

The Effect of Different Jumping Techniques with Starting Positions on Its Maximum Height

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ABSTRACT

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Today there are many types of jumping in the world. The main reason for jumping is the conversion of potential energy stored in the legs into kinetic energy, which are the main theories of this problem. The test that was considered for this problem was different jumping techniques in different starting points which states if a person uses more forces in both hands and feet will have the highest height, and the position that causes more potential energy to be stored in the legs, causes more height in the jump because more potential energy is converted into kinetic energy.

Keywords : : Jumping, Kinetic Energy, Height, Techniques

1. Introduction

A person can jump with straight legs, which is called vertical jump. Actually vertical jump or vertical leap is the act of jumping upwards into the air. The types of vertical jump have different heights and the amount of differences may be small or large.

In general, what happens in this movement is related to the elastic potential energy. When a person wants to jump, he/she first sits on his knees. When a person sits, the muscles are contracted or compressed. This can happen in some objects or even body parts, which are examples of compression. When the legs contract, energy is stored in the legs, which is called elastic potential energy and is effective in the strength and height of a person's jump.

In the next stage, when the person's knees are straightened then jumps up, the stored elastic potential energy in the legs is converted into kinetic energy. The more a person sits on his knees, the more muscles and legs are compressed, as a result, more elastic potential energy is stored in the legs and more energy is converted into kinetic energy which makes jumping higher.

This is like a spring that when it is compressed, elastic potential energy is stored in it. After the spring is released, the spring intends to return to its previous state, so it jumps. The higher the compression, the higher the spring jump.

2. Categories and Characteristics in Different Jumps

The jump height depends on factors that are generally divided into two categories :

- Characteristics of the person such as a person's height, BMI, physical strength, weight, etc.

-Type of the jump and the starting position which this category itself is divided into two groups as follows:

2-1. The Technique of Jumping

Different techniques are basically the types of jumps that are known in the world, such as :

2-1-1. Countermovement Jump

The vertical jump test is usually performed with a countermovement, where the knees are bent immediately before the jump . Taking help from the arms can help the height of jumping

2-1-2. Squat Jump

It is a body weight exercise characterized by jumping straight up at the top of the movement. It is basically adding a jump to the squat.

2-1-3. Triple Jump

A jumping which a participant leaps on one foot from a take off point, lands on the same foot, steps forward on the other foot.

2-1-4. Long jump

A jump in which a person jumps forward and focuses on length.

2-2. Starting Position

The position of a person in start point of a movement is called the starting position. In this factor, the technique does not make any difference and the starting position is different. Jumps are associated with sitting, and the starting position of the sitting position is the angle of the knee.

Knee's angle is generally divided into 3 angles :

1. Sharp that is less than 90 degree
2. Right that is 90 degree
3. Open that is more than 90 degree

In this issue, the effect of different jumping techniques and different starting positions on the maximum jump height will be investigated. It means that the influence of individual characteristics is not involved and the best method and situation for the highest height should be determined.

3. Materials and Methods

Materials :

1. Meter
2. Sport mat
3. Jogging suit

Method :

Investigating the influence of starting postures and jumping techniques on the maximum height of the jump Test A) Based on the technique

For this test 4 experiments have been conducted.

1. Testing countermovement jump

2. Testing squat jump
3. Testing triple jump
4. Testing long jump

Test B) Based on the starting positions

For this test 2 techniques with 3 position (6 experiment) have been conducted to confirm correctness.

1. Testing countermovement jump by sitting at a sharp degree
2. Testing countermovement jump by sitting at a right degree
3. Testing countermovement jump by sitting at a open degree
4. Testing squat jump by sitting at a sharp degree
5. Testing squat jump by sitting at a right degree
6. Testing squat jump by sitting at a open degree

3. Experiments

Test A part I (Fig. 1):



Fig. 1: Countermovement jump and measuring the height

Test A part 2 (Fig. 2):



Fig. 2: Squat jump and measuring the height

Test A part 3 (Fig. 3):



Fig. 3: Triple jump and measuring the height

Test A part 4 (Fig. 4):

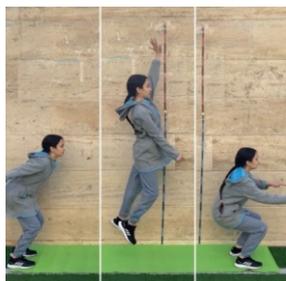


Fig. 4: Long jump and measuring the height

The heights in different techniques in test A are compared in Figure (5).

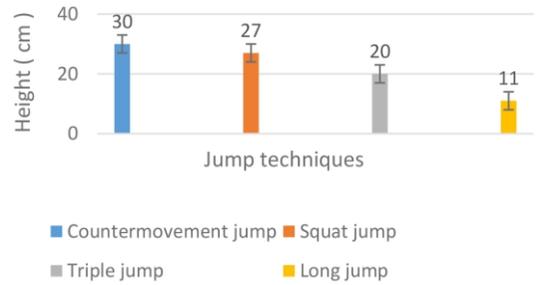


Fig. 5: Heights in different techniques in Test A

Test B part 1 (Fig. 6):



Fig. 6: countermovement jump by sitting at a sharp degree and measuring the height

Test B part 2 (Fig. 7):



(Fig. 7): Countermovement jump by sitting at a right degree and measuring the height

Test B part 3 (Fig. 8):



Fig. 8: Countermovement jump by sitting at an open degree and measuring the height

Test B part 4 (Fig. 9):



Fig. 9: Squat jump by sitting at a sharp degree and measuring the height

Test B part 5 (Fig. 10):



Fig. 10: Squat jump by sitting at a right degree and measuring the height

Test B part 6 (Fig. 11):



Fig. 11: Squat jump by sitting at an open degree and measuring the height

The heights in different techniques in test B are compared in Figure (12).

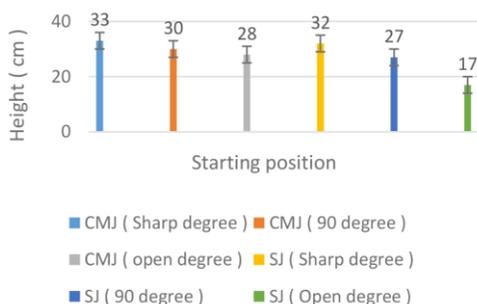


Fig. 12: Heights in different techniques in Test B

4. Results and Discussion

The height of jumps based on techniques in two test are compared as follows:

CMJ > SJ > Triple jump > Long jump

In countermovement jump, the person bends the knees before jumping to receive energy. It also takes help from the hands for more power, for this reason, the highest jump height belongs to the countermovement jump.

In the squat jump, there is an initial bending of the knees, but the hands are facing the face when the knee is sitting, and when the person jumps, the hands are at the side of the body. That is, the strength of the hands does not contribute much to the height of the jump. For this reason, it has a lower height than the countermovement jump.

In the triple jump and long jump, the focus is on the length of the jump and not on the height of the jump. For this reason, these two jumps have a lower height than countermovement jump and squat jump.

The difference between the triple jump and the long jump:

In the triple jump, as the name suggests, it has three steps, the steps before the jump increases to the person's jumping

power. (A participant leaps on one foot from a takeoff point, lands on the same foot, steps forward on the other foot).But in long jump, a person does not take a step to receive power and jumps with two feet. For this reason, the jump height is three steps higher than the long jump.

Comparison of the height of jumps based on starting positions :

Countermovement jump :

Sharp degree > Right degree > Open degree

Squat jump :

Sharp degree > Right degree > Open degree

More sitting on knees = More height on jump

As mentioned, one of the effective factors in jumping height is the amount of initial sitting on the knees so that the more a person sits, the more kinetic energy increases and the jumping height increases.

Test B was investigated by two techniques and in three modes. In the test where the amount of sitting was higher, more potential energy was stored in the legs and the person performed the jump with more strength to be able to jump higher.

But in the other two tests, when the amount of sitting decreased gradually, the stored energy and the height of the person's jump also decreased gradually.

This result was the same for both types of jumps (countermovement jump, squat jump).

The highest jump height is related to countermovement jump with the highest sitting on the knee. Because in this technique, in addition to sitting on the knees, the energy of the hand is also used, and with more sitting, the person will have more energy.

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