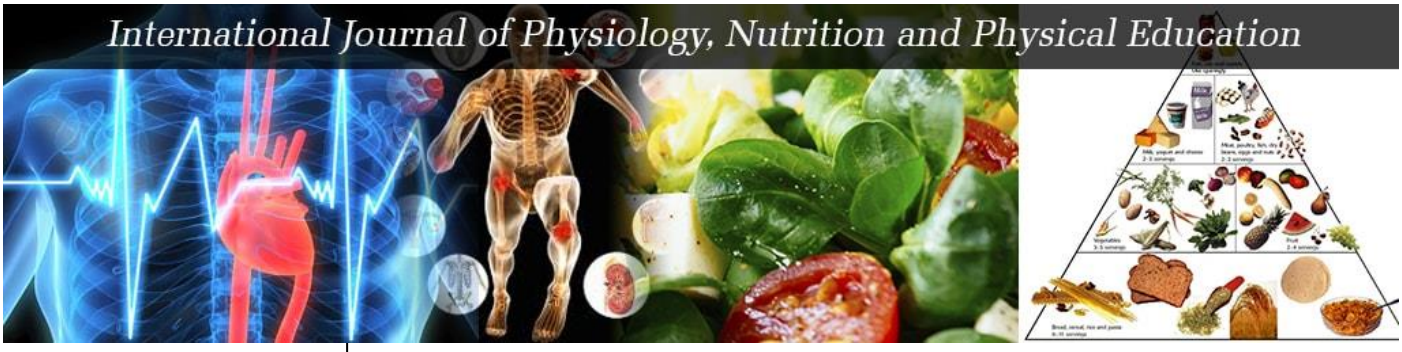

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Influence of plyometric and cycle ergometer training on anaerobic capacity of sprinters

Dr. Shrikant S Mahulkar

Abstract
The purpose of the present study was to determine influence of plyometric and cycle ergometer training on anaerobic capacity of Sprinters. The subjects were 30 male shot putters of 14 to 18 years of age group from Senior Secondary Schools of Amravati (Maharashtra). The subjects were randomly selected and were assigned to the two experimental groups (Plyometric, Cycle Ergometer) and one control group with 10 subjects in each group. The training was given for a period of 6 weeks. The two experimental groups were trained thrice a week, while the control group continued with their daily routine work. The anaerobic ability was selected for collecting data. The Pre and Post-test were conducted to collect the data. After the collection of data, the t- test was used to identify any significant differences between the groups. An analysis of co-variance was also used to determine significant differences for the anaerobic ability. The LSD Post hoc test was used to identify significant differences between the training programs. The level of significance was 0.05. The finding have shown the significant value of F- ratio's for anaerobic ability of all the experimental groups i.e. plyometric and cycle ergometer training programs as compared with the control group. The plyometric training program proved better than the cycle ergometer training.

Keywords: Plyometric, cycle ergometer, anaerobic ability

Introduction
The performance in most of the sports is determined by three factors namely physical fitness, technique and tactics. Strength is one such component which influences the performance and special attention has to be paid to it. There are three main form of Strength *viz.* Maximal strength, explosive strength and strength endurance. Strength may be developed in many ways such as weight lifting, bounding with or without resistance, various drills and of course depth jumping or plyometric. The word plyometric originally appeared in Russian sports literature in 1996 in work completed by V.M. Zaciorskij. A few other terms have been associated with plyometric as well including shock training, speed strength, bounce training and elastic reactivity. Plyometric training is a type of exercise designed to increase muscle power. It is best for sports persons such as, athletes, Sprinting players, footballers and sometimes boxers incorporate plyometric training into their training schedule, with the aim of adding additional explosive power to their game.

Polymeric training can be so beneficial to Sprinters are that, unlike standard weightlifting, they improve the explosion of the leg muscles rather than simply building strength and muscle mass layers should incorporate Sprinters into their workouts gradually and should be sure to include plenty of rest intervals in the workout so that the body can recover sufficiently between sets and between exercises. A stationary one-wheeled cycle used as an ergometer to measure a person's work output under controlled conditions. Cycle ergometer are not very good at measuring peak performances in people not used to cycling because the leg muscles usually fatigue before the rest of the body. An exercise device that enables the amount and rate of a person's physical work to be measured under controlled conditions. There are several different types of ergometer, each with its own particular advantages and disadvantages. The best ergometer for athletes is one which closely matches their training or competition. Rowing ergometers simulate the action of pulling on oars and have been designed to measure work output of competitive oarsmen under controlled conditions.

Arm ergo meters consists of a flywheel moved by a pedaling action of the arms. They are especially suitable for people who primarily use their arms and shoulders in physical activity. Anaerobic energy is produced without the use of oxygen. Anaerobic energy system is also known as lactic acid energy system. When we perform short term activity at that stage anaerobic energy system provides us energy to perform work, but in this condition the formation of lactic acid started because of the level of oxygen decreased.

Methods

Participant

For these purpose thirty male Sprinters aged between 14 – 18 years were selected from Senior Secondary Schools of Amravati, Maharashtra through purposive sampling technique. The subjects were divided in to three equal groups of ten subjects in each after pre-test of anaerobic ability through fifty meters dash.

1. Anaerobic ability

Sprint or speed tests can be performed over varying distances, depending on the factors being tested and the relevance to the sport.

a. The test involves running a single maximum sprint over 50 meters, with the time recorded. A thorough warm up should be given, including some practice starts and accelerations. Start from a stationary standing position (hands cannot touch the ground), with one foot in front of the other. The front foot must be behind the starting line. Once the subject is ready and motionless, the starter gives the instructions "set" then "go.". The tester should provide hints for maximizing speed (such as keeping low, driving hard with the arms and legs) and the participant should be encouraged to not slow down before crossing the finish line.

b. Two trials are allowed, and the best time is recorded to the nearest 2 decimal places. The timing starts from the first movement (if using a stopwatch) or when the timing system is triggered, and finishes when the chest crosses the finish line and/or the finishing timing gate is triggered.

Reliability of Data

The reliability of test score was established by test retest method. The reliability of data is presented in table-1

Sr.no	Test Item	Coefficient of correlation
1	Anaerobic ability	.83

Table 1: Six week of plyometric training programme

Plyometric Training Programme	Cycle Ergo meter Training Programme
Side box-Jumps	Sub-maximal
Foot Obstacle Hops	
Medicine Ball Throw	Supra-maximal
Lateral pass	
Back Toss throw	

Results

In order to compare the pre and post-test means of all the experimental groups and control group, the ‘t’ ratios were calculated, the results are given in table-2.

Table 2: Comparison of mean values between pre and post -test for 50 meters dash of the experimental Groups and control group

Groups	Test	Mean (sec)	S.D.	S.E.	‘t’- ratio
A (Plyometric)	Pre	6.94	0.436	0.138	4.03*
	Post	6.80	0.426	0.135	
B (Cycle ergometer)	Pre	7.32	0.282	0.089	2.72*
	Post	7.26	0.301	0.095	
C (Control)	Pre	6.92	0.353	0.111	0.43
	Post	6.92	6.92	0.136	

*Significant at 0.05 level. Tab t .05 (9) = 2.26

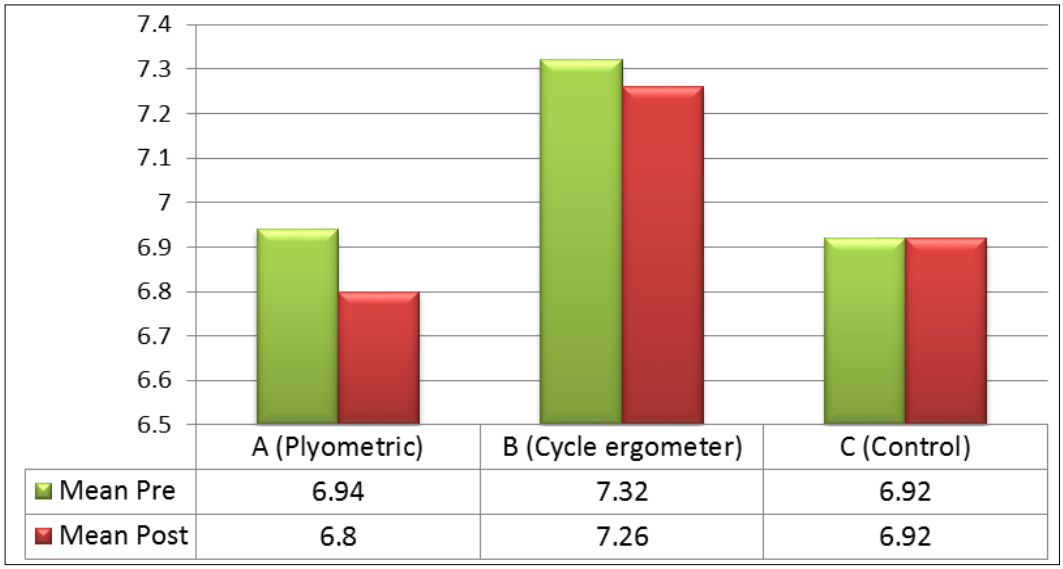

Fig 1: Comparison of mean values between pre and post -test for 50 meters dash of the experimental Groups and control group

Scores of 50 meter in case of plyometric training group. The obtained value of t-test was 4.03 which were found significant at 0.05 level confidences. In case of group B which trained with cycle ergometer training exercises has also shown the lesser value of post-test mean 7.26 than the pre-test mean value 7.32. The obtained t- test value 2.72 was more than the

table value of 2.26 which shown significant value at 0.05 level confidence. In case of control group (Group-C) the value of pre-test mean 6.92 and post -test mean 6.92 did not differ significantly since the obtained value of t-test was 0.43, which was found insignificant at the selected level of 0.05The results as shown in table-2 have exhibited that all the experimental groups (A, B) have shown the significant improvement in the performance of subjects in the test of fifty meter dash however the control group did not exhibit the significant improvement. Since the means of experimental groups differ significantly from each other, therefore, the data were subjected to analysis of co-variance. The results of analysis of co-variance are given in table 3.

Table 3: Analysis of co-variance for the experimental groups and the control group of 50meter dash

Test	Group Means (sec) A B C			Source of variation	Sum of squares	df	Mean Sum of squares	F-ratio
Pre-test Mean	6.94	7.32	6.91	Among	1.0421	2	0.5211	3.963*
				Within	3.5493	27	0.1314	
Post-test Mean	6.80	7.26	6.91	Among	1.1287	2	0.5644	4.591*
				Within	3.3613	27	0.1245	
Adjusted Post-test Mean	6.69	7.01	7.05	Among	0.0859	2	0.0429	6.018*
				Within	0.1856	26	0.0071	

*Significant at 0.05 level F.05 (2, 27) = 3.35 F.05 (2, 26) = 3.37

As shown in table-3 that significant value of F-ratios were obtained for the comparison of pre- test means (3.963), post -test means (4.591) and adjusted post- test means (6.018). The obtained values were higher than the required value for the selected degree of freedom and the significant level. The data were further subjected to LSD post hoc test. The results of the Post hoc analysis and the difference between the means among the four groups are shown in table- 4.

Table 4: Paired adjusted final means and differences between means among the experimental groups and control Group of 50 meters dash (seconds)

Groups			Mean Difference
A (Plyometric Group Mean)	B (Ergo meter Group Mean)	C (Control Group Mean)	
6.689	7.010		0.321*
6.689		7.047	0.321*
	7.010	7.047	0.037

* Significance at 0.05 level

Required value of critical difference at 0.05 level is 0.077A – Plyometric training, B –Cycle ergo meter training, C –Control group The results in table-4 have shown that the mean differences of experimental groups when compared with the control group have exhibited the significant values of critical difference at the selected level of 0.05

The mean difference of the A and C which are given plyometric training are shown greater value as compared with the groups A (Plyometric training) and B (Cycle ergo meter training), and B

(Cycle ergo meter training) and C (Control group). Therefore the plyometric training group shows a significant value of critical difference when compared with cycle ergo meter training group and control group respectively.

The comparison of means of pre and post-test of fifty meter dash for the two experimental groups and the control group are presented in Figure- 9

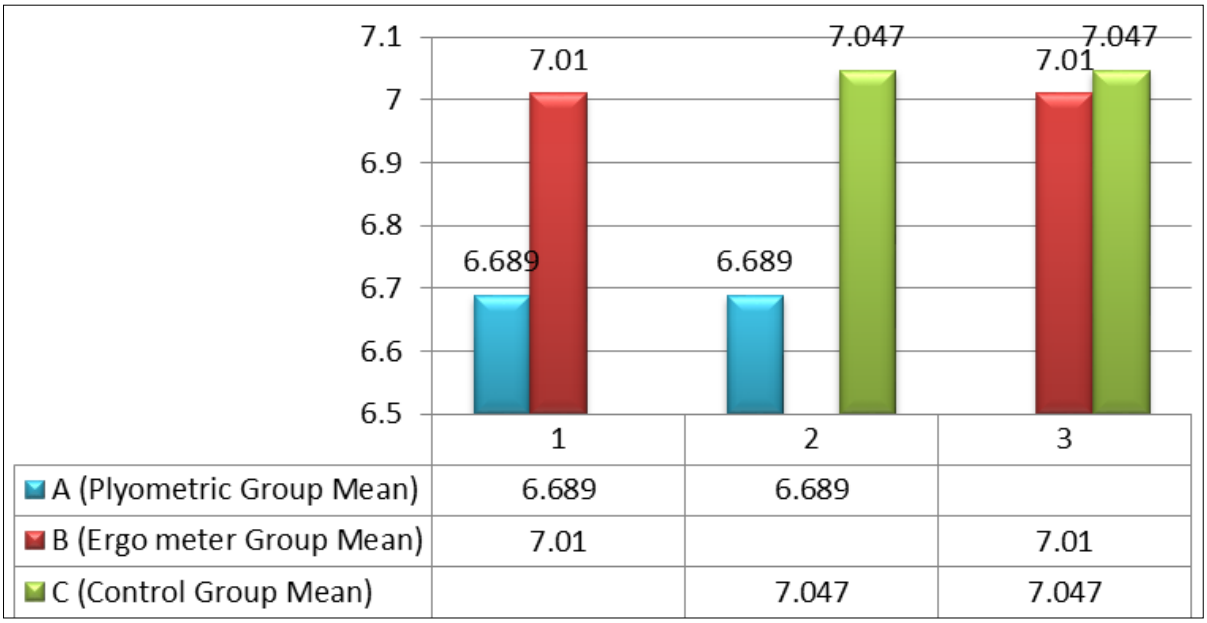

Fig 2: Comparison of means of pre and post-test of fifty meter dash for the two experimental groups and the control group

Discussion

Today the sports persons are trained scientifically with the latest training methods and sophisticated instruments for higher performance improvement in different sphere of sports [1]. It is therefore concluded that if a choice has to be made out of two training methods namely plyometric training and cycle ergo meter training. The plyometric training may be preferred for improving the anaerobic ability of the Sprinting players. These findings are supported by other reports. Plyometric exercises increase muscular power and are most effective

when designed to complement the specific movements required of the athletic activity [2]. Plyometric training technique is also the best for improving vertical jumping ability, positive energy production and elastic energy utilization [3]. 8 week sprint-specific plyometric training program improve sprint performance [4].

Conclusions

On the basis of the findings of this study, the following conclusions are drawn: Six weeks of Plyometric and cycle ergo meter training exercises are useful program to improve the anaerobic ability. The plyometric training program has greater effect on Sprinting players in comparison to cycle ergometer training.

Applications in sport

The world of training methodology has crossed many milestones. In modern time athletes are being trained by highly sophisticated means for better achievements in their concerned sports, and greater stress has been laid on the quality rather than the quantity of training. Six weeks of Plyometric and cycle ergometer training exercises are useful program to improve the anaerobic ability of Sprinters.

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