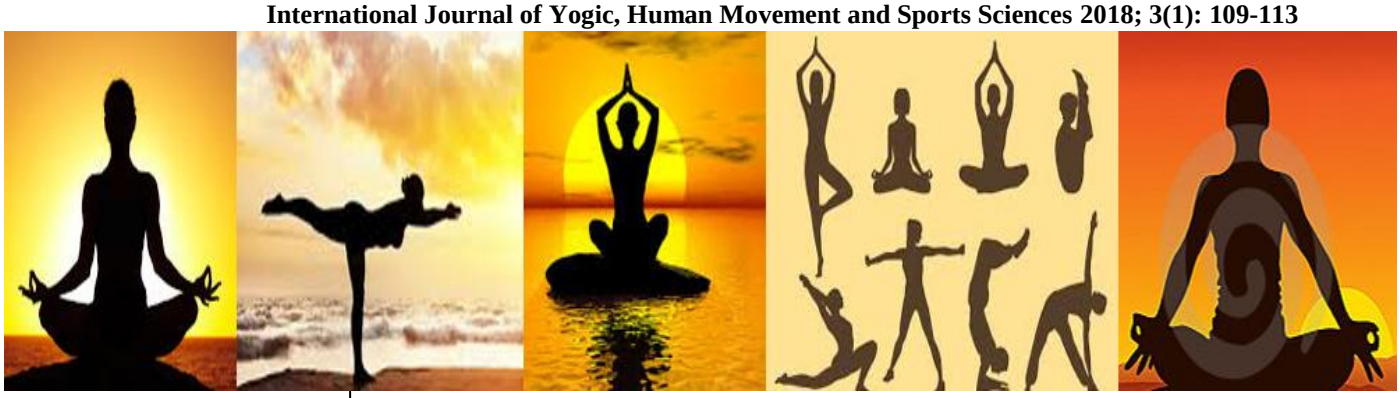
International Journal of Yogic, Human Movement and Sports Sciences 2018; 3(1): 109-113



ISSN: 2456-4419
Impact Factor: (RJIF): 5.18
Yoga 2018; 3(1): 109-113

www.theyogicjournal.com
Received: 21-11-2017
Accepted: 22-12-2017

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Trend of plyometric and circuit training on agility of Punjab state basketball players

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Abstract
The purpose of this study was to compare the Trend of Plyometric and Circuit training on agility of Punab State Basketball Players. The study was delimited to sixty male basketball players from Punjab. The age of the players ranged from 12 to 16 years. The Agility was measured before and after a six-week training period. The players of Experimental group were trained for six days per week on alternative days (Plyometric Training on Monday, Wednesday and Friday whereas Circuit Training on Tuesday, Thursday, and Saturday). The Agility was measured through shuttle run 10×10 Yards. Mean and Standard Deviation of the shuttle run were calculated. However, post-test of the Experimental Group showed a sign of improvement in shuttle run that was significantly lesser than pre-test. Results of this study showed significant difference between pre-test and post-test of Experimental group on dependent measurements (p<0.05).

Keywords: Trend, plyometric training, circuit training, agility

Introduction
In the last few decades, sports have gained tremendous popularity all over the world. The popularity of sports is increasing at a fast pace and this trend is likely to continue. The word 'Trend' has been defined as a movement in a given direction towards an idea (point) not yet reached, or as 'the path along which ideas have travelled, are travelling, or will probably travel'. New ideas are the invention of experimentation, exploration and research - taxing (demanding) man's intelligence, initiative, imagination, ingenuity, originality, endeavour, creative ability and challenging his capacity to think and to apply his knowledge and experience to a variety of demanding situations. So it is true that development in sports since the end of the Second World War have been the most progressive in the long history of sports. There have been periods in our history, when little has changed for a long time and progress has virtually become nil.

Modern basketball players are found to perform the movement skill such as quick starting, sudden stopping, change of pace, changing of direction, sudden acceleration of speed, quick jumping and shuffling of feet with and without ball. Basketball is a very pleasurable but exacting (demanding) game. It is one of the most strenuous games; and it demands high degree of physical fitness as well as a keen and alert mind. Running, jumping, passing, dribbling, shooting, intercepting, re- bounding are some of the fundamentals involved in the game, and the capacity to master them in practice and use them in co-ordination, has to be acquired by long and arduous training. It is also essentially a game of speed and endurance; and the players anxious to do well in Basketball must be prepared for systematic and persistent endeavour under capable coaches. Basketball is a sport which is played between two teams. In this game, there are five players in each team. This is the fastest sport in a short area and a short period of time. The calibre to generate strength level has been estimated as key to get high sports performance. Basketball is a sport with numerous complicated demands that need an aggregation of fitness, skill, team tactics and strategies and motivational outlook.

Plyometric is the term applied to exercises that have their roots in Europe, where they were first known simply as "jump training". Fredwilt, an American track and field coach first coined the term Plyometric. Basedon Latin origins, Plyo + metrics is interpreted to mean "measureable increases". Plyometric training is also known as "shock training".

It was develop by Yuri Verkhoshansky in 1977. Plyometric training is when a person performs explosive movements which generate large amounts of force quickly. The aim of these exercises is to increase concentric power output, by lengthening the muscle prior to the contraction. This will produce greater force through the storage of elastic energy. Athletes who participate in power sports i.e. football, basketball, hockey, use this method of training to develop explosive power. Performing plyometric correctly can increase power output dramatically on the other hand; lack of knowledge in this subject usually leads to injury.

Plyometric training is an excellent way to train for the players' demands of basketball. Training programmes should include repeated high intensity work, followed by period of recovery that imitates the specific tasks related to basketball. Other terms used in combination with Plyometric training are depth jump, box jump and jump training. Plyometric training has been used in basketball training program as a useful method for improving motor performance. It includes training loads with a number of rebounds and intervals between sets of exercises and drills. In plyometric training, athletes perform stopping, starting and changing direction in an explosive way, which helps to improve agility. One of the most effective mean of training for power is through plyometric training. It includes training loads with a number of rebounds and intervals between sets of exercises and drills. These abilities are the necessary skills in many team games including basketball because they enable players to do activity during the game at the required height, speed and at the right moment. Several researchers have used Plyometric training in their research and have shown that it improves power output and increases explosiveness by training.

There is more training programme which improves the fitness of a sportsman. The circuit training method is a much organised method of doing exercises to improve the performance of the player. Circuit training has been adopted throughout the world as simple but effective method. Circuit training differs from other fitness programs in that the activities are all performed at a maximal or near-maximal level. Circuit training was developed in Great Britain as a systematic and progressive conditioning program that would appeal to young people. The programme was developed by R.E. Morgan and G.T. Anderson in 1957 at the University of Leeds in England. As the name implies, a "circuit" is one completion of all prescribed exercises in the program. Exercise can be sequenced in a variety of combinations, which isolate single muscles, a group of muscles or total body training. A circuit is a specified number of exercise stations that are consecutively arranged in a given area. The individual do a set number of repetitions at each exercise until they come to the first exercise again and start a second lap. Each individual participant faces the challenge of completing the entire circuit as quickly as possible. Each circuit training participant moves from one station to the next with little (15-30 seconds) or no rest, performing a 15 to 45 seconds work session of 8-20 repetitions at each station using a resistance of about 40%-60% of one repetition maximum (1RM). The major advantages of circuit training are economy of time inherent in the organisation of a circuit, small amount of space and equipment required and eases in supervising a training programme. Another advantage of the circuit is that bad weather does not affect the circuit schedule since all the stations can be arranged indoor. The activities in the circuit are varied and thus seen to hold the interest of the athlete.

In recent years athletic coaches have recognised the worth of such a program and have utilized the circuit training method for conditioning their squads. The near-maximal overload on a variety of activities, geared to one's abilities, makes circuit training one of the best ways for developing all-round physical fitness. It is designed to provide a vigorous, all-round workout over a short period of time. Circuit training aims at developing muscular strength and endurance, flexibility, cardio-respiratory endurance and in some instances, coordination. Such elements as running, calisthenics and weight training can all be incorporated into the program. The exercises are specially selected so that a fixed amount of effort is required on each one. This might be measured by the number of repetitions, the resistance or load provided for the muscles to work against, or a time factor for the completion of the whole schedule. Exercises must be simple and involve very little skill. Two or three circuits, or laps of the exercises, constitute a training session and as training progresses the improvement in strength and stamina may be seen in the increase of repetitions, the heavier poundage used or the decrease in the overall time taken for three laps of the circuit. Circuit training improvement can only be affected by some form of training which makes continuous demand upon the heart and lungs over a prolonged period of time.

Agility enables the athlete to change the position of his body quickly and easily. Agility is important for evading a tackler in Foot ball, dodging in Basketball and Hockey, and turning at the end of Swimming Lane. Agility refers to the manoeuvrability of the individual, i.e., the ability to change the direction of movement rapidly, without less of balance or sense of position. It is therefore, a combination of speed, strength quick reactions, balance and coordination and can refer to the total body or to a specific part, such as the hands or feet.

Objectives

- To find out the Trend of Plyometric and Circuit Training on agility of experimental group of Punjab State basketball Players.
- To find out the effect of Plyometric and Circuit Training on agility among the experimental groups (pre-test, mid-test and post-test) of Punjab State Basketball Players.
- To find out the effect of Plyometric and Circuit Training on agility of experimental group of Punjab State basketball players.

Hypotheses

- There is no significant difference in Trend of plyometric and Circuit Training on agility of experimental group of Punjab State Basketball players
- There is no significant difference in Plyometric and Circuit Training on agility among experimental group of Punjab State Basketball players.
- There is no significant difference in Plyometric and Circuit Training on agility between pre- test and post-test of Experimental Group of Punjab State Basketball players.

Delimitations

- The research was delimited to male basketball players of Punjab.
- The study was delimited to sixty male basketball players of Experimental Group.
- The age ranging from 12 to 16 years were selected randomly.

- The training programme of Plyometric and Circuit training was restricted to one hour for six weeks in which subjects attended the training for three days on alternate days in a week.

Training Schedule

The Plyometric and Circuit Training were administrated for a week on alternate days. Plyometric Training was on Monday, Wednesday and Friday whereas Circuit Training was carried out on Tuesday, Thursday and Saturday per week for six weeks. The load for the training programme will be progressively increased from beginning to the end of the training session.

Table 1: Plyometric Training Programme

	Week 1 & Week 2		Week 3		Week 4 & Week 5		Week 6	
	Repetition	**Sets**	**Rep**	**Sets**	**Rep**	**Sets**	**Rep**	**Sets**
MONDAY								
Jump Squat	15	2	20	2	20	3	20	4
Box Jump	15	2	20	2	20	3	20	4
Side Jump	15	2	20	2	20	3	20	4
Strides	15	2	20	2	20	3	20	4
Skipping	15	2	20	2	20	3	20	4
WEDNESDAY								
Side way box jump	15	2	20	2	20	3	20	4
Jump over to tuck jump	15	2	20	2	20	3	20	4
Sumo Jump	15	2	20	2	20	3	20	4
Hamstring curl fast	15	2	20	2	20	3	20	4
Jumping on Toes	15	2	20	2	20	3	20	4
FRIDAY								
One Leg Hop jump	15	2	20	2	20	3	20	4
Box Jump	15	2	20	2	20	3	20	4
Side Way Jump	15	2	20	2	20	3	20	4
Depth jump	15	2	20	2	20	3	20	4
Scissor Jump	15	2	20	2	20	3	20	4

Table 2: Circuit Training Programme

	Week 1 & Week 2		Week 3 & Week 4		Week 5 & Week 6	
	Duration(sec)	**Sets**	**D (sec)**	**Sets**	**D (sec)**	**Sets**
Tuesday, Thursday, Saturday						
Jumping Jacks	20	3	30	3	45	3
Kicking back	20	3	30	3	45	3
High knee strides	20	3	30	3	45	3
Side hopes	20	3	30	3	45	3
Squat	20	3	30	3	45	3
Flutter kick	20	3	30	3	45	3
Pilates Leg Pulls	20	3	30	3	45	3
Pilates Leg Pulls	20	3	30	3	45	3

Method and Procedure

The study is experimental in nature. In this study, the sample of sixty male basketball players was selected from Punjab, age ranging from 12 to 16. Experimental group went through Plyometric and Circuit Training for one hour, after 15 minutes of warm-up and stretching exercise, for six weeks. Agility was measured with the help of shuttle run and the score was recorded in seconds. The data would be collected by the pre-test (T1), mid-test (T3) after three weeks and the post-test (T2) after Six-week of training programme.

Statistical Techniques Used

For analysis of the data collected from pre-test, mid-test and post test of Experimental Group of basketball players, Mean and Standard Deviation were computed. For this purpose 't-test', ANOVA were applied and for testing the hypotheses, the level of significance was set at 0.05%.

Findings and Discussion

Trend of Pre-test, Mid-test and Post-test of Experimental Group on Agility of Punjab State Basketball Players

The following table 1 shows the trend of pre-test, mid-test and post-test of Experimental Group on Agility of Punjab State Basketball Players

Table 3: Means of Trend of Pre-test, Mid-test and Post-test of Experimental Group on Agility of Punjab State Basketball Players

Group	Mean		
	Pre-Test	**Mid-Test**	**Post-Test**
Experimental Group	11.33	10.59	9.76

Table-3 shows the means of trend of pre-test, mid-test and post-test are 11.33, 10.59 and9.76 respectively. The decrease values show that there is a positive progress from pre to post in trend of Agility. It shows that the Plyometric and Circuit Training affect the agility of Experimental Group.

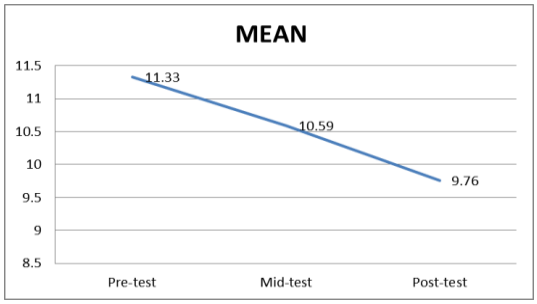

Fig 1: Trend of Pre-test, Mid-test and Post-test of Experimental Group on Agility

It may be inferred that means of pre-test, mid-test and post-test of experimental group differ in Agility.

Difference in Pre-test, Mid-test and Post-test of Experimental Group in Agility of Punjab State Basketball Players

The following table 2 shows the value of pre-test, mid-test and post-test of Experimental Group in Agility of Punjab State Basketball Players.

Table 4: ANOVA for the Measures of Pre-test, Mid-test and Post-test of Experimental Group in Agility

Variable	Source of Variance	Sum of Square	Degree' s of Freedom (df)	Mean Sum of Square (MSS)	'F'-Ratio
Explosive Strength	Between Groups	74.03	2	37.01	77.12*
	Within Groups	84.95	177	0.48	

*Significant at 0.01 level

Table 4 shows the F-ratio for Experimental Group to test the null hypothesis with respect to Agility. Obtained F-value {F (2, 177) = 77.12; $p<0.01$} was found to be significant. It denotes that there is a significant difference among pre-test, mid-test and post-test of Experimental Group in Agility of Punjab State Basketball Players.

Hence the hypothesis, *"*There is no significant difference among measures of pre-test, mid-test and post-test of Experimental Group in Agility" is rejected.

Difference between Pre-test and Post-test of Experimental Group in Agility of Punjab State Basketball Players

The table 3 shows the values of mean, Standard deviation and t-value for comparison between Pre-test and Post-test of Experimental Group.

Table 5: Comparison of Statistical Values between Pre-test and Post-test of Experimental Group on Agility

Groups		Mean	SD	df	t-test
Experimental Group	**Pre-test**	11.33	0.93	59	6.04*
Experimental Group	**Post-test**	9.76	0.32		

* Significant at 0.01 level

Table 5 represents the mean, SD and t-value between pre-test and Post-test of Experimental Group on Agility that the pre-test of Experimental Group was found to have higher value on Agility 11.33±9.76 as compared to post-test of Experimental Group 9.76±0.32. The obtained t-ratio for this difference was found to be significant (t=6.04; $p<0.01$).

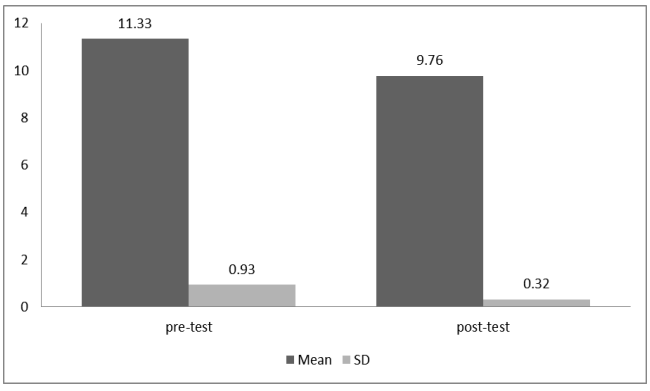

Fig 2: Comparison of Mean and Standard Deviation between Pre-test and post-test of Experimental Group on Agility

It may be inferred that post-test differs significantly in Agility from pre-test of Experimental Group.

Thus the hypothesis, *"*There will be no significant difference between pre-test and post-test of Experimental Group in Agility*"* is rejected.

Conclusion

The Plyometric and Circuit Training enhance the performance from pre to post training. The Plyometric and Circuit Training bring positive effect on shuttle run of Agility on male basketball players of Punjab.

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