Effects of Varied Surface of Circuit Plyometirc Training on Speed and Speed Endurance Performance of School Level Basketball Players

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Abstract

Background: Basketball, game played between two teams of five players each on a rectangular court, usually indoors. Each team tries to score by tossing the ball through the opponent's goal, an elevated horizontal hoop and net called a basket.

Purpose: To find out the effects of varied surface of circuit plyometirc training on Speed and Speed Endurance of school level basketball players.

Methods: The study was conducted on sixty (N=60) boys Basketball players who will be participating in inter school Basketball tournament in Pudukkottai District during the year 2018- 2019 were randomly selected as subjects. The age of the subjects were ranged from 14 to 16 years. The subjects were divided into four groups of fifteen in each (n=15). Group-I underwent Grass Based Circuit Plyometric Training, Group-II underwent Sand Based Circuit Plyometric Training, and Group-III underwent Aquatic Based Circuit Plyometric Training and group –IV was act as the Control group. The experimental groups underwent their training programme for 12 weeks in addition to the training program designed by the school curriculum. The control group was not underwent any specific training. Speed and Speed Endurance were selected as dependent variables and it was assessed by 50 meter run and 150 meters run test. The data was collected from the four groups prior to and post experimentation on Speed and Speed Endurance was statistically analyzed by using Analysis of Covariance (ANCOVA). Hence, whenever the obtained f-ratio value was significant the Scheffe's test was applied as post hoc test to determine the paired mean differences, if any. In all the cases 0.05 level of significance was fixed.

Results: The results of the study showed there was a significant differences among the selected groups, further the results showed, Aquatic Based Circuit Plyometric Training group was better than other groups on the development of Speed and Speed Endurance.

Key words: *Grass Based Circuit Plyometric Training, Sand Based Circuit Plyometric Training, Aquatic Based Circuit Plyometric Training, Speed, Speed Endurance*

Introduction

In India, basketball was introduced some 80 years ago by the YMCA at Calcutta. Later the YMCA established in 1920 at Madras played an important role in developing the game. Now a day's basketball is one of the most favourite games in our colleges and schools. Every State in India has formed a State Basketball Association. The Basketball Federation of India was set up in 1950. It is perhaps the youngest national sport organization in the country. The word training means different things in different fields. In sports the word training is generally understood to be synonym of doing exercise. In a narrow sense training is physical exercise for the improvement of performance. Training involves constructing an exercise programme to develop an athlete for a particular event. This increasing skill and energy capacities are equal consideration[2].

Circuit training is defined as moving quickly from one exercise station to another and completing a prescribed number of exercises in a given time schedule. It is also a form of body conditioning or resistance training using high-intensity aerobics. The aim is to develop strength and muscular endurance. "An exercise circuit" is a single go of all prescribed exercises in the program in a given time period. This program was developed by R.E. Morgan and G.T. Anderson in 1953 at the University of Leeds in England. Circuit training is the most efficient way to enhance not only the muscular strength, but also the muscular strength endurance, explosive power, cardio respiratory endurance, anaerobic capacity, agility and flexibility. According to Morgan and Anderson the circuit training programs have six to twelve stations focusing on total body conditioning. A complete workout consists of two to three sets of each circuit. Depending on the type of programmes, it may be required to complete a specific number of exercises or for a specified period of time. The break between the sets is usually 15 to 30 seconds. However, any individual can modify the circuit training programme to ensure whether it meets his fitness needs or not[3].

The actual term 'Plyometrics' was first coined in 1975 by Fred Wilt, the American Track and Field coach. The elements ply and metric come from Latin roots for "increase" and "measure" respectively, the combination thus means 'measurable increase" [4].

Plyometric training can take many forms, including jump training for the lower extremities and medicine ball exercises for the upper extremities. Jump training exercises were classified according to the relative demands they placed on the athlete. All the exercises are progressive in nature, with a range of low to high intensity in each type of exercise. The classification of exercises is jumps in place; standing jumps; multiple hops and jumps, bounding, box drills and depth jumps.

The ability to apply force rapidly (reactive force) is the major goal of plyometric training. Plyometrics are used to apply an overload to the muscles with speed – strength as a goal. The speed-strength ability is known as power. Plyometrics should not be considered an end in itself, but as part of an overall program (stretching, running, strength training nutrition, etc). After an athlete has begun a proper strength and conditioning program, plyometrics are used to develop speed–strength[5].

Methodology

The study was conducted on sixty (N=60) boys Basketball players who will be participating in inter school Basketball tournament in Pudukkottai District during the year 2018- 2019 were randomly selected as subjects. The age of the subjects were ranged from 14 to 16 years. The subjects were divided into four groups of fifteen in each (n=15). Group-I underwent Grass Based Circuit Plyometric Training (GBCPT), Group-II underwent Sand Based Circuit Plyometric Training(SBCPT), Group-III underwent Aquatic Based Circuit Plyometric Training (ABCPT)and group –IV was act as the Control group. The experimental groups underwent their training programme for 12 weeks in addition to the training program designed by the school curriculum. The control group was not underwent any specific training. Speed and Speed Endurance was selected as dependent variable and it was assessed by 50 meters run and 150 meters run.

The data collected from the experimental groups and control group on prior and after experimentation on selected variables were statistically examined by analysis of covariance (ANCOVA) was used to determine differences, if any among the adjusted post test means on selected criterion variables separately. Whenever they obtained f-ratio value in the simple effect was significant the Scheffe's test was applied as post hoc test to determine the paired mean differences, if any. In all the cases 0.05 level of significance was fixed.

Results and Discussion

The Analysis of covariance (ANCOVA) on Speed and Speed of Experimental groups and control group have been analyzed and presented in Table -1 & 2.

a) Speed

The results of the Analysis of Covariance on Speed of the pre, post, and adjusted test scores of GBCPT group, SBCPT group, ABCPT group and Control group are presented in Table –1.

Table – 1 : Analysis of Covariance on Speed of Experimental Groups and Control Group

Test	GBCPT group	SBCPT group	ABCPT group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	F ratio
Pre Test Mean	7.72	7.70	7.73	7.70	Between	0.01	3	0.002	0.12
					Within	1.31	56	0.02	
Post Test Mean	7.16	7.03	6.73	7.69	Between	7.32	3	2.44	68.48*
					Within	2.00	56	0.04	
Adjusted Post Test Mean	7.15	7.04	6.71	7.70	Between	7.61	3	2.53	182.87*
					Within	0.76	55	0.01	

**** Significant at 0.05 level of confidence***

(**Speed** Scores in **1/100th of a Second)**

Table value for df (3, 56) at 0.05 level = 2.76 Table value for df (3, 55) at 0.05 level = 2.78

The table-1 shows that the pre-test mean values on Speed of GBCPT group, SBCPT group, ABCPT group and Control group are 7.72, 7.70, 7.73 and 7.70 respectively. The obtained 'F' ratio of 0.12 for pre-test scores was lesser than the table value of 2.76 for degrees of freedom 3 and 56 required for significance at 0.05 level of confidence on Speed.

The post test mean values on Speed of GBCPT group, SBCPT group, ABCPT group and Control group are 7.16, 7.03, 6.73, and 7.69 respectively. The obtained 'F' ratio of 68.48 for post-test scores was higher than the table value of 2.76 for degrees of freedom 3 and 56 required for significance at 0.05 level of confidence on Speed.

The adjusted post-test means on Speed of GBCPT group, SBCPT group, ABCPT group and Control group are 7.15, 7.04, 6.71 and 7.70 respectively. The obtained 'F' ratio of 182.87 for adjusted post-test scores was higher than the table value of 2.78 for degrees of freedom 3 and 55 required for significance at 0.05 level of confidence on Speed.

The results of the study indicate that there are significant differences among the adjusted post test means of GBCPT group, SBCPT group, ABCPT group and Control group in Speed.

To determine which of the paired means have a significant difference, the Scheffe's test is applied as Post hoc test and the results are presented in Table – 2.

Table – 2 : The Scheffe's test for the differences between the adjusted post test paired means on Speed

Adjusted Post-test Means				Mean Difference	Confidence Interval
GBCPT group	SBCPT group	ABCPT group	Control Group		
7.15	7.04			0.11	0.12
7.15		6.71		0.43*	0.12
7.15			7.70	0.56*	0.12
	7.04	6.71		0.33*	0.12
	7.04		7.70	0.66*	0.12
		6.71	7.70	0.99*	0.12

**** Significant at 0.05 level of confidence***

Table-4.2 shows that the adjusted post test mean differences on Speed between GBCPT group and ABCPT group, GBCPT group and Control group, SBCPT group and ABCPT group, SBCPT group and Control group and ABCPT group and Control group are 0.43, 0.56, 0.33, 0.66 and 0.99 respectively, which are greater than the confidence interval value of 0.12 at 0.05 level of confidence.

Further the table-2 shows that the adjusted post test mean differences on Speed between GBCPT group and SBCPT group is 0.11, which is lesser than the confidence interval value of 0.12 at 0.05 level of confidence.

The results of the study showed that there was a significant difference between GBCPT group and Aquatic ABCPT group, GBCPT group and Control group, SBCPT group and ABCPT group, SBCPT group and Control group and ABCPT group and Control group on Speed. Further the study showed there was a significant difference between GBCPT group and SBCPT group on Speed.

The above data also reveal that ABCPT group had shown better performance than GBCPT group, SBCPT group and Control group in Speed.

The pre, post and adjusted post mean values of GBCPT group, SBCPT group, ABCPT group and Control group on Speed are graphically represented in the Figure -1.

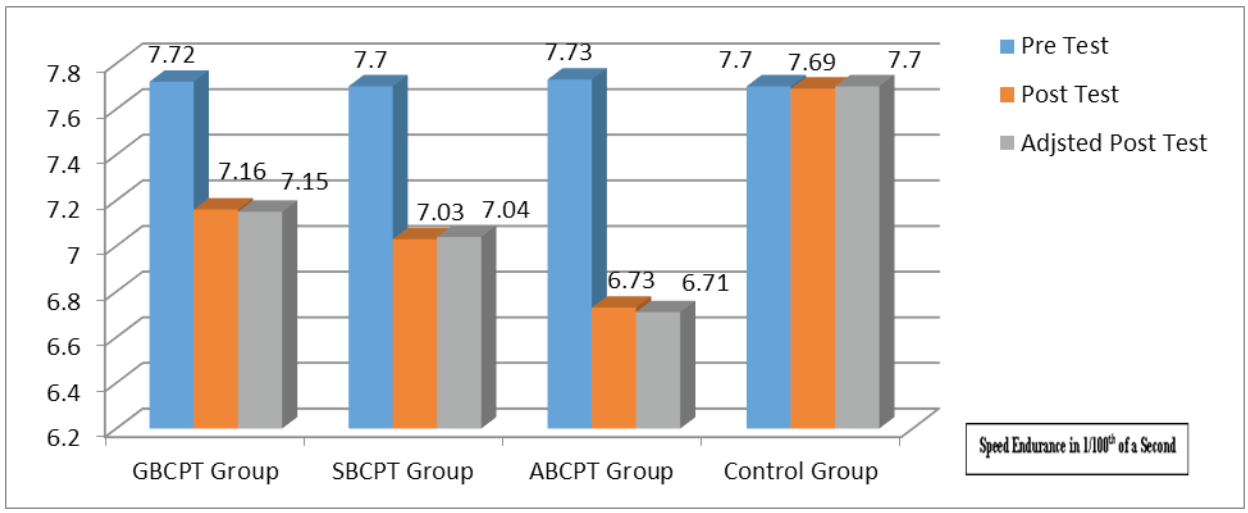

Figure: 1 The Pre, Post and Adjusted Post test Mean GBCPT group, SBCPT group, ABCPT group and Control group on Speed

b) Speed Endurance

The results of the Analysis of Covariance on Speed Endurance of the pre, post, and adjusted test scores of GBCPT group, SBCPT group, ABCPT group and Control group are presented in Table – 3.

Table – 3 : Analysis of Covariance on Speed Endurance of Experimental Groups and Control Group

Test	GBCPT group	SBCPT group	ABCPT group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	F ratio
Pre Test Mean	27.93	28.93	28.56	28.20	Between	8.40	3	2.80	0.22
					Within	700	56	12.50	
Post Test Mean	36.47	38.00	40.47	28.47	Between	1212.45	3	404.15	26.71*
					Within	847.20	56	15.13	
Adjusted Post Test Mean	36.78	37.64	40.38	28.60	Between	1154.76	3	384.92	39.76*
					Within	532.52	55	9.68	

**** Significant at 0.05 level of confidence***

(**Speed Endurance** Scores in **1/100th of a Second)**

Table value for df (3, 56) at 0.05 level = 2.76 Table value for df (3, 55) at 0.05 level = 2.78

The table-3 shows that the pre-test mean values on Speed Endurance of GBCPT group, SBCPT group, ABCPT group and Control group are 27.93, 28.93, 28.56 and 28.20 respectively. The obtained 'F' ratio of 0.22 for pre-test scores was lesser than the table value of 2.76 for degrees of freedom 3 and 56 required for significance at 0.05 level of confidence on Speed Endurance.

The post test mean values on Speed Endurance of GBCPT group, SBCPT group, ABCPT group and Control group are 36.47, 38.00, 40.47 and 28.47 respectively. The obtained 'F' ratio of 26.71 for post-test scores was higher than the table value of 2.76 for degrees of freedom 3 and 56 required for significance at 0.05 level of confidence on Speed Endurance.

The adjusted post-test means on Speed Endurance of ABCPT group, SBCPT group, ABCPT group and Control group are 36.78, 37.64, 40.38 and 28.60 respectively. The obtained 'F' ratio of 39.76 for adjusted post-test scores was higher than the table value of 2.78 for degrees of freedom 3 and 55 required for significance at 0.05 level of confidence on Speed Endurance.

The results of the study indicate that there are significant differences among the adjusted post test means of GBCPT group, SBCPT group, ABCPT group and Control group in Speed Endurance.

To determine which of the paired means have a significant difference, the Scheffe's test is applied as Post hoc test and the results are presented in Table – 4.

Table – 4: The Scheffe's test for the differences between the adjusted post test paired means on Speed Endurance

Adjusted Post-test Means				Mean Difference	Confidence Interval
GBCPT group	SBCPT group	ABCPT group	Control Group		
36.78	37.64			0.86	3.28
36.78		40.38		3.60*	3.28
36.78			28.60	8.18*	3.28
	37.64	40.38		2.73*	3.28
	37.64		28.60	9.04*	3.28
		40.38	28.60	11.78*	3.28

**** Significant at 0.05 level of confidence***

Table-4 shows that the adjusted post test mean differences on Speed Endurance between GBCPT group and ABCPT group, GBCPT group and Control group, SBCPT group and Control group and ABCPT group and Control group are 3.60, 8.18, 9.04 and 11.78 respectively, which are greater than the confidence interval value of 3.28 at 0.05 level of confidence.

Further the table-4 shows that the adjusted post test mean differences on Speed Endurance between GBCPT group and SBCPT group, SBCPT group and ABCPT group are 0.86 and 2.73, which are lesser than the confidence interval value of 3.28 at 0.05 level of confidence.

The results of the study showed that there was a significant difference between GBCPT group and ABCPT group, GBCPT group and Control group, SBCPT group and Control group and ABCPT group and Control group on Speed Endurance.

Further the results of the study showed that there was no significant difference between GBCPT group and SBCPT group, SBCPT group and ABCPT group on Speed Endurance.

The above data also reveal that ABCPT group had shown better performance than GBCPT group, SBCPT group and Control group in Speed Endurance.

The pre, post and adjusted post values of GBCPT group, SBCPT group, ABCPT group and Control group on Speed Endurance are graphically represented in the Figure -2.

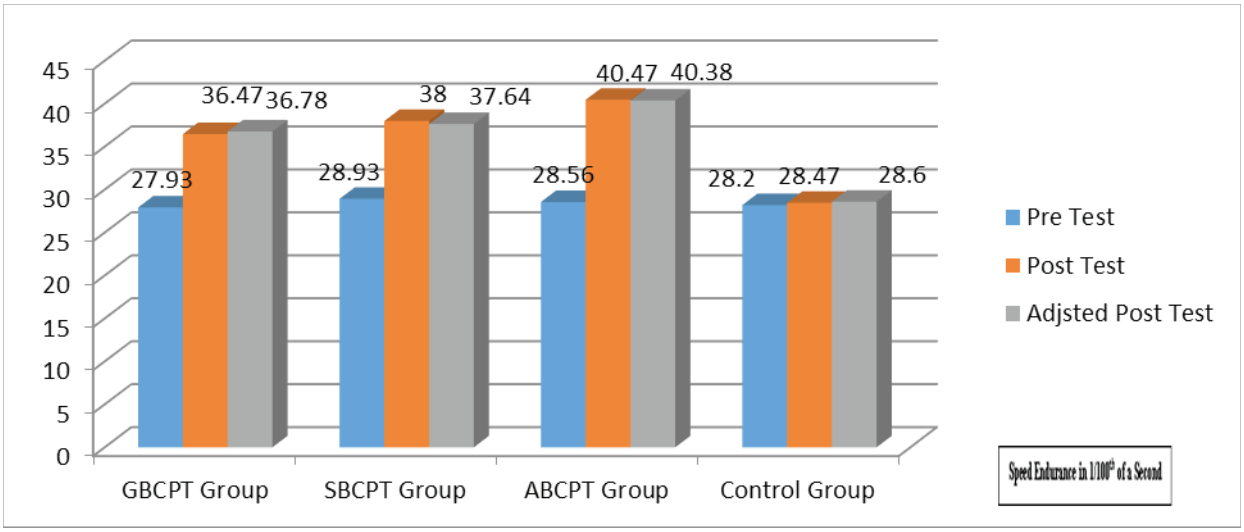

Figure: 2 The Pre, Post and Adjusted test Mean values on GBCPT group, SBCPT group, ABCPT group and Control group

Discussion on Findings

The results of the study indicate that all the Experimental groups namely GBCPT group, SBCPT group and ABCPT group have significantly improved in the selected dependent components namely Speed and Speed Endurance. Further the results of the study showed Control group showed there is no significant improvement.

It is also found that the improvement effected Speed and Speed Endurance by ABCPT group is greater when compared to the effects of GBCPT group and SBCPT group.

Conclusions

The Experimental groups namely, Grass Based Circuit Plyometric Training group, Sand Based Circuit Plyometric Training group and Aquatic Based Circuit Plyometric Training group had significantly improved in Speed and Speed Endurance.

Significant differences in achievement were found among Grass Based Circuit Plyometric Training group, Sand Based Circuit Plyometric Training group, Aquatic Based Circuit Plyometric Training group and Control group on selected criterion variables such as Speed and Speed Endurance

Aquatic Based Circuit Plyometric Training group was found better than Grass Based Circuit Plyometric Training group, Sand Based Circuit Plyometric Training group on the development of Speed and Speed Endurance.

Ethical Clearance: Nil

Source of Funding: Self

Conflict of Interest: Nil

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