

# A study on the effects of three different intensity of plyometric training on football players

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**Abstract** - Football players need to be physically fit so that they can run with strength, change direction quickly off the mark to control the game, pass properly, and tackle effectively for the duration of the game. In addition, players need to be able to tackle well for the duration of the game. In addition to having the skills required to play the game, individuals who are interested in playing football need to be in exceptional physical condition in order to participate. Plyometric exercises, as their name suggests, are meant to aid a muscle in reaching its maximal strength in the quickest length of time possible. Plyometric exercises are often performed in a jumping motion. There is a large variety of different types of physical activities that may be done in addition to jumping, which is the primary focus of the vast majority of the exercises in this category. The phrase "measurable growth" derives from a combination of two Latin words: "increase" and "measure." Both the English term "measure" and the Latin word "increase" have their origins in the Latin language.

**Keywords** - Plyometric training, Intensity, Football, Physical Fitness, Exercises

## 1. INTRODUCTION

In order to enhance the functions one is training for, physical training includes subjecting the organism to a training load or labour stress of sufficient intensity, duration, and frequency to generate a training effect. In order to induce such a training effect in an organism, it must be subjected to an overload (i.e., a stress) greater than that normally encountered in daily life. A widespread belief in training settings is that "to build up, one must first tear down." Yes, some catabolic processes, like the breakdown of glycogen, are linked to training stress, but this is counteracted by an anabolic reaction that leads to a surplus of the molecules that were mobilised or broken down during exercise. This is, at most, a vague statement about the influence on other sub-cellular components.

Today, a more nuanced picture of the molecular processes underlying training responses is beginning to take shape. However, it is reasonable to say that all cells and tissues of the body, regardless of the presence or lack of training, are subject to some form of ongoing exchange and remodelling, which may be used as a basis for understanding the training process. The lifespan of molecules is limited at the cellular level, and old molecules are continually being replaced with new ones of the same sort, or with a different isoform of the same molecules if the need arises. [1]

### 1.1 Football

The world as we know it has undergone a total transformation as a direct result of the innovations and research that have taken place in this age of high technology and scientific discovery. As a result, with the assistance of scientific training and coaching, there has been a significant shift in the area of football as well. The athletes are being coached based on scientific guidelines with highly advanced methods for the purpose of effectively improving their performance and enabling the coaches to extract the best possible results within a reasonable amount of time. The players, when they are participating in training, are being put through activities that are useful and advantageous for obtaining greater standards. Training is a term that refers to the process of getting someone ready to do a certain activity. The purpose of participating in sports training is to improve one's overall athletic performance. [2]

### 1.2 Fitness for football

A great degree of fitness is required to play the sport of football, which enables players to run forcefully, move swiftly off the mark in any direction to control, pass accurately, and tackle efficiently throughout the game. In addition to requiring talent, football also needs a high level of physical fitness. A high degree of physical fitness is required for the game of football since it is played for a total of 90 minutes (and, in the event that the game finishes in a draw during a knockout competition, an additional period of 30 minutes is played), therefore the training programme

should be prepared appropriately. A player who is in good physical shape has a greater likelihood of being able to keep up their work pace for a longer amount of time.

As a result, all players are responsible for improving their speed, power, strength, endurance, agility, and cardiorespiratory endurance. The minimum need for excellent performance in any sport is a degree of physical fitness. [3]

### 1.3 Importance of performance

When it comes to achieving truly remarkable sporting outcomes, the performances are crucial. While certain abilities, like speed, can be attributed to genetics alone, most can benefit from scientifically sound training. Performance-based factors, such as speed, power, strength, endurance, agility, and cardiorespiratory endurance, tend to be the deciding factors in the majority of sporting events and contests. To achieve at a high level in football, a player's physical ability must be backed up by a number of other aspects. Most industrialised countries have a strong scientific understanding of the need of exposing children to physical activity, motor learning, and skill development from a young age so that they may attain their full potential as athletes. Football demands a high degree of overall fitness, including motor talents such as speed, power, strength, endurance, agility, cardio respiratory endurance, leaping activity, etc. [4]

### 1.4 Biomotor abilities

Football is a very physical sport, regardless of age. It will need you to run. It requires a lot of twisting and turning. It requires running, jumping, and kicking, as well as tackling. In addition, the pressures and tensions of playing in a competitive atmosphere become increasingly difficult to handle for younger players as they get older. Football is a sport that prioritises physical fitness in addition to technical and tactical abilities. The aggregate of these five components is referred to as physical fitness. To put it another way, strength, speed, endurance, flexibility, and endurance, as well as their complicated forms.

Skill-related physical fitness is a more comprehensive term, which includes all of the fitness components including additional five motor components, such as power, speed, agility, balance, and reaction time, which are important primarily for success in sports. This term also includes all of the fitness components. [5]

### 1.5 Sports training

Training for a sport is a methodical, time-consuming procedure. A scientific basis and approach to training are necessary for optimal results. If that isn't an option, then the training should be based on the outcomes of tried-and-true methods that have stood the test of

time. The goal of every sports programme should be to raise the level of performance of its athletes. Several things influence how well an athlete performs. Performance capacity, including speed, strength, and endurance, is crucial to a sportsperson's success. Therefore, the primary goals of physical exercise are all of the above. Training for a sport involves developing one's body, mind, and character via a regimen of strenuous workouts. It's a methodical procedure in which sportsmen and players actively take part to improve their performance. Training is analogous to erecting a skyscraper. In order to reach the final destination of completed structures or competitively fit athletes, it is necessary to use a variety of resources in a continuous process, such as training intensities and modalities. The proportion of each material used will change as building advances. Over the course of a training season, the focus will shift from volume to intensity in establishing the total load, with a shift toward more compressive conditioning activity for strength and endurance. [6]

## 2. PLYOMETRIC

Plyometrics are workouts that help a muscle develop its full potential as quickly as feasible. Leaping is a common component of many workouts, but jumping is by no means the only option. The words "ply" and "metric," both of which have Latin origins, signify "increase" and "measure," respectively. Plyometrics are workouts that use the force of gravity to build muscle endurance and stamina (potential energy). The muscle's elastic qualities cause it to generate kinetic energy, which is promptly put to use in an opposing response. The capacity for quick force application by muscles and connective tissues (muscle sheath and tendinous tissues), leading to maximum power output in linear, vertical, lateral, or combined motions; this is elastic strength.

The benefits of plyometric training are especially noticeable in high-intensity sports where agility and power are equally important. What we mean when we talk about "speed strength" is the capacity to use maximum power while performing quick motions. Throwing and sprinting, as well as racket sports like baseball and softball and contact sports like football and tackling, all demand a high level of speed and strength (which require swinging movements). Throwing and catching a medicine ball, and doing different variations of push-ups, are all excellent plyometric exercises for the upper body. Plyometrics with a high shock intensity, such deep leaps, can improve leg strength and power on their own or in combination with resistance training.

It's unclear whether or not deep jumping aids with vertical leaping. On the other hand, Herman (1976) by D. Herman. Jumps at depth are conducted by stepping off a box and then jumping. Plyometrics are performed to improve one's explosive power and reaction time. The purpose of plyometrics is to train the muscles to fatigue quickly in order to increase

their speed and strength. The goal of plyometric exercise should not be in and of itself, but rather to complement the whole plan (stretching; running, strength training, nutrition, etc.). [7]

### **2.1 Mechanics of plyometric exercise**

Standing atop a box, stepping off with bent knees, and launching into a vertical leap. The knees flex fast after the balls of the feet make contact with the ground, activating the quadriceps and hip extensors in a rapid eccentric motion. Plyometrics is based on the principle that fast acceleration (concentric contraction) is followed by quick slowdown (eccentric action) of a mass. This is because the quick eccentric movement triggers the stretch reflex, or stretch-shortening cycle, which causes the same muscles to contract more forcefully during the concentric phase. The muscle spindle plays a pivotal role in the stretch reflex. Muscle spindles are a type of sensory mechanism that are found in intrafusal muscles, alongside extrafusal muscle fibres. When stretched, muscle spindles respond differently depending on the frequency and intensity of the force. A motor neuron in the spinal cord receives input from a sensory neuron in the muscle spindle. Once the strain is released, the motor neuron triggers a contraction in the muscle (extrafusal fibres). This prevents the muscle from being injured by fast stretching at an extreme length.

A countermovement consists of an equally quick eccentric reaction, followed by a similarly quick concentric contraction. One's absolute performance in these exams increases as the rate of stretch increases. The approach leap will show the greatest height, while the static squat jump will provide the minimum. The countermovement is not used in the static squat leap (the countermovement is the quick eccentric reaction during the flexion of the ankles, knees, and hips), and the approach jump uses a more powerful countermovement than the countermovement alone. When performing plyometrics, which are dynamic activities that promote high muscular tension (eccentric), the stretch reflex will cause a larger force to be generated than when performing a concentric contraction from a static posture without first stretching. Muscles and tendons lengthen as part of the stretch-shortening cycle triggered by activation of the stretch reflex. The elastic tendencies of the muscle store energy during the elongation. The force generated by the concentric contraction can be enhanced if it quickly follows an eccentric reaction. The power of speed is therefore enhanced.[8]

## **3. PROGRAM DESIGN**

### **i. Equipment and Facilities**

Plyometric training will be more successful and safer if participants follow the instructions that are provided below when selecting proper equipment and facilities.

### **ii. Proper footwear**

Shoes must have adequate cushioning in the heel and ball of the foot, sufficient lateral stability, and a broad, nonslip sole. To avoid injury from ankle rollover, a cross-training shoe is recommended. Ankle pain, especially while turning in and out, can be caused by shoes with a thin sole and inadequate upper support, such as size 9 running shoes.

### **iii. Sufficient training area**

As for how much room you'll need, that'll vary from drill to drill. Sometimes, a 100-meter straightaway is needed for long-response drills. Most drills involving bounding and running require a straightaway of at least 30 metres in length. Some of the tall and deep leaps require just a little footprint, but plenty of height (between 3 and 4 m).

### **iv. Intensity**

The intensity of an exercise is measured by how much strain it places on the muscles, tendons, and ligaments, as well as the joints. The muscles and joints are not put under as much strain when skipping as they are when doing deep leaps. If you want to keep the same level of intensity, you should turn down the volume. Both intensity and volume can rise during the first stages of training, but after high-intensity drills are established as the foundation of the programme, volume should fall. Numerous factors are linked to the difficulty of plyometric drills:

- Whether or not one or both of your feet touch the ground. The impact of an athlete landing from an alternate-leg bound is significant because of the potential for a stronger vertical than horizontal component.
- The course that the leap was going to take (vertical or horizontal).
- Horizontal speed.
- How high above the ground the body's centre of gravity is elevated whether it is standing or sitting. The greater the height of the object's centre of gravity, the more force will be exerted upon landing.
- The presence and amount of extra weight (in the form of weight vests, ankle weights, and wrist weights) worn while exercise. These weights are only for advanced athletes. Because of the wide range of intensity that exercises might cover due to these and other circumstances, it's important to select the most useful drills for each training cycle with due diligence. [9]

### **3.1 Progression in a Plyometric Training Program**

The beginning of a programme need to consist of drills with a low intensity and a low volume (up to 80 foot contacts). These highlight the vertical aspect of the structure. Jumping in place should be followed by jumping while standing. These latter provide an emphasis on linear as well as vertical components.

Jumps from a standing position count as IRM work, but they should be done in sets of 5 to 10 repetitions each. Move on to doing many hops and leaps. These patterns include moving in a repetitive manner. It's possible to look at several leaps as a mix of jumping in place and jumping while standing. One possible multiple jump is repeat triple jumps (this will turn into combination bounding as soon as a long response is used). When compared to other drills, bounding consists of movements that are performed at a larger linear speed. These motions are performed for predetermined durations or predetermined repetitions in order to cover the greatest possible distance.[10]

#### 4. OPERATIONAL DEFINITIONS OF TERMS

In order to prevent misunderstandings and incorrect interpretations of the information presented in this study, the terminology that is likely to be utilised is defined and clarified in this section.[11]

##### i. Training

It is a set of physical activities with the goal of enhancing an athlete's capabilities as well as their capacity for sustained physical activity in preparation for a specific competition.

##### ii. Plyometric Training

Plyometrics are a type of resistance training in which the emphasis is placed on explosive muscular contractions.

##### iii. Speed

One way to describe speed is an individual's capacity to successfully repeat a series of motions at a higher tempo while maintaining the same pattern.

##### iv. Explosive power

It is a mix of physical toughness and the ability to move quickly. One definition of it is the capacity to prevail against opposition with a fast rate of speed.

##### v. Physiology

The scientific study of how all of an organism's parts—including its organs and its systems—work together is known as physiology.

#### 5. DIRECTION OF MOTION

Football players need to be able to move quickly and powerfully not just in the vertical plane but also in the horizontal (forward), lateral, and diagonal planes as well. Football, baseball, and running are examples of sports that use horizontal and/or lateral movement during competition. Basketball and volleyball are two examples of sports that have horizontal movement but also place a strong emphasis on vertical movement.

The long jump and the triple jump both include both horizontal and vertical movement in their execution. Some sports require players to move laterally or alter their direction, and others incorporate elements of both horizontal and vertical movement to varying degrees. Football Players who push, toss, or swing their arms might benefit from upper-body plyometric activities. These drills focus on building explosiveness and power in the upper body.[12]

#### 5.1 Safety

A strength and conditioning coach should be present during plyometric training to ensure proper form is being followed by all participants. Injuries occur when training protocols are disregarded, which can be the consequence of a lack of strength and conditioning, a bad warm-up, a lack of development in the lead-up drills, a training volume or intensity that is out of proportion to the current phase, poor footwear, or a lack of expertise. Spinal discs, knees, hips, and ankles are all vulnerable spots. Plyometric training can cause injuries, however there is evidence that it does not cause problems during preseason workouts.

Unique to Each Person and Each Sport - The athlete's specific sport must be accounted for in any training plan. As an example, large football players may be more prone to injury due to the physical demands of the game. They put their ankles, knees, and low backs under a lot of strain and torque during practise and competition due to the many different ways their bodies are positioned. This, together with the often violent nature of physical contact, may mean that these athletes can't take part in high-intensity and shock workouts.

#### 5.2 Progressive Overload

As a kind of progressive resistance training, plyometric has to adhere to the rules of progressive overload. The term "progressive overload" refers to the methodical ascent in frequency, volume, and intensity through a variety of permutations. There may be times when two of these variables are raised, or when one is increased while one or both of the others are decreased. There may also be instances when just one of these variables is increased. As was said earlier, in general, a rise in intensity results in a reduction in volume.

#### 6. PLYOMETRIC TRAINING'S POSITIVE EFFECTS ON MALE AND FEMALE ATHLETES

The landing mechanics and decreased extremities strength of female athletes who participated in a jump training programme were compared before and after training with those of male athletes. When compared to male athletes, female ones showed less progress. These results were consistent with those of earlier research that found women to be more susceptible to

significant knee injuries than men while engaging in jumping sports. Jumping sports were especially dangerous for women because they were four times more likely to suffer serious knee ligament injuries than men were at the national championship level of volleyball. Eighty-nine percent of surgeries on female basketball players were for knee injuries, and 18 percent of girl injuries were knee-related, compared to 10% of boy injuries. In a professional basketball league, female players had a 2.2-fold higher incidence of knee injuries than male players over the course of a two-year research. According to these results, gender inequalities persisted even when women were just as highly trained as males.[13]

## 7. CONCLUSION

People who are interested in playing football need to be in outstanding physical condition in addition to possessing the abilities necessary to play the game in order to be eligible to participate. Plyometric exercises, as their name indicates, are intended to assist a muscle in obtaining its full strength in the shortest amount of time feasible. Plyometric exercises may be found in a variety of sports and fitness contexts. The advantages of plyometric training are most readily apparent in high-intensity sports like basketball and football, which place equal emphasis on quickness and power. The gains that were observed should be of great interest for players and coaches as performance in these team sports relies greatly on specific power sprinting.

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