



THEORETICAL ASPECTS OF PLYOMETRIC TRAINING IN BASKETBALL

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Abstract

Plyometric training consists of exercises which make muscle rapidly contract right before an explosive contraction. Plyometric exercises are based on all forms of jumping. The ability to generate power is decisive in sports performance. Power is also important in basketball, where quick jumps and reactions on the ball are key factors. A strong basketball player is capable to generate the highest amount of strength in the least possible time.

Knowing what plyometric training means, its most important rules as well as precautions when doing these exercises has a very important impact on developing basketball required movement skills..

Keywords: jumping, plyometric training, basketball, jump coverage

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Introduction

In physical education and sports, jump coverage as a term is used to underline the maximum height a player is able to reach while setting off into the air on a vertical direction. Dedicated literature sees jump coverage in a variety of meanings with many authors having different perspectives on the subject. There is, however a common nominator in all definitions – the fact that jump coverage requires combined movement skills like strength – speed or explosive force.

Speed driven force or explosive force means the capacity of developing a high as possible amount of strength in the least possible amount of time, it being the most important in training basketball players.

When talking about strength, we associate this movement skill with the human body's capacity of overcoming a resistance thanks to muscle contraction. According to Zatiorski (1968): "...a difference between strength as the mechanical component of movement versus strength as a human trait must be drawn."

The fact that body-generated strength is always analyzed in relation to time gives birth to a new term – power.

According to Demeter (1972): "...power is the ability of a human body to perform mechanical exertion based on a quantity of energy released in a known timeframe". We can clearly notice the common idea of mechanical action, the main difference being only the speed of exercising within a time limit.

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Content

Plyometric training consists of exercises which make muscle rapidly contract right before an explosive contraction. Plyometric exercises are based on all forms of jumping. The ability to generate power is decisive in sports performance. Power is also important in basketball, where quick jumps and reactions on the ball are key factors. A strong basketball player is capable to generate the highest amount of strength in the least possible time.

Principles of plyometric training

“Plyometric training is a form of training based on a rapid succession of stretching and contracting muscle fibers. For example, if we take into account knee joints, the two steps of muscle contraction are:

- *Tensioning (eccentric phase)*
- *Rebounding (concentric phase)”*

Plyometric training is used in basketball during depth jumps but also in all motion actions which involve impulse or hard-stepping. Due to this fact, training must include multiple situations in which plyometric skills are applied to both regular jumping and depth ones.

Adapting to these means is a quick process and progress stops, fact that drives training to include variability while still following specific rules of this type of muscular strain. Following this idea, 3 principles of plyometric training have been issued:

1. Alternating positioning

During a jump, an athlete will execute a certain knee flexion, following a certain specific positioning for this joint. As a result, alternating positioning means different flexing angles of the knee according to a specific situation.

Alternating positioning training methods

This method aims at a variation in joint exercising angle.

A muscle base unit is called a sarcomere. When talking about the knee joints, the degree in which a sarcomere stretches is given by the flexing angle of it. During the stretching of sarcomeres, a number of connections are created, depending on actin and myosin filament positioning.

If a sarcomere is too stretched, the crossing of actin and myosin filaments is weaker; meaning a lower number of connections can be established. When the degree of stretching is average, partial filament overlap is ideal for creating the maximum number of connections and increases the generated strength. Finally, if that stretching degree is too small, not too little connections can form.



Training can trigger muscle adaption improving connection creation ability on a sarcomere level.

During plyometric training, 3 types a flexing can be achieved: 60 degrees, 90 degrees and 130 degrees. A flexing angle is the angle a thigh and shank form.

Referring to 60 degree angles, performing exercises is especially uncomfortable, a risk of overstretching and muscle pain being present. This type of training is not recommended during an official season.

For the second type of flexing, the one of 90 degrees a very quick improvement in muscle efficiency during plyometric contractions can be achieved.

The third type of flexing, the 130 -150 degree is the closest type of training to a competition level.

This diversity of imposed flexing diversity is diminishing as athletes approach the competitive season. As the objective gets closer so do these variations get closer to a specific angle.

2. Movement variation

The first variable is influenced by how a knee flexes, making it possible for the flexing to be constantly altered in order for the lower limbs to have different angles with the ground during motion.

Movement variation training methods

These methods aim at creating variation in contraction times whilst keeping the flexing angle constant. Exercises done with both legs close together are only good for reduced movement. In order to travel a bigger distance jumped steps is necessary.

As competitions approach the main objective must also aim to perform athlete challenge specific movement.

In this type of plyometric training it is important to have a balance between in-depth jumps and amplitude ones.

3. Muscle tension variation

Changes in muscle tension can be done by 2 methods:

- Using variable heights for in-depth jumps results in an increase or decrease of plyometric contraction tension;
- By executing eccentric, isometric or concentric contractions, with different degrees of tension, resulting in tension variations besides the plyometric contraction.

Muscle tension variation training methods

A plyometric contraction is actually formed out of 3 types of contractions: eccentric, isometric and concentric.

As a consequence, the training structure will follow 2 ways of action:

Kinetic – means simultaneous approach of all 3 elements;

The difficulty degree in order to obtain lower levels of tension is obtained



by hanging elastic bands from the ceiling. In order to increase tension in in-depth jumps both the depth is increased and the plyometric tension.

Analytic – only takes in consideration a part of these elements. This means approaching different parameters of plyometric contraction. In this case, the movement structure can be broken down in 2 by 2 element combination or individually.

a) 2 by 2 element combination

- Eccentric and isometric phase, very demanding, used outside competition periods;
- Isometric and concentric phase involves one static and one dynamic phase, also being known as the “stato-kinetic method”, it being used during competition periods.

b) Individual element approach

- Eccentric
- Isometric
- Concentric

Rules for executing plyometric exercises:

1. Knowing player strength levels

It is very important trainers know strength levels before starting a plyometric training program. A sufficient strength level is essential for allowing the correct execution technique as this will reduce injury rates. Trainers can evaluate improvements by continuous observation and by performing check-ups. These can indicate an athlete's readiness for advancing to the next level of difficulty.

2. Respecting warm-up rules and recovery periods

Warming up is an essential factor in the training schedule. Light running, gymnastics and low intensity jumping are good examples of warm-ups. Right after these an active warm-up follows, an activity which fully prepares the body. After completing the plyometric training several relaxation and stretching moves must be performed. For a complete muscle recovery a minimum of 48 hours is needed.

3. Plyometric exercises are done at a right intensity

When plyometric exercises are done the athlete must be aware of the right technique and purpose. The impact degree depends on how intense the exercise is. The following exercises are generally considered high-intensity plyometric exercises:

- In-depth jumps from high crates;
- Obstacle jumps;
- One-leg jumps.

4. Slow evolution from easy to hard

An exercise's difficulty is tied to its intensity. A lot of exercises look easy and have low intensities. This is the main reason special attention must be given in order to limit their number. Plyometric exercises are extremely demanding on a



body, so a rigorous training exercises program must be applied. Once a strength level is known, more demanding exercises can be included in the program.

5. Correct setting of training sessions, series and repetitions

Knowing how many series and repetitions are needed is all up to intensity. A lower intensity exercise will generally need a higher number of repetitions. On the opposite side are high intensity exercises which will only require a few repetitions. Training never has more than 6 of them. The total volume of repetitions is determined based on done exercises, the number of series per exercise and difficulty.

Conclusions

A basketball player's position is constantly on the move. As a result, each athlete must continuously move in order to get into position. Field movement and jumps are some of the multiple moves that can be done on a basketball field. The plyometric training program must focus on developing handling and strength of executing these moves at a quick pace.

Knowing what plyometric training means, its most important rules as well as precautions when doing these exercises has a very important impact on developing basketball required movement skills.

Plyometric training offers modern methods and means of developing motor skills in basketball. The use of these modern methods and means to develop motor skills can lead to high performance in basketball

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