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EFFECT OF CONCURRENT STRENGTH AND PLYOMETRIC TRAINING ON SELECTED BIOMOTOR ABILITIES

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Abstract

The underlying principle of this study was to assess the effect of eight weeks concurrent strength and plyometric training in enhancing the selected biomotor abilities. For the purpose of this study, thirty male volleyball specialization students from the department of physical education and sports sciences, Annamalai university, aged 20 to 22 years took part in the study. Subjects were randomly assigned to either concurrent training (n=15) or control (n=15) group. The training regimen lasted for eight weeks. The selected criterion variables were assessed using standard tests and procedures, prior to and immediately after the training programme. Analysis of covariance was employed to establish the degree of significant modification on chosen criterion variables. The findings of the study revealed that eight weeks of concurrent training had an effectiveness of 4.13% on leg strength, 11.81% on strength endurance, 0.40% on speed, and 7.53% on anaerobic power. These findings suggest that the concurrent strength and plyometric training programme have statistically significant influence in developing the selected criterion variables.

Keywords: Concurrent Strength, Plyometric and Biomotor ability

Introduction

In today's age of scientific knowledge man is making rapid progress in all walks of life and it is true in the area of games and sports. Also scientific knowledge has revolutionalised the standards of human performance in sports disciplines. The athletes are now trained on scientific lines and using highly sophisticated technology for top performance in their specific sports, with minimum expenditure of energy and time.

So as to have the utmost efficiency, consistent improvement and balanced abilities, a sportsperson must participate in year round conditioning programs. For that they must put their bodies under a certain amount of stress to increase physical capabilities. Physical exercise is extremely important for maintaining physical fitness including healthy weight; building and maintaining healthy bones, muscles, and joints; promoting physiological well-being; and strengthening the immune system. To improve or maintain a desired level of physical fitness, there is a need to constantly administer an adequate training intensity while exercising. Different training modalities are used for the development of different features of physical fitness, as each sportsperson requires a different types and levels of physical composure.

Today, most weight training systems in use are based on variation, of the De Lorne method. If properly carried out weight training may improve speed, explosive power, strength and endurance.

Circuit weight training is one of the effective means to improve all round physical and cardiovascular fitness, whereas, plyometric training is one of the most effective methods for improving explosive power as stated by Fleck and Kraemer (2004). A wide variety of athletes can benefit from power training, particularly if it follows or coincides with a strength training program.

Although, plyometric training has received much attention recently, it had been a part of the training of athletes in a variety of sports for years. It is used in conjunction with other power development methods in a complete training programme to bridge the gap between maximum strength and explosive power. Scientific research has given us a fundamental understanding of the elastic properties of muscle and its training ability.

The effects of resistive type exercise on athletic performance have been largely evident. To know the efficacy of concurrent circuit weight training and plyometric training; and its commendable contribution to one's level of fitness, it was decided to take up this study. We hypothesized that concurrent strength and plyometric training may have significant affluence for the development of selected biomotor abilities.

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Methodology

Subjects and variables

For the purpose of this study, thirty male volleyball specialization students from the department of physical education, Annamalai university, in the age group of 20 to 22 years were recruited, with their consent. All of them were healthy, nonsmoking and with a negative medical history. The selected subjects were randomly assigned to both the concurrent training and control groups of fifteen each. The selected criterion variables were assessed using standard tests and procedures, prior to and immediately after the training regimen. The instruments used for testing the criterion variables were standard and reliable as they were purchased from the reputed companies, and moreover they were attuned and tested for its accuracy. The standard tests and instruments used for assessing the criterion variables are presented in table 1.

Table 1: Criterion Variables and Test

S. No.	Variables	Tests / Instruments	Unit of Measurement
1.	Leg Strength	Leg Dynamometer	Kilograms
2.	Strength Endurance	Bent Knee Sit-ups	Counts
3.	Speed	50 Metres Dash	Seconds
4.	Anaerobic Power	Margaria Kalamen Power Test	Watts

Training protocol

The experimental group underwent training regimen that consisted of six to eight exercises a session, two sessions a day, four days a week for eight weeks. In the morning circuit weight training was administered with intensive sessions on Monday and Friday for upper and lower body respectively, and the extensive sessions on Tuesday and Thursday for lower and upper body respectively. In the evening plyometrics was incorporated with sessions contrary to that of in the morning, on the principles of load and specificity. The control group did not participate in any specialized training during the period of study.

Experimental design and statistical procedure

The experimental design used for the present study was random group design involving thirty subjects. Analysis of covariance (ANCOVA) was used as a statistical procedure to establish the significant difference, if any, existing between pretest and posttest data on selected criterion variables. The level of significance was accepted at $P < 0.05$.

Results and Discussions

The descriptive analysis of data collected on selected biomotor abilities prior to and immediately after eight weeks of concurrent strength and plyometric training is presented in table 2.

Table 2: Computation of Mean and Standard Deviation on Selected Biomotor Abilities

Variables	Groups	Pretest		Posttest	
		$\bar{x}$	σ	$\bar{x}$	σ
Leg Strength	Control	96.67	11.41	95.73	7.81
	Experimental	95.20	8.71	99.13	5.83
Strength Endurance	Control	27.67	6.38	28.13	4.64
	Experimental	28.80	3.91	32.20	3.47
Speed	Control	7.53	0.41	7.52	0.41
	Experimental	7.49	0.37	7.46	0.36
Anaerobic Power	Control	104.53	4.29	109.07	4.38
	Experimental	101.80	4.46	109.47	4.24

ANCOVA was employed to determine the significant impact of concurrent strength and plyometric training on selected biomotor abilities and it is presented in table 3.

Table 3: Analysis of covariance on selected biomotor abilities of control and concurrent training groups

Variables	Groups	Adjusted Mean	SOV	Sum of Squares	df	Mean Square	'F' ratio
Leg Strength	Control	95.29	B	137.73	1	137.73	14.80*
	Experimental	99.58	W	251.29	27	9.31	
Strength Endurance	Control	28.50	B	82.74	1	82.74	14.94*
	Experimental	31.84	W	149.53	27	5.54	
Speed	Control	7.52	B	0.0052	1	0.0052	35.24*
	Experimental	7.47	W	0.0040	27	0.0002	
Anaerobic Power	Control	107.56	B	64.03	1	64.03	196.77*
	Experimental	106.91	W	8.79	27	0.325	

Required table value for significance at 0.05 level of confidence for df of 1 and 27 is 4.21
* Significant at 0.05 level

The findings of the study shows that significant difference existing between control group and concurrent strength-plyometric training group on leg strength, strength endurance, speed and anaerobic power, since the obtained 'F' ratio of 14.80, 14.94, 35.24, and 196.77 respectively were greater than the required table value of 4.21 for significance at 0.05 level of confidence for df of 1 and 27.

It appears that regular participation in physical exercises initiate a disruption in systemic homoeostasis, which is followed by an adaptive phase results in the betterment of the performance of leg strength, strength endurance, speed and anaerobic power, which might be due to the progressive loading of intensity.

The findings of the study is in par with some of the literatures (Blackey & Southard, 1987; Gehri *et al*., 1998; Matavulj *et al*., 2001) that a relatively small amount of plyometric training is required to improve performance in vertical jumping, long jumping, sprinting and sprint cycling. A conditioning program consisting of both plyometric training and resistance training can improve power performance in the vertical jump (Blackey & Southard, 1987; Adams *et al*., 1992; Bauer *et al*., 1990; Clutch *et al*., 1983) and 40-yard sprint time (Olhemus *et al*.).

Conclusions

The result of this study demonstrated that, concurrent strength and plyometric training with repeated bouts of a combination of physical exercise has significant impact on leg strength, strength endurance, speed and anaerobic power of volleyball players.

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