Effect of interval training and plyometric training on physical fitness variables of college level students

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Abstract
The purpose of this study was to compare the effect of interval training and plyometric training on physical fitness variables of college level students. Total 60 male students were selected randomly as subjects those who were untrained in sports and games from the different departments of IIT Tirupati The age group of the subjects was between 18-24 years. The subjects were divided into three groups, each group consisting of 20 subjects. Group 1 (ITG) was undergone Interval training, Group 2 (PTG) was undergone Plyometric training and Group 3 (CG) was control group which was not undergone any specific training. The experimental groups were undergone training for six days in a week for totally 12 weeks. The study was restricted to selected physical fitness variables namely Speed and Explosive power. Speed was tested by 50 meters' dash and Explosive power was tested by standing broad jump. The data were examined by applying Analysis of Covariance (ANCOVA) and the level of significance was set at 0.05 levels. Based on the analysis of statistical results, two experimental groups namely interval training and plyometric training made striking and robust advancement in physical fitness variables i.e. in explosive power and speed whereas the control group did not show any significant result. From the results it was found that interval training had shown better result in improving speed whereas plyometric training had shown better result in improving explosive power.

Keywords: interval training, plyometric training, speed, explosive power

Introduction
Games and sports have crossed many mile stones in the universe. Now a day's performance oriented scientific investigation has been tremendously increased to enhance the performance of sportsman. Physical fitness is one of the key aspects for every sports person to reach the top performance and become a champion at international sports competitions. Physical fitness components such as speed, explosive power, flexibility, strength, endurance are attained by a systematic fitness training methods. Interval training is a training method in which the subject undergone for training with short intervals. During the training, after short intervals, again there will be training sessions with reduced intensity. Interval training is the training method developed by many top coaches, trainers and performers who have used it benefited through this training method. Plyometric exercises refer to the training method which exploits the muscles natural cycle of lengthening and shortening to increase power. These exercises start with rapid stretching of the muscle (eccentric contraction) followed by shortening of the same muscle (concentric contraction). Plyometric trains the nervous system to react quickly to the lengthening of the muscle by rapidly shortening the same muscle with maximum force. There is a lot of confusion on which fitness training method is the best for developing overall physical fitness of a sports trainee. The author found a solution to solve these types of problems by a special training method to improve the physical fitness of sports trainee.

Statement of the problem
The purpose of the study was to compare the effect of Interval training and Plyometric training on physical fitness variables of college level students.

Materials and Methods
Selection of Subjects
To achieve the purpose of this study, 60 (N=60) untrained students were selected randomly from different departments in Indian Institute of Technology – Tirupati. The subjects' age was ranged between 18 and 24 years as per the college records. The subjects were randomly divided into three groups. Group 1 (Interval training group) and Group 2 (Plyometric training group) were experimental groups whereas Group 3 was the control group. Each group consisted of 20 subjects.

Selection of Variables
Independent variables
Here two different kinds of training methods which were named as Interval training and Plyometric training were selected as independent variables.

Dependent variables
Speed and Explosive power were taken for this study as

dependent variables.

Training Programme

During the training programme the two experimental groups i.e. Group 1 was undergone interval training programme, Group 2 was undergone plyometric training programme in the morning session.

The training was given for six days in a week for twelve weeks in the order to find out the effects on selected variables. Group 3 was a control group and did not go for any training. At the end of the twelfth week, the subjects were tested on the selected physical fitness variables.

Test Administration

Table 1

S.No	Variable	Test	Measuring Unit
1	Speed	50 Meters dash	Seconds
2.	Explosive power	Standing broad jump	Meters

Statistical Techniques

Necessary measurements were taken from participants of certain variables as part of the post-tests after the twelve weeks was completed. These measurements were closely scrutinized with Analysis of Covariance (ANCOVA) to determine if any modifications were noticed among the participants. The procedure of testing the hypothesis or rejecting the same in accordance with the results obtained in relation to the level of confidence was fixed at 0.05 level for selected physical fitness variables. In addition to that the significance between paired adjusted post-test mean were also tested by computing the confidence interval, utilizing the *Scheffe's post hoc test.*

Results and Discussions

The description, analysis and interpretation of findings with regard to the present study have been presented in two sections. Section one deals with the descriptive statistics and analysis & interpretation of 'F' ratio for three groups. Section two deals with Scheffe's post hoc comparison of paired means differences between experimental and control group.

Table 2: Analysis of Covariance for the Pre Test and Post Test Data of Experimental Group I, Experimental Group and Control Group on Speed (in seconds)

	Exp I (ITG)	Exp II (PTG)	CG	SOV	SOS	df	MS	'F' ratio
Pre-test								
Mean	8.16	8.17	8.12	B	0.04	3	0.12	0.076
S.D	0.41	0.40	0.42	W	12.25	76	0.16	
Post-test								
Mean	7.36	7.61	8.10	B	7.13	3	2.38	16.60*
S.D	0.29	0.44	0.40	W	10.89	76	0.14	
Adjusted				B	7.84	3	2.61	
Post-test	7.34	7.60	8.12					52.67*
Mean				W	3.72	75	0.05	

*=Significant at.05 level

Table value for df 3 and 76 at 0.05 level = 2.72

Table value for df 3 and 75 at 0.05 level = 2.72

From table 1, clearly observed that the value of pre-test of calculated F (0.076) was less than the table value of F-Statistics (2.72) at 0.05 level 0f significance. SO, there was no variation between control group and experimental groups. In the second row having the post-test value of the calculated F is 16.60 which was greater than the table value of F (2.72) at 0.05 level of significance. So, there was a variation between control group and Experimental Group. In the last row of the table, shows that the Adjusted Post Test calculated F-Value was 52.67, which was greater than the critical value of Fat 0.05 level of significant was 2.72. Here also, there existed a variation between two groups i.e. control group and experimental group.

Table 3: Scheffe's Test for the Differences between the Paired Adjusted, Post Test Means on Speed

ITG	PTG	CG	Mean Difference	CI
7.34	7.60		0.26*	
7.34		8.12	0.78*	0.14
	7.60	8.12	0.52*	

Confidence interval value at 0.05 level = 0.14

In the above table, calculated that the adjusted mean values of two experimental groups and control groups. From these

results, clear evidence has been obtained by comparing between ITG, PTG & CG. Here, there was a statistical variation between any two groups of these combinations but there was no statistical variation. The above table also explained that there was a statistical variation difference between ITG & PTG, ITG & CG, PTG & CG at 0.05 level of confidence.
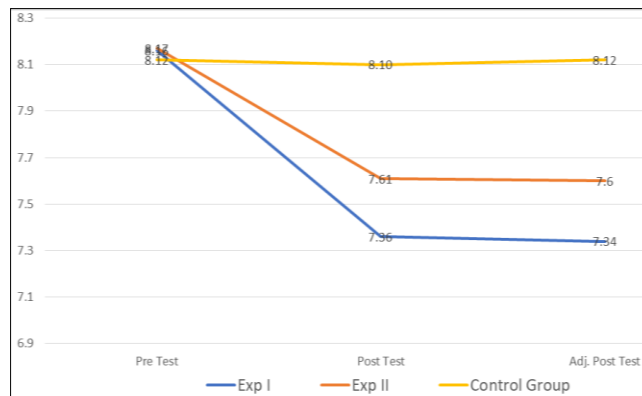

Fig 1: The Pre-Test, Post-Test and Adjusted Post Test Mean Values of Experimental Groups and Control Group on Speed

Table 4: Analysis of Covariance for the Pre Test and Post Test Data of Experimental Group Experimental Group II Experimental and Control Group on Explosive Power (in Meters)

	Exp I (ITG)	Exp II (PTG)	CG	SOV	SOS	df	MS	'F' ratio
				Pre-test				
Mean	1.23	1.21	1.21	B	0.10	3	0.003	0.31
S.D.	0.13	0.09	0.10	W	0.84	76	0.011	
				Post-test				
Mean	1.43	1.48	1.22	B	1.10	3	0.367	
S.D.	0.10	0.08	0.07	W	0.60	76	0.008	46.17*
Adjusted				B	1.01	3	0.335	
Post-test	1.42	1.48	1.23					
Mean				W	0.16	75	0.002	161.73*

Significant at 0.05 level
Table value for df 3 and 76 at 0.05 level = 2.72
Table value for df 3 and 75 at 0.05 level = 2.72

From the table Clearly observed that the value of pre-test of calculated F ratio 0.31, it is less than the table value of F-Statistics 2.72 at 0.05 level of significance. So, there was no statistical variation between control group and experimental groups. In the second row having the post-test value of the calculated F was 46.17 which was greater than the table value of F ratio was 2.72 at 0.05 level of significance. So, there was a statistical variation between control group and Experimental Group. In the last row of the table showed that the Adjusted Post Test calculated F-Value was 161.73, which was greater than the critical value of F was 2.72 at 0.05 level of significant. Here also, there existed a statistical variation between two groups i.e. control group and experimental groups.

Table 5: Scheffe's Test for the Differences between the Paired Adjusted, Post Test Means on explosive power

ITG	PTG	CG	Mean Difference	CI
1.42	1.48		0.06*	
1.42		1.22	0.20*	0.03
	1.48	1.22	0.26*	

Confidence interval value at.05 level = 0.03

In table, calculated that the adjusted mean values of three experimental groups and control groups. From these results, clear evidence has been obtained by comparing between ITG, PTG & CG. Here, there was a statistical variation between any two groups of these combinations. The above table also explained that there was a statistical variation difference between ITG & PTG, ITG & CG, PTG & PTG & CG at 0.05 level of confidence.
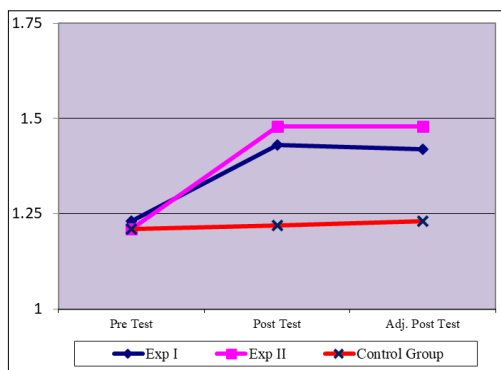

Fig 2: The Pre-Test, Post-Test and Adjusted Post Test Mean Values of Experimental Groups and Control Group on Explosive Power

Conclusions
1. From the study it was concluded that two experimental groups namely interval training and plyometric training made striking and robust advancement in physical fitness variables such as explosive power and speed whereas the control group did not show any significant result.
2. From the results it was found that interval training had shown better result in improving speed when compared to polymeric training.
3. From the results it was found that plyometric training had shown better result in improving explosive power when compared to interval training.

References
1. Estes R Rebekah *et al*. The Effect of High Intensity Interval Run Training on Cross- Sectional Area of the Vastus Lateralis in Untrained College Students. International Journal of Exercise Science,2017:10(1):137-145.
2. Fatouros *et al*. Evaluation of plyometric exercise training, weight training and their combination on vertical jumping performance and leg strength The Journal of Strength and Conditioning Research,2000:14(4):470-476.
3. Foster Carl *et al*. The Effect of High Intensity Interval Training Vs Steady State Training on Aerobic and Anaerobic Capacity. Journal of Sports Science and Medicine,2015:14(4):747-755.
4. Gibala J Martin *et al*. Physiological Adaptations to Low-Volume, High-Intensity Interval training in Health and Diseases. The Journal of Physiology,2012:590(5):1077-1084.
5. Gopinath R. Effect of resistance training, plyometric training and combined resistance and plyometric trainings on strength, power and speed parameters Unpublished Doctoral Thesis, Annamalai University, 2000.
6. Jlid Mohamed Chedly *et al*. Effects of in Season Multi-Directional Plyometric Training on Vertical Jump Performance, Change of Direction Speed and Dynamic Postural Control in U-21 Soccer Players. Frontiers of Physiology,2020:11:374.
DOI: 10.3389/fphys.2020.00374.