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Effect of plyometric training programme on physiological variables among adolescent school boys

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Abstract

The purpose of the study was to find out the effect of plyometric training on selected physiological variables among adolescent school boys. To achieve the purpose of the study 30 adolescent IX and X standard school boys were selected at random from the Schools of Tuticorin District. The age of the subjects were ranged from 14 to 18 years. The selected subjects were divided into two groups of 15 each. Group A undergone plyometric training for 6 weeks and group B acted as control. The data pertaining to the variable in this study were examined by using dependent t-test to find out a significant improvement and analysis of covariance the differences if any among the adjusted post-test means. Result of the study indicated that there was a significant improvement takes place on resting heart rate, systolic blood pressure and diastolic blood pressure due to the effect of six weeks plyometric training program. There was a significant difference exists between experimental and control groups on selected physiological variables such as resting heart rate, systolic blood pressure and diastolic blood pressure. The pre-test and post-test comparisons in respect of all the selected Physiological variables were positive and significant at 0.05 level of significance.

Keywords: Plyometric training, resting heart rate, systolic blood pressure and diastolic blood pressure

Introduction

Regular exercise has the potential to be a key non pharmacological tool in the management of blood pressure (BP). After exercise, BP is normally reduced below pre-exercise level a well-known phenomenon termed "post-exercise hypotension (PEH)". PEH has been demonstrated after aerobic (endurance) exercise and resistance exercise. In normotensive subjects, it has been attributed to a decrease in cardiac output and/or systemic vascular resistance. Moreover, it has been accompanied by a decrease in peripheral sympathetic activity, and an increase in cardiac sympathetic activity.

Nowadays, endurance and resistance exercise has also been recommended as part of a comprehensive exercise program to reduce cardiovascular risk in general population (American College of Sports Medicine, 2000) [1] and in hypertensives. The benefits of endurance and resistance exercise on the cardiovascular system are well-documented. Evidence suggests that endurance and resistance exercise favorably alters resting arterial BP in persons with hypertension.

Plyometric exercise (PE) is one of the important types of training for the development of performance and is used in the conditioning schedule by athletes and conditioning coaches. Despite the important role of plyometric exercise, the information about this kind of exercise on the cardiovascular system, especially on BP is not completely understood (Kenny MJ, Seals DR, 1993) [5].

Materials and Methods

The purpose of the study was to find out the effect of plyometric training programme on selected physiological variables. To achieve the purpose of the study, thirty (n=30) IX and X standard school boys were selected from the Schools of Tuticorin District. All subjects were fully informed of the risks and discomfort associated with the investigation before accepting their willingness to act as subjects. Subjects were divided into two groups of 15 each. Group A, the experimental group participated in plyometric training. Group B, the control group were

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allowed to perform their regular physical activities but denied for participation in plyometric training. The training stimuli adopted for a six week long included plyometric training exercises as listed below,

Plyometric Training Exercises:

1. Exercises for Lower Extremities

- Spot Jump
- Standing Jumps
- Multiple Hop Jumps
- Box Drill
- Depth Jump

2. Exercises for Upper Extremities

- Front toss
- Over-under pass
- Trunk rotation

- Over head throw
- Rotation in eight figure

The above stated Plyometric exercises were performed thrice in a week for one hour in the afternoon under the direct supervision of the investigator. Prior to practicing the exercises the subjects were being asked for getting warmed-up for 10 minutes and to follow the demonstration of each exercise. The data pertaining to the variable in this study were examined by using dependent t-test to find out a significant improvement and analysis of covariance the differences if any among the adjusted post-test means.

Data Analysis

The data collected on the selected variables were analyzed and presented below.

Table I: Mean, Sd Scores And Result Of The Test Of Significance ('T') In Respect Of Physiological Variables Of Experimental And Control Groups

Variables	Groups	Pre Test		Post-test		t
		Mean	SD	Mean	SD	
Resting Heart Rate	Group B	74.5	3.73	74.6	2.61	0.326
	Group A	78.6	6.45	75.6	4.36	4.68*
Systolic B.P.	Group B	117.7	8.92	117.8	8.36	0.37
	Group A	114.5	6.35	117.5	8.48	3.94*
Diastolic B.P.	Group B	75.7	6.07	75.8	5.79	0.32
	Group A	75.1	5.27	78.3	6.9	3.7*

*significant at.05 level.

Table II: Analysis of Covariance (Ancova) On Selected Physiological Variables of Plyometric Training and Control Group

Variables	Adjusted Post-test Means		Source of Variance	Sum of Squares	df	Mean square	F - ratio
	Plyometric Training Group	Control Group					
Resting Heart Rate	7.65	8.11	Between	0.43	1	0.43	53.88*
			Within	0.21	27	0.01	
Resting Systolic Blood Pressure	51.59	56.55	Between	183.07	1	183.07	111.71*
			Within	44.25	27	1.64	
Resting Diastolic Blood Pressure	9.77	10.13	Between	0.98	1	0.98	95.93*
			Within	0.28	27	0.01	

* Significant at 0.05 level. The table value required for significance at 0.05 level with df 1 and 27 is 4.21)

Table I indicates that, significant differences between pretest and posttest of the Experimental Group (Group A) on all the physiological variables namely Resting Heart Rate, Resting Systolic Blood Pressure and Resting Diastolic Blood Pressure. Whereas no significant difference are observed between

pretest and posttest of the Control Group (Group B) on all stated physiological variables. Table II indicates that, there is a significant difference exists between the adjusted post-test means of plyometric training and control groups.

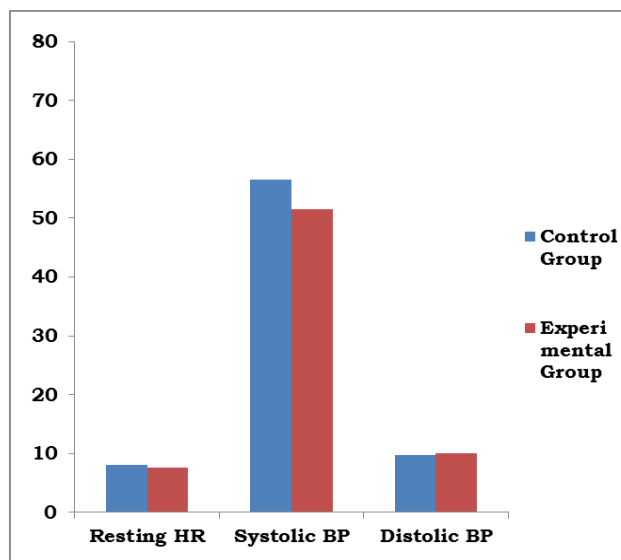


Fig I: Mean Scores of Plyometric Training and Control Groups on Selected Physiological Variables

Discussion on Findings

Considering the important role of plyometric exercise and training for improving muscular performance, the effects of this exercise on cardiovascular responses is important and few studies have focused on this area and information about this aspect is little and scarce. Therefore, this study was designed to examine the effect of a bout of plyometric exercise on heart rate and blood pressure. The findings of the present study are in line with previous studies Arazi H, Asadi A, Nasehi M, Delpasand A, 2012 ^[2], Brown SP, Clemons JM, He Q, Liu S, 1994 ^[3]. In contrast, Brown *et al*, 1994 ^[3] examined the effects of 8 sets of 10 reps of depth jump from 80 cm box on BP and HR responses, and found no changes in SBP, DBP at 5-10 min post exercise in normotensive men and women.

On the other hand, a decrease in muscle cell pH plyometric exercise may stimulate chemosensitive afferent fibers, thereby elevating HR (Victor RG, Bertocci LA, Pryor SL, Nunally RL, 1988) ^[7]. The forces and intensity of plyometric exercise (Rozenek R, Rosenau L, Rosenau P, Stone MH, 1993) ^[6] greater involvement of the fast-twitch muscle fibers (Collins MA, Cureton KJ, Hill DW, Ray CA, 1991) ^[4], and size of activated muscle mass may also stimulate increases in HR and BP. Overall, according to findings of present study the mechanism(s) causing decreases in BP and increases in HR can be increases in pH, increase in muscle metabolites and heat production after plyometric exercise.

Conclusion

1. There was a significant improvement takes place on resting heart rate, systolic blood pressure and diastolic blood pressure due to the effect of six weeks plyometric training program.
2. There was a significant difference exists between experimental and control groups on selected physiological variables such as resting heart rate, systolic blood pressure and diastolic blood pressure.

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