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# EFFECT OF PLYOMETRIC (KNEE TO CHEST TUCK JUMPS) ON SPEED IN YOUNG FOOTBALLERS

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## ABSTRACT

**Background:** Speed is an important component of football game as well as the training process. The setting of today's football requires agile players, that would be unpredictable and subtle for the opponent. Plyometric helps to fill up the performance gap by improving speed, power, agility and skill of an individual. The aim of the study is to find out the effects of Plyometrics (knee-to-chest tuck jump) on speed in football players. **Objectives:** To find out the effect of regular exercise in control group on speed in football players and to find out the effect of Plyometrics (knee-to-chest tuck jump) on speed in football players. **Methods:** Experimental study design carried out on 50 footballers who were randomly divided into 2 groups: experimental (25) and control (25). Outcome measures were 50 Meter Run Test for assessing speed. Control group continued their regular training sessions and experimental group received intervention of "Knee to Chest Tuck Jumps" in addition. **Result:** The control group performed 50m Run Test with mean pre 6.66 (±0.28) and post 6.59(±0.28), MD 0.07, t Value 1.021 and p value 0.317. The experimental group performed 50m Run Test with mean Pre 7.266 (±0.172) and Post 7.01(±0.146), MD 0.256, t Value 12.53, p value < 0.001 shows

significant improvement in the speed of participants. **Conclusion:** Regular training in addition to plyometrics gives additional improvement in speed.

**KEY WORDS:** Speed, Plyometric, Knee to Chest Tuck Jumps, Football, Speed Training

## INTRODUCTION

Sports refer to physical activities involving skills of competitive nature. A group or an individual competes against each other for entertainment. Training of body, mind and conduct of a student is the main aim of education. For physical and mental well-being of a student he or needs regular physical exercise[1]. Aim of sports science is to recognize and develop muscle strength, endurance, speed, and power, which are essential and play an important role in achieving athletic excellence.[1]

In 1920, plyometrics were invented in the eastern parts of the world, which has roots in the Greek work pleythyein which means to augment. In 1975, plyometrics was first used by an American track field coach named Fred Wilt after he performed an pervasive study of Dr. Verkoshanskys. He derived the word from the Latin words "pilo" and "metrics".[2] Plyometric training is the most common method for enhancing performance in explosive, high velocity and high power exercises.[3]

Plyometric training increases strength, power and velocity through rapid contraction and the stretch shortening cycle, where concentric contraction occurs prior to eccentric contraction. During the eccentric contraction, there is increase in the motor unit recruitment of the muscle which is produced by the stretched muscle, once the muscle is stretched to its limits; it then contracts (concentric contraction) allowing all of the force generated to be used by the body in form of explosive movement. The body is therefore able to produce a greater amount of force to improve an individual's performance in high power and high velocity exercises.[3]

Eccentric muscle contractions are swiftly followed by concentric contractions in a variety of team or individual sport skills. A rapid concentric contraction is accompanied by the elastic energy which is produced by the stretched muscles during an eccentric contraction. This combined act is widely known as stretch-shortening cycle (SSC) which depends on making use of elastic energy passively in the muscle and the active role of stretch reflex.[4]

Soccer is the world`s most popular sport. According to the International Federation of Association Football (2014A), approximately 265 million players and 5 million referees and

officials are actively involved. This is equivalent to 4% of the world`s population. The game is intermittent in nature and involves multiple motor skills such as running, dribbling, kicking, jumping and tackling. Performance depends upon a variety of individual skills and their interaction and integration among different players within the team.[10] Young individual dream is giving a best performance in every appearance or where ever they play. Football game consists of three main components and they are endurance, speed and agility. A player can function smoothly with speed and agility only if the player has a good endurance level.[11,12]

Football is a game based on endurance, speed, power and agility. Every player is not good in endurance, power, speed and agility. They undergo different trainings to improve these factors to perform well. Different trainings are not sufficient to achieve a good power and speed. Till now there is no such study where same Plyometric technique is used for both speed and power. There are different studies where it is been stated that Plyometric helps to fill up the performance gap by improving speed, power, agility and skill of an individual, that is why plyometrics is important and must be included in the training session with regular training.

## METHODOLOGY

An experimental Study design conducted at Aryans Football academy ground, Sant-Tukaram Nagar and Pune football club ground, Mamurdi, Dehuroad. Outcome measures were 50 meters run test (speed).

## PROCEDURE

The study, procedures and guidelines was presented orally and in written consent form. Subjects who agreed to participate signed an institutionally approved consent form. The subjects were randomly allotted into the experimental group and the control group each having 15 subjects.

### 50 Meters Run Test

The test involves running a single maximum sprint over 50 meters, with the time recorded. A thorough warm up will be given, including some practice starts and accelerations. Start from a stationary standing position, once the subject is ready and motionless, the starter gives the instructions "set" then "go". Time will be recorded once he crosses the 50 meters mark.

Players were asked to do the test 3 times with a break of 5 minutes after each run. The best of 3 attempts was recorded.



**A. Starting Position** **B. Acceleration** **C. Finishing**

**INTERVENTION:** The intervention was knee to chest tuck jumps and were carried out by plyometric group for 5 days per week for 4 weeks, 3 repetitions of exercise in each session 25 jump at one go. The study population was male footballers of 18-25 years. Before performing the knee to chest jumps the players were told to go for general warm-up exercises like jogging and stretching. After the warm-up is done they were asked to perform the knee to chest jump 25 reps at one go, 2 minutes break was given after every 25 jumps, and this was repeated 3 times i.e. 75 jumps in one session and were continued for 4-weeks. In these 4-weeks all the subjects were advised not to start with any other exercises like gym training strength training for lower limbs, any abdominal exercises. The players were advised only to go for general warm-up exercises. Before starting the training they were asked to go for 50 meters run test for speed, readings were noted to compare it with after the training program.



**A. Starting Position** **B. Knee to Chest Tuck Jumps** **C. Finishing**

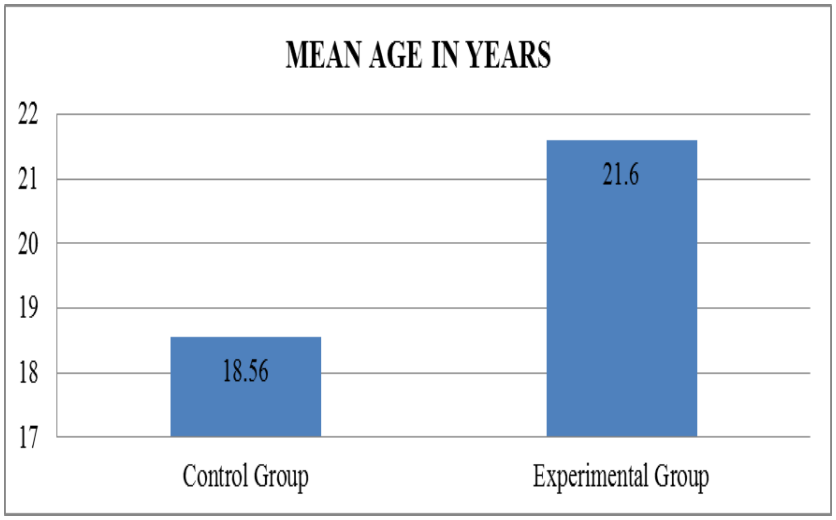
## STATISTICAL ANALYSIS

The data collected was entered in EXCEL sheet and statistical analysis was done using PRIMER. Parametric testing was used to compare groups since the quantitative dependent variables were reasonably normally distributed. Paired t-tests were used to compare quantitative outcomes within group.

## RESULTS

**Table 1. Demographic data of participants according to AGE**

| Mean Age (years) | Control Group | Experimental Group |
|---|---|---|
| | 18.56 | 21.6 |

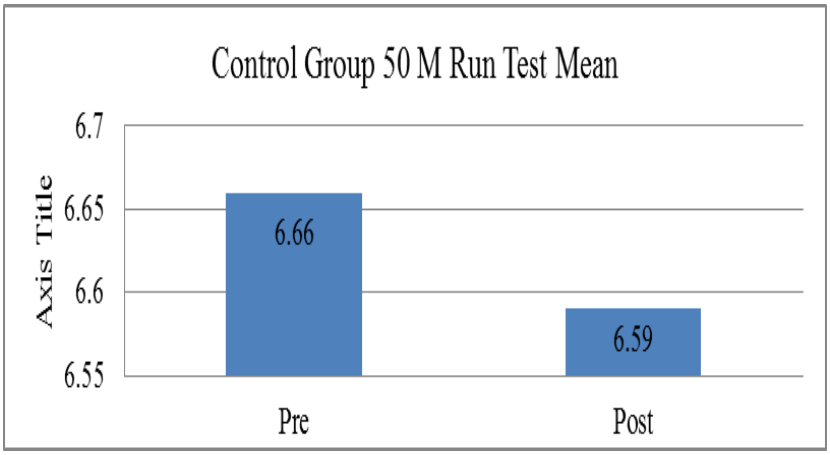



**Graph 1 Demographic data of participants according to AGE**

This graph shows the age distribution of participants. The mean age of control group participants were found to be 18.56 years where as the mean age of experimental group was found to be 21.6 years.

**Table 2.A. Comparison of (Pre and Post) Control Group 50 Meter Run Test**

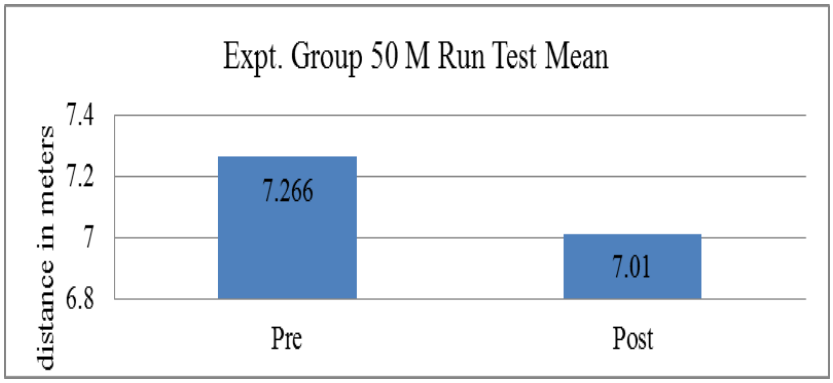
| | Pre | Post |
|---|---|---|
| Mean | 6.66 | 6.59 |
| SD | 0.2774 | 0.2755 |
| Mean Difference | 0.07 | |
| t Value | 1.021 | |
| p value | 0.317 | |




This graph shows within group analysis of 50 meters run test of control group where the pre-mean of 50 meter run timing was 6.66 seconds and it decreased to post-mean of 6.59 seconds with p = 0.317

**Table2.B. Comparison of (Pre and Post) Experimental Group 50 m Run Test**

| | Pre | Post |
|---|---|---|
| Mean | 7.266 | 7.01 |
| SD | 0.172 | 0.146 |
| Mean Difference | 0.256 | |
| t Value | 12.53 | |
| p value | < 0.001 | |




## DISCUSSION

The present study was carried out with the aim to find out the effects of Plyometrics (knee-to-chest tuck jump) on power and speed in football players and the objectives were to find out the effect of Plyometrics (knee-to-chest tuck jump) on speed in football players and the effect of regular exercise in control group on speed in football players.

A lot of movements in soccer include jumping, hopping and bounding that characterized by the use of the stretch-shortening cycle (SSC) that develops during the transition from a rapid

eccentric muscle contraction to a rapid concentric muscle contraction (Markovic et al., 2007).[18] The goal of Plyometrics is to Decrease amount of time required between the eccentric muscle contraction& the initiation of the overcoming concentric contraction. The Normal physiological movement rarely begins from a static starting position, but is usually preceded by an eccentric pre-stretch as it utilizes the series-elastic & stretch reflex properties of the neuromuscular unit, i.e. Stretch-shortening (rapid eccentric loading phase-concentric phase) cycle. This Stimulation causes proprioceptor excitability of the neuromuscular receptors, Improves the reactivity of the neuromuscular system, and a brief Amortization phase (phase between the stretch & shortening cycles).[16]

Muscles have a natural tendency to rebound when stretched rapidly (e.g. rubber band). The more rapid the eccentric contraction, more likely the stretch reflex is activated[15]. For an activity to truly be plyometric there must be a movement preceded by an eccentric muscle action. Plyometric training can promote changes within the neuromuscular system that allow the person to have better control of the contracting muscles.[13]

Plyometrics are important factors in increasing strength & power output. There is development of neuromuscular responses to stresses applied. Golgi tendon organ thresholds are raised to permit more stretch increases neuromuscular coordination.[14] As speed increases & activity is performed more accurately, the strength to perform is improved. Energy & movement are not wasted on ineffective activity. Better coordination permits greater power production. When speed & coordination of activity is improved, greater power can be produced. Thus, the rate of stretch is more important than amount of stretch.[15]

In our study we have measured speed (50 meters run test ) both the groups showed improvement in 50 meters run test. At stretch-shortening cycle muscle function, a pre-stretch enhances the maximum force and work output that muscles can produce during the concentric phase. This is the ability that plyometric exercises can improve.

In our study we found that the program improves the running velocity (0-50m) in young footballers. However Meylan and Malatesta[21], and Ingle et al. reported a marked reduction of the initial acceleration time and maximal velocity phase of soccer players. Kotzamanidis[14] after a training program with plyometrics (10 weeks duration) found that velocity for the running distances 0-30, 10-20 and 20- 30 m increased but not for the distance 0-10 m. In another study, Dialloet al.[20], (2001) investigate the effectiveness of plyometric

training on physical performances in young soccer players. Some of the findings showed that the performances at 20 m running velocity increased. Also our results were in line with the findings of Lehance et al. (2006)[19] and Michailidis et al. (2013).[17] These researchers found that strength and plyometric exercises can improve the ability of sprint in young soccer players.

The limitations of the study are the anthropometric measurements such as height and weight that affect the vertical jump and 50m run test results along with age group and the individual's role in the team. Future scope of this study is application of plyometric training along with regular endurance and weight training sessions to improve the physical fitness and performance of the players.

## CONCLUSION

Regular training improves speed in young footballers. Although, regular training in addition to plyometrics gives further improvement in speed and power young football players.

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