and size of the skeletal muscles. It uses the force of gravity (in the form of weighted bars, dumbbells or weight stacks) to oppose the force generated by muscle through concentric or eccentric contraction.[1] The basic principles of strength training involve a manipulation of the number of repetitions (reps), sets, tempo, exercises and force to cause the desired changes in strength, endurance, size or shape by overloading a group of muscles.[2]

Weight training boosts VO₂ max, the maximum capacity of an individual's body to transport and use oxygen during incremental exercise, which reflects the physical fitness of the individual.[3] Circuit training is a workout routine that combines cardiovascular fitness and resistance training. It was first proposed in the late 1950s as a method to develop general fitness.[4] In planning a

circuit training programme, exercises are chosen to fit the need of the individual. [5]

Circuit weight training (CWT) was developed in the 1950's to address the question of whether one program can increase muscular strength and endurance while working the aerobic system.[6] In a circuit weight training session, heart rate average around 80% of max, but oxygen consumption only 40% of VO₂max, which is the minimum level for aerobic fitness improvements.[7]

Leg strength plays a vital role in the daily activities of human being. It is an essential factor for including in almost all games and sports. Strength endurance is defined as the capacity of the whole organism to withstand under the long lasting experience of strength.[8] Vital capacity is the amount of oxygen which can be inspired by the lungs to fuel the body with oxygen.[9]

Methods

Forty five male sports person around Thiruvallur, Tamilnadu studying in various colleges were selected as subjects. The age of the subjects ranged from

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18 to 23 (mean age = 21.0 ± 0.7 months) years. *Design:* The selected subjects were divided into three equal groups, each group consisted of fifteen subjects, in which group - I (n=15) underwent weight training, group - II (n=15) underwent circuit weight training and group - III (n=15) acted as control, which did not participate in any special activities apart from their regular curricular activities. The training period for weight training group and circuit weight training group was three days (alternative days) per week for twelve weeks. The researcher consulted with the physical education professionals and coaches of various games and sports and selected the following variables as criterion variables: 1. leg strength, 2. strength endurance and 3.vital capacity. The leg strength was assessed by using leg lift with dynamometer and it was recorded in kilograms, strength endurance was assessed by administering sit-ups test and it was recorded in numbers per minutes and vital capacity was assessed by using the

wet spirometer and it was recorded in liters. For the purpose of collection of data the subjects were asked to report early morning, one day prior and one day after experimental period.

Analysis of covariance (ANCOVA) was applied to find out the significant difference if any, among the experimental groups 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 appropriate. Whenever the 'F' ratio was a significant in adjusted post test mean, the Scheffé S was applied as post-hoc test.

Results and Discussion

The data collected on leg strength, strength endurance and vital capacity among weight training group, circuit weight training group and control group were analysed and presented in Table – I.

Table I. Analysis of Covariance on Selected Criterion Variables among Experimental and Control Groups

<i>Variable Name</i>	<i>Group Name</i>	Weight Ttraining Group	Circuit Weight Training Group	Control Group	'F' Ratio
Leg Strength (in Kgs.)	Pre-test Mean \pm S.D	77.13 \pm 5.668	76.20 \pm 5.48	77.13 \pm 6.664	0.123
	Post-test Mean \pm S.D.	79.33 \pm 5.447	78.27 \pm 5.59	76.40 \pm 6.822	0.922
	Adj. Post-test Mean	79.027	78.879	76.094	27.104*
Strength Endurance (No./min)	Pre-test Mean \pm S.D	32.47 \pm 3.226	30.67 \pm 2.19	32.07 \pm 3.282	1.555
	Post-test Mean \pm S.D.	35.27 \pm 3.081	34.13 \pm 2.20	31.20 \pm 3.052	8.381*
	Adj. Post-test Mean	34.680	34.987	30.933	31.22*
Vital capacity (Liters)	Pre-test Mean \pm S.D	3.43 \pm 0.16	3.44 \pm 1.40	3.43 \pm 0.17	0.026
	Post-test Mean \pm S.D.	3.67 \pm 0.13	3.66 \pm 0.15	3.42 \pm 0.873	14.25*
	Adj. Post-test Mean	3.667	3.655	3.425	30.19*

*Significant 0.05 level of confidence. (The table values required for significance at .05 level of confidence with df 1 and 28 and 1 and 27 were 4.20 and 4.21 respectively).

Table – I shows that pre and post test means 'f' ratio of weight training group, circuit weight training group and control group on leg strength were 0.123 and 0.922, which was not significant ($p > 0.05$). The adjusted post test mean 'f' ratio value of experimental groups and control group was 27.104, which was significant ($p < 0.05$). The pre and post test means 'f' ratio of weight training group, circuit weight training group and control group on strength endurance were 1.555, which was not significant ($p > 0.05$) and 8.381, which was significant

($p < 0.05$). The adjusted post test mean 'f' ratio value of experimental groups and control group was 31.22, which was significant ($p < 0.05$). The pre and post test means 'f' ratio of weight training group, circuit weight training group and control group on vital capacity was 0.026, which was not significant ($p > 0.05$) and 14.25, which was significant ($p > 0.05$). The adjusted post test mean 'f' ratio value of experimental groups and control group was 30.19, which was significant ($p > 0.05$).

Table II. Scheffe's Test for the Difference between the Adjusted Post-Test Mean on Selected Criterion Variables

Adjusted Post-test Mean on Leg Strength				
Weight Training Group	Circuit Weight Training Group	Control Group	Mean Difference	Confidence interval at .05 level
79.027		76.094	2.933*	1.140067
79.027	78.879		0.148	1.140067
	78.879	76.094	2.785*	1.140067
Adjusted Post-test Mean on Strength endurance				
34.680		30.933	3.747*	1.444971
34.680	34.987		0.307	1.444971
	34.987	30.933	4.054*	1.444971
Adjusted Post-test Mean on Vital capacity				
3.667		3.425	0.242*	0.089348
3.667	3.655		0.012	0.089348
	3.655	3.425	0.23*	0.089348

* Significant at .05 level of confidence.

Table – II shows that the Scheffé S Test for the difference between adjusted post-test mean in leg strength of weight training group and control group (2.933) and circuit weight training group and control group (2.785), which were significant at .05 level of confidence. There was a significant difference in strength endurance between weight training group and

control group (3.747) and circuit weight training group and control group (4.054) and also there was a significant difference on vital capacity between weight training group and control group (0.242) and circuit weight training group and control group (0.23) which was significant at 0.05 level of confidence after the respective training programme.

Conclusions

There was a significant improvement in leg strength after the weight training period [10,11] and circuit weight training [12]. There was a significant improvement in strength endurance due to weight training [11] and circuit weight training [13]. The improvement in vital capacity was significantly higher for weight training group [10] and for circuit weight training group [14] when compared with the control group. It was also found that there was no significant difference was found between the weight training group and circuit weight training group on selected criterion variables.

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