



“EFFECT OF SIX WEEK PLYOMETRIC TRAINING ON AGILITY, AEROBIC ENDURANCE AND POWER IN FOOTBALL PLAYERS AT PARUL UNIVERSITY: AN EXPERIMENTAL STUDY”

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ABSTRACT

Background:

Football is an intermittent sport characterized by repeated high-intensity efforts (i.e., accelerations, decelerations, and changes of direction and strokes) during a variable period of time (i.e., on average 90 min). increases in power and efficiency due to plyometrics may increase agility training objectives and plyometric activities have been used in sports such as football, football, soccer or other sporting events that agility may be useful for their athletes. Hence plyometric helps to improve agility, power and endurance among football players.

Aim:

To know the effect of plyometric training on agility, aerobic endurance and power in elite football player.

Method:

Total number of subject (n=60) were taken from Parul university. All 60 participants were playing football as a sports activity. All these participants were assessed for inclusion and exclusion criteria. The ones falling into the inclusion criteria were then asked to sign a written consent form. These participants were then divided into 2 groups in a randomized manner by picking up chit from the bowl. Group-A consist of 30 football players which comprised the experimental group and Group-B had another 30 participants and they received normal warm-up exercise like, jogging, cycling and stretching of lower limb muscle.

Participants were between the age group of 16 - 22 years, free of lower extremity injuries, and were not included in any type of plyometric training at the time of the study.

All participants were asked not to change or increase their current exercise habits during the course of the study. The plyometric training group participated in a 6-week training program performing a variety of plyometric exercises designed for the lower extremity, while the control group did not participate in any plyometric exercises. All participants were instructed not to start any lower extremity strengthening programs during the 6-week period and to only perform activities of normal daily living. Prior to the study, procedures and guidelines were presented orally and in written form. Plyometric treatment was given twice per week to allow for sufficient recovery between workouts as recommended by researchers.

Pre intervention assessment were taken in both the groups and after the training protocol post assessment data were collected.

Result:

Participants in the Plyometric group (Group A) showed a statistical significance improvement in the agility, aerobic capacity and power compared to the convention group (Group B). Group A showed statistical significance in agility with $p=0.036$, Aerobic capacity with $p=0.000$ and power with $p=0.005$.

Conclusion:

The study concluded that when plyometric is compared to conventional training or routine day to day activities shows greater improvement in agility, aerobic capacity and power among football players. Hence plyometric can be an integral part of training program for football players.

Key words:

Football, Plyometric, Agility, Cardiac endurance, Power

Introduction:

Football is an intermittent sport characterized by repeated high-intensity efforts (i.e., accelerations, decelerations, and changes of direction and strokes) during a variable period of time (i.e., on average 90 min). To be competitive and successful, football players will need a mixture of speed, agility, and power combined with well-developed aerobic fitness.

Players must be able to react as fast as possible to actions performed by the opponent, where reaction time, initial acceleration, and agility play an important role. Initial acceleration can be referred to as the first 10 m of a sprint, while agility can be recognized as the ability to change direction by starting and stopping quickly during points.

Speed is the ability to achieve high velocity, and it is a manifestation of strength (i.e., explosive force: early portion of force–time curve) applied to a specific movement or technique. The average sprint distance performed in football is 4 m to 7 m in the course of a point, with an average of 4 changes of direction. Based on these facts, football players need to possess exceptional dynamism in multidirectional movements during

matches. Together with explosive, short movements around the court, players are required to possess a good and powerful serve, as it is the most important stroke from a strategic standpoint. Moreover, due to its complexity (e.g., reliance on multiple body segments to produce power through properly timed rotations and complex coordinated muscular activations), it has received more attention in the literature than other strokes. To improve serve performance, muscle strength throughout the entire kinetic chain must be increased without affecting serve accuracy, therefore this is frequently the main target of training programs in football practice. Given the nature of sport, athletes and sport champions have various needs, priorities, and preferences in terms of physical fitness and mobility status. In other words, all sport courses hold individual requirements in strength, endurance, power, flexibility, and speed, or a combination of them; which vary from one sport to another.

Muscle power is an effective parameter to success. Power is defined as an ability to do work per unit of time. In physical education, it refers to the maximal force that a muscle generates in the shortest possible time in order to confront the resistance, it is equal to muscular force or explosive power. Increased power enables muscles to do the same work in small time period, or high work volume within the same time. Peak muscle power is determined by the ability to generate maximum strength and speed, and represented as the highest power output during a specific movement. The variable can be improved through several exercises.

The word "plyometric" consists of two parts: "plio" meaning "more"; and "metric" meaning "measure". Based on the findings of Miller and Power (1981) for eccentric contractions, scientific principles of drop jump training were developed. In accordance with the theory of primary muscle strain, the jump training is aimed to increase the use of kinetic energy.

When the focus is on feet extensor muscles, those plyometric exercises which are performed based on drop jump from an initial height to on the land or on a hard and flat surface, is usually considered. Meanwhile, some studies have concentrated on the initial jump height. According to previous studies; plyometric exercises can cause similar achievements with resistance practices in jumping performance¹.

It has been suggested that increases in power and efficiency due to plyometrics may increase agility training objectives and plyometric activities have been used in sports such as football, football, soccer or other sporting events that agility may be useful for their athletes⁴.

Need for the Study:

- To find efficacy of Plyometric training on various physical performance (agility, aerobic endurance and power) measures in elite football player.

Aims & Objectives:

- To know the effect of plyometric training on agility in elite football player.
- To know the effect of plyometric training on aerobic endurance in elite football player.
- To know the effect of plyometric training on power in elite football player.
- To compare the effect of plyometric training in agility, aerobic endurance and power.

Methodology:**Source of data:**

- Parul University, Vadodara, Gujarat.

Inclusion criteria:

- Age: 16-22 Years
- Playing football for 1 year

Exclusion criteria:

- Any musculoskeletal disorder and systemic illness that can affect the performance of football player

Sampling method:

- Sample Size: n = 60
- Selection of Sample: simple random sample

Method of data collection:

- Study design: Experimental study design

Material used:

- Illinois Agility Test: flat non-slip surface, marking cones, stopwatch, measure tape, pen, pencil, paper
- Cooper 12 minutes run test: 400-meter track, stopwatch, whistle, assistant, pen, pencil, paper

Outcome measure

- Illinois Agility test (time in second): for agility
- Cooper 12-minute run test (meter): for aerobic endurance

Procedure:

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Participants were between the age group of 16 - 22 years, free of lower extremity injuries, and were not included in any type of plyometric training at the time of the study.

All participants were asked not to change or increase their current exercise habits during the course of the study. The plyometric training group participated in a 6-week training program performing a variety of plyometric exercises designed for the lower extremity, while the control group did not participate in any plyometric exercises. All participants were instructed not to start any lower extremity strengthening programs

during the 6-week period and to only perform activities of normal daily living. Prior to the study, procedures and guidelines were presented orally and in written form. Plyometric treatment was given twice per week to allow for sufficient recovery between workouts as recommended by researchers.

Pre intervention assessment were taken in both the groups and after the training protocol post assessment data were collected.

Plyometric Training program was given as follows:

Training Week	Training Volume (foot contacts)	Plyometric Drill	Sets X Reps	Training Intensity
Week 1	90	• Side to side ankle hops	2 X 15	Low
		• Standing jump and reach	2 X 15	Low
		• Front cone hops	5 X 6	Low
Week 2	120	• Side to side ankle hops	2 X 15	Low
		• Standing long jump	5 X 6	Low
		• Lateral jump over barrier	2 X 15	Medium
		• Double leg hops	5 X 6	Medium
Week 3	120	• Side to side ankle hops	2 X 12	Low
		• Standing long jump	4 X 6	Low
		• Lateral jump over barrier	2 X 12	Medium
		• Double leg hops	3 X 8	Medium
		• Lateral cone hops	2 X 12	Medium
Week 4	140	• Diagonal cone hops	4 x 8	Low
		• Standing long jump with lateral sprint	4 x 8	Medium
		• Lateral cone hops	2 x 12	Medium
		• Single leg bounding	4 x 7	High
		• Lateral jump single leg	4 x 6	High
Week 5	140	• Diagonal cone hops	2 x 7	Low
		• Standing long jump with lateral sprint	4 x 7	Medium
		• Lateral cone hops	4 x 7	Medium
		• Cone hops with 180-degree turn	4 x 7	Medium
		• Single leg bounding	4 x 7	High
		• Lateral jump single leg	4 x 7	High

Week 6	120	• Diagonal cone hops	2 x 12	Low
		• Hexagon drill	2 x 12	Low
		• Cone hops with change of direction sprint	4 x 6	Medium
		• Double leg hops	3 x 8	Medium
		• Lateral jump single leg	4 x 6	High

The plyometric training group were trained at the same time of day, two days a week, throughout the study. During the training, all participants were under direct supervision and were instructed on how to perform each exercise.

Three tests were conducted to determine agility outcomes.

Illinois Agility Test:

- The length of the course is 10 meters and the width (distance between the start and finish points) is 5 meters.
- Four cones are used to mark the start, finish and the two turning points.
- Another four cones are placed down the center an equal distance apart. Each cone in the centre was spaced 3.3 meters apart.
- Participants should lie on their front (head to the start line) and hands by their shoulders.
- On the 'Go' command the stopwatch is started, and the athlete gets up as quickly as possible and runs around the course in the direction indicated, without knocking the cones over, to the finish line, at which the timing is stopped.

Cooper 12-minute run test:

This test requires the athlete to run as far as possible in 12 minutes.

- The athlete warms up for 10 minutes
- The assistant gives the command "GO", starts the stopwatch and the athlete commences the test
- The assistant keeps the athlete informed of the remaining time at the end of each lap (400m)
- The assistant blows the whistle when the 12 minutes has elapsed and records the distance the athlete covered to the nearest 10 metres

For an evaluation of the athlete's performance select the age group and gender, enter the total distance covered and then select the 'Calculate' button.

By means of these three procedures post data of all 60 participants will be taken.

For control group, routine work was allowed to perform as per the instruction of their coach. And after 6 weeks data were calculated.

- 30 seconds rest between two trials

Result:

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Discussion:

Football is an intermittent sport characterized by repeated high-intensity efforts (i.e., accelerations, decelerations, and changes of direction and strokes) during a variable period of time (i.e., on average 90 min). To be competitive and successful, football players will need a mixture of speed, agility, and power combined with well-developed aerobic fitness:

Players must be able to react as fast as possible to actions performed by the opponent, where reaction time, initial acceleration, and agility play an important role. Initial acceleration can be referred to as the first 10 m of a sprint, while agility can be recognized as the ability to change direction by starting and stopping quickly during points.

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Michael G. Miller et all (2006) have done study on The Effects of A 6-Week Plyometric Training Program on Agility; the purpose of the study was to determine if six weeks of plyometric training can improve an athlete's agility. Subjects were divided into two groups, a plyometric training and a control group. The plyometric training group performed in a six-week plyometric training program and the control group did not perform any plyometric training techniques. The plyometric training group reduced time on the ground on the post-test compared to the control group. The results of this study show that plyometric training can be an effective training technique to improve an athlete's agility.

Mario A. Cardoso Marques et all (2010) have done study on Strength in Power Events: Theory and Practice Over the last 30 years, strength and power training has been a major issue for, coaches, athletes and researchers. Unfortunately, despite the increasing professionalization of coaches and athletes, there is little research data concerning performance in top athletes. In fact, experimental studies in high level athletes are very difficult to put into practice for many reasons. However, such considerations ought not to detract from the necessity and

importance of this type of research in strength and power events. Many experiments demonstrated that a specific strength training program can improve athletes' maximal force and power production, reduce the incidence of injury, and contribute to faster injury recovery times, thereby minimizing the number of missed practice sessions and competitions.

Conclusion:

The study concluded that when plyometric is compared to conventional training or routine day to day activities shows greater improvement in agility, aerobic capacity and power among football players. Hence plyometric can be an integral part of training program for football players.

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