



ISSN: 2456-0057  
IJPNPE 2018; 3(2): 208-210  
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www.journalofsports.com  
Received: 27-05-2018  
Accepted: 28-06-2018

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## A study of plyometric and circuit training on muscular strength, muscular endurance and flexibility among university player

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### Abstract

The purpose of the present study was to find out the effect of Plyometric and Circuit training on muscular strength, muscular endurance, and flexibility among university player. The purpose of the present study was to find out the study of plyometric training and circuit training on physical fitness and body composition of university player. To achieve the purpose of this study, the researcher will select sixty (60) male university level players of different sports will be selected. The age group will be 18 to 24 years as per the college records.

The selected subjects were divided into two experimental groups and a control group with twenty subjects in each (n=20). Experimental group I underwent plyometric training, Group II underwent circuit training and Group III served as the control group for the training period for this study was five days in a week for twelve weeks. Prior to and after the training period, the subjects were tested for muscular strength, muscular endurance, and flexibility. The selected criterion variables, such as muscular strength, muscular endurance, and flexibility, were tested by using and administering, handgrip strength test, sit-ups test and sit and reach test. Analysis of Covariance (ANCOVA) was applied as a statistical tool. Whenever the post-test mean found significant, the Scheffé S was applied as the post-hoc test. In all cases, .05 level of confidence was fixed to test the significance, which was considered as an appropriate. It was concluded from the results of the study that the training groups have improved Muscular strength, muscular endurance, and flexibility.

**Keywords:** Physical fitness, Plyometric training, Circuit Training, Muscular Strength, Muscular Endurance, Flexibility

### Introduction

Fitness is the ability to live a full and balanced life. The totally fit person has a healthy and happy outlook on life. Fitness is the young man's absolute necessity. It breeds self-reliance and keeps man mentally alert. Physical fitness is essential for human beings to adjust well to his environment as his mind and body are in complete harmony. Clarke and Clarke (1989)<sup>[2]</sup> found that physical fitness is not a static factor and it varies from individual to individual and in the same person from time to time depending on factors.

Sports performance can be improved through Sports training. Like any other type of human performance, sports performances are also a product of the total personality of the sportsperson. In general, the personality of a person reflects suspects like physical, physiological, social and psychic traits. Therefore apart from physical and physiological traits, the social and psychic traits of the sportsperson need to be improved for Achieving improvement in sports performances.

Plyometric training is an "intense, advanced form of exercise in which the muscles are first stretched, then contracted (the pre-stretching makes the muscle contract with greater force)".

The movements of Plyometric training are so powerful and have high impact. Strength and endurance are essential requirements of Plyometric training. Common Plyometric training is imparted through simple exercises like jumps and hops. Sometimes these simple exercises are practiced by using obstacles like steps or cones.

Plyometric exercises enhance the excitability, sensitivity, and reactivity of the neuromuscular system and increase the rate of force production, motor unit recruitment, firing frequency,

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and motor unit synchronization. These training exercises are a progression that can be incorporated once a player has achieved an overall strength base, proper core strength, and balance stabilization capabilities. Adequate isometric stabilization strength decreases the time between the eccentric muscle action and concentric contraction, resulting in shorter ground contact times, which result in decreased tissue overload and potential injury when performing plyometric training. Plyometric exercises also use the stimulation of the body's proprioceptive mechanism and elastic properties to generate maximal force output in the minimal amount of time. All movement patterns that occur during functional activities involve a series of repetitive stretch-shortening cycles (eccentric and concentric contractions). Stretch-shortening cycles require the neuromuscular system to react quickly and efficiently after an eccentric muscle action to produce a concentric contraction and impart the necessary force in the appropriate direction. The purpose of this activity is to produce the necessary force to change the direction of an object's center of mass efficiently.

Circuit training is another important form of sports training which combines strength training with endurance training. The exercises imparted in circuit training are usually groups of exercises with no rest or little rest between one group and another group of exercises. Usually, a group, or circuit, contains six to ten stations. The intensity of the exercises varies depending on the fitness level of the trainees.

Athletes need good levels of strength and conditioning to help them attain their sporting goals. For maximum benefit, conditioning training methods need to be applied in an effective manner.

Circuit training is one such training method used in strength and conditioning programmed, and in this fact sheet, we provide information related to the correct design and implementation of a circuit training programmed. Effective programmed design and implementation can result in improved athletic performance.

Circuit training is gaining recognition as it improves strength and endurance concurrently. The trainees can understand the dramatic improvement in their fitness level after the circuit training

Flexibility is the ability to execute a wide range of movement in the joints while for repetition of work done at natural speed. Flexibility is the most important flexibility helps to move bodily parts easily, takes less time, energy to perform a task. Elasticity in muscle reduces tension and provides maximum length

Muscular strength refers to the amount of force a muscle can produce and is usually measured by the maximum amount of force a muscle can produce in a single effort (maximal effort). The amount of muscle strength which can be achieved depends on gender, age, and inherited physical attributes. While strong muscles are essential for any athletic Endeavour,

strong muscles can benefit everyone in some way.

Daily tasks, such as lifting heavy items and placing them on shelves can be made easier if an individual has good muscular strength. Parents and grandparents need strong muscles to life infants and young children.

Muscular endurance is the ability of a muscle or group of muscles to sustain repeated contractions against a resistance for an extended period of time. It is one of the components of muscular fitness, along with muscular strength and power.

In strength training, muscular endurance refers to the number of repetitions of a single exercise you can do without needed to stop and rest.

Examples include how many times you can do a full squat, a sit-up, or a bicep curl with a light-to-moderate weight before breaking form.

The specific type of muscular endurance used during cardiovascular fitness activities such as running, swimming, or cycling is usually called cardiovascular endurance or cardiorespiratory endurance and is from the strength training definition. Endurance training for these types of physical activities builds the energy systems of the body, the muscle fibers, and capillaries that can sustain long periods of exercise, such as running a marathon or cycling a 100-miler.

**Methods**

The purpose of the present study was to find out the effect of plyometric and circuit training on muscular strength, muscular endurance, and flexibility among university player. To achieve the purpose, sixty (60) male university level players of different sports will be selected from Shree B.P.B arts and M.H.G commerce college, Unjha. The age group will be 18 to 24 years were selected as subjects. They were divided at random into three groups of twenty each. This study consisted of two experimental groups. Group I underwent plyometric training and Group II underwent circuit training, and Group III acted as the control group. The training period for this study was five days a week for twelve weeks. For every training programme, there would be a change in various structure and systems in the human body. So, the researcher consulted with the experts then selected the following variables as criterion variables: 1. Muscular strength, 2. Muscular endurance and 3. Flexibility. The selected criterion variables, such as muscular strength, muscular endurance, and flexibility, were tested by using and administering, handgrip strength test, sit-ups test and sit and reach test. Analysis of the Data Analysis of covariance was used to determine the differences, if any, among the adjusted post-test means on selected criterion variables separately. Whenever the 'F' ratio for adjusted posttest mean was found to be significant, the Scheffé S test was applied as post-hoc test. The level of significance was fixed at .05 level of confidence to test the 'F' ratio obtained by analysis of covariance.

**Table 1:** Analysis of Covariance and 'F' ratio for Muscular strength, Muscular Endurance and Flexibility of Plyometric group, Circuit groups and Control group

Variable Name	Group Name	Plyometric Group	Circuit Group	Control Group	'F' Ratio
Muscular strength (In Kg.)	Pre test Mean ± S.D	44.80 (+5.22)	44.60 (+5.80)	45.95 (+5.18)	14.65*
	Post test Mean ± S.D	47.45 (+5.40)	47.60(+5.59)	46.50(+5.27)	
	Adj. Post test Mean ± S.D	47.75	48.10	45.70	
Muscular Endurance (In Nos.)	Pre test Mean ± S.D	40.90 (+3.49)	34.45 (+4.66)	31.85 (+3.48)	48.29*
	Post test Mean ± S.D	43.70 (+3.51)	38.80(+3.71)	32.80(+3.35)	
	Adj. Posttest Mean ± S.D	39.32	39.89	36.09	
Flexibility (In Cm.)	Pre test Mean ± S.D	27.83 (+1.94)	27.50 (+2.07)	26.55 (+2.32)	12.52*
	Post test Mean ± S.D	31.40 (+2.86)	30.93(+2.26)	27.75 (+2.06)	
	Adj. Post test Mean ± S.D	30.99	30.77	28.31	

\* Significant at .05 level of confidence. (The table value required for significance at .05 level with df 2 and 56)= 3.16.

**Table 2:** Scheffé S Test for the Difference between the Adjusted Post-Test Mean of Muscular Strength, Muscular Endurance and Flexibility

Adjusted Post-test Mean of Muscular Strength				
Plyometric Group	Circuit Group	Control Group	Mean Difference	Confidence Interval at 0.05 level
47.75	-	45.70	-2.06*	0.95
47.75	48.10	-	0.34	
-	48.10	45.70	-2.40*	
Adjusted Post-test Mean of Muscular Endurance				
39.32	-	36.09	3.22*	0.75
39.32	39.89	-	-0.57	
-	39.89	36.09	3.79*	
Adjusted Post-test Mean of Flexibility				
30.99	-	28.31	2.68*	1.15
30.99	30.77	-	0.22	
-	30.77	28.31	2.45*	

\* Significant at .05 level of Confidence.

## Results

Table-I showed that there was a significant difference among plyometric group, circuit group, and control group on muscular strength, muscular endurance and flexibility. Table-II shows that the Scheffé S test on muscular strength for the difference between adjusted post-test mean of between plyometric group and control group (2.06), circuit group and control group (2.40), which were significant at .05 level of confidence. Table – II also shows that the Scheffé S test on muscular endurance for the difference between adjusted post-test mean difference of plyometric group and control group (3.22), circuit group and control group (3.79), which was significant at .05 level of confidence.

Table – II shows that the Scheffé S test on flexibility for the difference between adjusted post-test mean difference of plyometric group and control group (2.68), circuit group and control group (2.45), which were significant at .05 level of confidence. The result also showed that there was no significant difference between the training groups on selected criterion variables such as muscular strength, muscular endurance, and flexibility.

## Conclusions

1. It was concluded from the results of the study, the muscular strength, muscular endurance and flexibility has improved significantly after the respective training programme.
2. When compared with the control group, both training groups has significantly improved in selected criterion variables, such as, muscular strength, muscular endurance and flexibility.
3. It was also concluded from the results of the study, in other words plyometrics and circuit may be recommended for improving the Muscular strength, Muscular endurance and Flexibility of university player.

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