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Effect of endurance, strentgh and concurrent training on selected physiological variables of college men players

G Redempta Nishanthi
Director of Physical Education, St. Justin's College of Education, Madurai, Tamil Nadu, India

Abstract
The purpose of the study was to find out the effect of endurance, strength and concurrent training on selected physiological variables of college men players. In this study 60 Male students were randomly selected from Aditanar College of Arts and Science, Tiruchendur, Tamil nadu, India and divided into four groups as three experimental groups and one control group. Data were collected from each subject before and after training. The collected data were statistically analysed by using dependent 't' test and analysis of covariance (ANCOVA). It was found that there was a significant improvement on fat free mass and body fat percentage due to the influence of strength, endurance and concurrent training of college men players.

Keywords: endurance training, strength training, concurrent training, physiological variables

Introduction

"Physical Fitness is the first requisite of Happiness." Over the past 3 decades obesity has become a global pandemic that affects people of all age groups both in developed countries and in developing countries (Raj M., 2012) [10]. Obesity in young individuals is growing mainly due to changes in living style and feeding behavior. Lifestyle habits learned in childhood can last during adolescence and adulthood which may cause various health complications. Moreover, parents with unhealthy habits such as physical inactivity and high-fat diet may reflect on the habits of their children. The metabolic imbalance in overweight individuals provides support for inflammation, insulin resistance and increased cholesterol. There is evidence to indicate that youth with values of body mass index (BMI) and percentage of high fat are associated with cardio metabolic disorders presenting lipoprotein values, fasting glucose, triglycerides and higher inflammatory markers in overweight and obese individuals compared to those with desirable weight (Bridger, T., 2009) [2].

There is incontrovertible evidence that regular physical activity contributes to the primary and secondary prevention of several chronic diseases and is associated with a reduced risk of premature death. There appears to be a graded linear relation between the volume of physical activity and health status, such that the most physically active people are at the lowest risk. However, the greatest improvements in health status are seen when people who are least fit become physically active. The current activity guidelines promoted by Health Canada appear to be sufficient to reduce health risk. People who engage in exercise at levels above those recommended in the guidelines are likely to gain further health benefits. Health promotion programs should target people of all ages, since the risk of chronic disease starts in childhood and increases with age (Warburton Darren, *et al*., 2006) [12] Health and longevity are threatened when a person is either overweight or under weight. Overweight and obesity increase one's risk of developing serious CVD. Likewise, individuals who are underweight may have a higher risk than others of cardiac, musculoskeletal and reproductive disorders. Thus, healthy weight is key to a healthy and longer life. One will learn about weigh control principles and practices, as well as guidelines for designing exercise programs for weight loss, weight gain and body composition change. Individuals with body fat levels falling at or near the extremes of the body fat continuum are likely to have serious health problems that reduce life expectancy and threaten their quality of life. (Heyward, 2002) [5]

The overall average prevalence of obesity in adults for the year 2000 was 8.2% of the global population. The prevalence of obesity progressively increases with the degree of development of countries, as seen in the data for undeveloped countries (1.8%), developing countries (4.8%), countries in transition (17.1%), and developed countries (20.4%) (WHO, 2001). Excess body weight and fatness pose a threat to both the quality and quantity of one's life. Obese individuals have shorter life expectancy and greater risks of CHD, hypercholesterolemia, hypertension, diabetes mellitus, certain cancers and osteoarthritis. For a comprehensive report and roundtable discussion of the role of physical activity is the prevention and treatment of obesity and its co-morbidities. Obesity may be caused by genetic and environmental factors. As an exercise specialist, one play an important role in combating this major health problem by encouraging a physically active lifestyle and by planning exercise programs and scientifically sound diets for one's clients, in consultation with trained nutrition professionals. Restricting caloric intake and increasing caloric expenditure through physical activity and exercise are effective ways of reducing body weight and fatness while normalizing blood pressure and blood lipid profiles. (Morrow, *et al*., 2005) [9] Increasing widespread overweight and obesity in the world indicates reduction of physical activity (McLennan, 2004) [8]. The lack of physical activity in daily life induces obesity and increases the risk of various types of diseases are induced by obesity rather than the serious aspect of obesity alone, they become an issue as well (Leutholtz *et al*., 1995). There are multiple factors engaged

proliferation of cardiovascular disease in which we can note improper eating habits, high blood pressure, inactivity, low aerobic fitness, obesity, overweight, unfavorable lipid profile. Some of the factors such as obesity and overweight linked with reduction of physical activity in teenager have been known as the main reason leading to cardiovascular abnormalities (McLennan, 2004) [8]. Endurance training will also allow preferential loss of central fat in other populations of subjects at risk for obesity-related metabolic complications and might produce impressive improvement in metabolic abnormalities, despite only a small loss of weight and fat (Schwartz Robert, S., 1991) [11]. Concurrently training has numerous physiology adoptions to the body, including neuromuscular, skeletal-muscular, cardio respiratory and the endocrine system. Combined aerobic and resistance training is the best program to treat obesity (Hill *et al*., 1987) [6]. Moreover, doing a combination of strength and endurance training is more beneficial for weight loss and change body composition (Hendrickson, *et al*., 2010) [4]. The obtained results indicated that concurrent training can significantly increase basal metabolism and decrease body fat relative LDL to the obtained amounts in the before-training period (Dolezal, and Potteiger, 1998) [3]. In addition, the significant decrease of subcutaneous fat, body fat percentage and waist-to-hip ratio after performing eight weeks of combined strength and endurance training (Maiorana, *et al*., 2002, Akbarpour, Assarzadeh and Sadeghian, 2011) [7, 11]. Based on the above information, investigator planned to study the effect of endurance and concurrent training on selected physiological variables and lipid profile of college men players.

Objectives

The following are the specific objectives of this study.

1. To find out the effect of strength, endurance and concurrent (i.e., combination of strength and endurance) training on selected physiological variables of college men players.
2. To find out the best training method to enhance the selected physiological variables of college men players.

Methodology

To achieve the purpose of this study, 60 men college students were selected from Aditanar College of Arts and Science, Tiruchendur, Tamilnadu, India, at random and their age ranged from 18 to 21 years. The selected subjects were divided into three experimental groups and a control group with 15 subjects (n=15) each. Group I (STG) underwent strength training, Group II (STG) underwent endurance training, Group III (CTG) underwent concurrent training for the training period of 8 weeks with three days per week and Group IV (CG) served as control group. However, control group was not exposed to any specific training but they participated in the regular scheduled work.

The aerobic training consisted of three phrases.

The first one is jogging, Aerobic exercise and cycling with the intensity of 60% of maximum one repetition maximum (1RM) on a track, indoor respectively for 10 min per training unit during the first week, reaching 75% of 1RM for 10 min during the 8th week.

The performance of endurance training and concurrent training group's men players were measured on the physiological (BMR, FFM, BF) variables of the investigator on separate days. The data on selected dependent variables for pre-tests and post-tests were collected two days before and after the training programme respectively. On the first day Physiological, strength and endurance were tested whereas cardio-respiratory endurance was tested on the second day.

Analysis of data

All the subjects were tested on selected dependent variables prior to and after the treatment. The data pertaining to the variables in this study were examined by using dependent t-test to find out significant changes and analysis of covariance (ANCOVA) for each variable separately in order to determine the differences if any among the adjusted post test means. Whenever 'F' ratio for the adjusted post-test was found to be significant, the Scheffe's test was used as post-hoc test to determine the three paired mean differences.

The level of significance was fixed at 0.05 level of confidence in all the cases.

Table 1: Summary of mean standard deviation and dependent 'T' test for the pre post and adjusted post tests on selected variables of experimental and control groups

Variables	Test		Group			
			STG	ETG	CTG	CG
Fat Free Mass	Pre Test	Mean	25.71	25.73	25.75	25.76
		SD	0.28	0.32	0.32	0.48
	Post Test	Mean	24.37	24.47	23.50	25.69
		SD	0.51	0.36	0.60	0.36
	't' Test		9.79*	12.30*	12.78*	1.07
Body Fat	Pre Test	Mean	28.70	28.72	28.76	28.73
		SD	0.28	0.30	0.31	0.40
	Post Test	Mean	27.45	26.89	26.30	28.69
		SD	0.40	0.43	0.77	0.36
	't' Test		10.81*	16.67*	14.09*	1.32
BMR	Pre Test	Mean	1623.80	1626.33	1625.93	1623.53
		SD	9.50	12.76	15.23	15.34
	Post Test	Mean	1640.73	1655.87	1691.00	1626.80
		SD	9.42	12.36	19.01	12.02
	't' Test		9.05*	10.35*	13.77*	1.53

*****Significant at.05 level. The table value required for.05 level of significance with df 14 is 1.761.

Table 2: Analysis of covariance on selected criterion variables of experimental and control groups

Varia-bles	Adjusted Post-test Means				SOV	SS	Df	MS	F-Ratio
	STG	ETG	CTG	CG					
Fat Free Mass	24.38	24.47	23.50	25.68	B	36.277	3	12.092	60.045*
					W	11.076	55	0.201	
Body Fat	27.47	26.89	26.28	28.69	B	47.512	3	15.837	75.498*
					W	11.538	55	0.210	
BMR	1641.41	1654.98	1690.36	1627.64	B	32458.588	3	10819.529	89.949*
					W	6615.684	55	120.285	

* Significant at 0.05 level.

Table value required for 0.05 level of significance with df (3, 55) is 2.78.

Table 3: Scheffe's test on criterion variables of experimental and control groups

Variable	STG vs ETG	STG vs CTG	STG vs CG	ETG vs CTG	ETG vs CG	CTG vs CG	CI Value
Fat Free Mass	0.086	0.994*	1.191*	0.908*	1.278*	2.185*	0.452
Body Fat	0.579*	1.189*	1.223*	0.610*	1.802*	2.412*	0.483
BMR	13.568*	48.949*	13.769*	35.380*	27.337*	62.717*	11.565

* Significant at 0.05 level.

Results and Discussion

The results of the study indicate that significant difference exist among the post and adjusted post test means of experimental and control groups on the physiological (BMR, FFM, BF) among the all participants. The result of the study indicates that all the experimental groups significantly differed when compared to the control group on FFM, BF and BMR.

Successful performance in endurance is determined by the specific training and by the quality level of basic physical condition or fitness.

An aerobic endurance training in particular leads to numerous health benefits, and there is great evidence for its favorable influence on weight (Donnelly, *et al*., 2009).

First the body composition such as BMI, WHR, percent body fat, weight and body fat mass were measured. Then the experiment group underwent the effect of an aerobic exercise program. After 12 weeks, all the measured variables before intervention the test were re-measured. Correlated t-test was used for comparing the two groups before and after intervention the test and independent t-test was used for comparing the two groups ($P < 0.05$). The results showed that after 12 weeks of exercise, BMI, WHR, fat rate, weight and fat mass and triglyceride had significant reduction and HDL had significant increase (Abazar E, *et al*, (2015)).

The present study training methods also used the endurance and Concurrent training during the specified training sessions. In the present investigation, the use of endurance based specified training and concurrent based specific training improves the physiological (FFM, BF, BMR).

Conclusions

The current study highlights on strength training, endurance training and concurrent training among college men students. The present study revealed that all the experimental groups namely STG, ETG and CTG had reduced the FFM and BF, and improved BMR were better than the control group (CG). When comparing experimental groups, CTG had improved better performance of selected criterion variables better than the other two (STG & ETG) groups and ETG is better than that of STG on selected criterion variables (FFM, BF, BMR).

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