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Relative effect of resistance training and plyometric training programme on physical fitness variable among Pondicherry athletes

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Abstract
The purpose of the study was to find out the effect of resistance training and plyometric training on physical fitness variable among Pondicherry athletes. To achieve this purpose, 45 male athletes studying in various colleges in the Pondicherry state, India were selected as subjects during the academic year 2012-13. The age of the subjects were ranged from 18 to 25 years. The subjects were further classified at random into three equal groups of 15 subjects each. Group - I underwent resistance training for three days per week for twelve weeks, Group II underwent plyometric training for three days per week for twelve weeks and group - III acted as control, however they performed their regular practice. The selected criterion variable strength endurance was assessed before and after the training period. The collected data were statistically analysed by using Analysis of Covariance (ANCOVA). From the results of the study it was found that there was a significant improvement on strength endurance among the resistance training group when compared with the plyometric training and control group.

Keywords: Resistance training, Plyometric training, Physical fitness variables, strength endurance, Pondicherry Athletes.

1. Introduction
Athletic performance has dramatically progressed over the past few decades. Performance levels unimaginable before are now commonplace and the number of athletes capable of outstanding results are increasing. One among the contributing factors is that athletics is a challenging field, and intense motivation has encouraged long, hard hours of work. Also, coaching has become more sophisticated, partially from the assistance of sports specialists and scientists. Sports sciences have progressed from descriptive to scientific. A broader base of knowledge about athletes existing now is reflected in training methodology. Today athletes prepare themselves for achieving goals through training. The physiological goal is to improve body function and optimize athletic performance. The main scope of the training is to increase athlete's work and skill capabilities and to develop strong psychological traits. Many physiological, psychological and sociological variables are also involved. Training is primarily a systematic athletic activity of long duration, which is progressively and individually graded. Human physiological and psychological functions are modeled to meet demanding tasks.
Athletic achievement is a complex dynamic state characterized by high level of physical and psychological efficiency on the degree of participation of the necessary skills and knowledge. In today's age of scientific knowledge man is making rapid progress in all walks life and it is true in the area of games and sports (Materyev 1981). 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 to get optimum performance with minimum expenditure of energy and time (J.M. Tanner 1965).
Sports training are a process of athletic improvement which is conducted on the basis of scientific principles and which through systematic development of mental and physical efficiency, capacity and motivation enables the athletes to produce outstanding and record breaking athletic performances (Dietrich Harre 1982) [1, 9]. If a training routine is planned and executed correctly, the result of systematic exercise is improvement of the athletes physical fitness, particularly strength, as the body adapts to physical load. In a broad sense, the word adaptation means the adjustment of an organism changes to better survive in these new conditions. In biology, adaptation is considered as one of the main features of living species. In physical education, exercise or regular physical work is a very powerful stimulus for adaptation

(Veadimir 1995). Moran and McGlynn (1998), consider resistance training as an stationary weight are used for the purpose of increasing muscular strength, muscular endurance and power, through which skill can be improved for several years athletes have lifted weights to gain strength, the principles of progressive resistance are followed. There are many exercises in which the body weight of the athlete performing the exercise act as resistance for improving strength. There are many exercises that can be performed without any equipment. The load intensity in this type of exercise is automatically related to one's own body weight. There type of exercise involving one's own body weigh as resistance if properly performed is very effective for improving explosive strength and strength endurance.

Plyometrics -- also known as jump training -- is a training technique designed to increase muscular power and explosiveness. Originally developed for Olympic athletes, plyometric training has become a popular workout routine for people of all ages, including children and adolescents. Plyometric training conditions the body with dynamic resistance exercises that rapidly stretch a muscle (eccentric phase) and then rapidly shorten it (concentric phase). Hopping and jumping exercises, for example, subject the quadriceps to a stretch-shortening cycle that can strengthen these muscles, increase vertical jump, and reduce the force of impact on the joints.

Methodology

The purpose of the study was to find out the effect of resistance training and plyometric training on physical fitness variable among Pondicherry athletes. To achieve this purpose, 45 male athletes studying in various colleges in the Pondicherry state, India were selected as subjects during the academic year 2012-13. The age of the subjects were ranged from 18 to 25 years. The subjects were further classified at random into three equal groups of 15 subjects each. Group - I underwent resistance training for three days per week for twelve weeks, Group II underwent plyometric training for three days per week for twelve weeks and group - III acted as control, however they performed their regular practice. The duration of training sessions in all the days was between 45 minutes and an hour approximately, which included also warming up and warm down. The selected criterion variable strength endurance was assessed by standard testing procedure sit up test before and after the training period. The data collected from resistance training, plyometric training and control groups on selected variable was statistically examined by applying analysis of covariance (ANCOVA). Whenever, the obtained 'F' ratio was found to be significant, the Scheffe's test was applied as post hoc test to determine the paired mean differences. All the data were analyzed using SPSS statistical package. The level of confidence was fixed at. 05 level of significance.

Strength Endurance (Sit-ups)

The pre- and post-test data on sit-ups of the resistance training group, plyometric training group and control group have been analysed statistically and the results are shown in the below Table.

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Table 1: Lysis of Covariance for Pre and Post Test Data on Sit-Ups of Resistance Training, Plyometric Training Groups and Control Group

	Resistance training Group	Plyometric training group	Control group	SOV	Sum of squares	df	Mean squares	'F' ratio
Pre test Mean	34.26	33.33	32.6	B	20.93	2	10.46	1.01
SD	3.21	3.55	2.79	W	431.86	42	10.28	
Post test Mean	50.06	41.40	33.73	B	2003.33	2	1001.66	61.73*
SD	4.35	4.74	2.68	W	681.46	42	16.22	
Adjusted post test Mean	49.22	41.46	34.51	B	1548.28	2	774.14	118.05*
				W	268.84	41	6.55	

* Significant at 0.05 level of confidence. The table value required for significance at 0.05 level with df 2 & 42, and 2 & 41 are 3.22 and 3.22 respectively.

It is clear from the above table that the pre-test means of sit-ups for resistance training group is 34.26, plyometric training group is 33.33 and control group is 32.6. The obtained 'F' ratio 1.01 is less than the table value of 3.22 required for significance at 0.05 level for df 2 and 42. It is inferred statistically that there is no significantly variation in sit-ups among the three groups before the commencement of training.

The post-test means of the sit-ups for the resistance training group is 50.06, plyometric training group is 41.40 and control group is 33.73. The obtained F ratio of 61.73 is more than the table value of 3.22 required for df 2 and 42 at 0.05 level of significance. It reveals that there was significant variation in sit-ups among the three groups after the completion on training programme. The adjusted post-test mean of sit-ups for resistance training group is 49.22, plyometric training group is 34.51 and control group is 118.05. The obtained F-ratio of 107.52 is more than the table value of 3.22 required for significance at 0.05 level for df 2 and 41.

In order to determine which of the adjusted post-test paired mean have a significant difference, Scheffe's test was applied and the results are presented in below table.

Table 2: Scheffe's Test for the Adjusted Post-Test Paired Mean Differences on Sit-Ups

Adjusted Post-Test Means			Mean Differences
Resistance training Group	Plyometric training Group	Control Group	
49.22	41.46	-	7.76*
49.22	-	34.51	14.71*
	41.46	34.51	6.95*

* Significant at 0.05 level. The confidence interval required for significance at 0.05 level is 1.77.

The table indicates that the adjusted post-test mean differences of sit-ups between control group and resistance training group, control group and plyometric training group, resistance training group and plyometric training group are 14.71, 6.95 and 7.76 respectively and are higher than the confidence interval of 1.77 required for significance at 0.05 level. The results reveal that the increase in sit-ups is significantly more for resistance training group than the plyometric training group and control groups. The comparison of adjusted post-test means of sit-ups among the resistance training group, plyometric training group and control group are graphically illustrated in figure below.

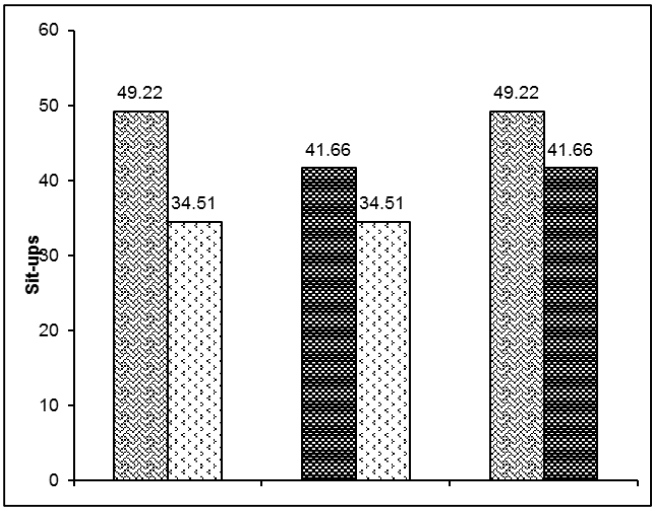

Fig 1: Adjusted Post-Test Means of Sit-Ups between Resistance Training Group, Plyometric Training Group and Control Group

Result

The results reveal that the increase in sit-ups is significantly more for resistance training group than the plyometric training group and control groups.

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