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# Effect of squat jump training on performance of high jumping in young female students

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**Abstract**
**Background:** The vertical jump is a test of hip and thigh power production. A strength training program using squat as the main exercise increases the strength of key muscles involved in vertical jump. The squat vertical jump is a technique widely used to develop concentric leg extensor power.
**Methodology**: Thirty participants from Dr. APJ Abdul Kalam College of Physiotherapy. The basic height of the participant was assessed, the pre readings of high jump test were taken and the interventions were given for 6 weeks. After the complete period of intervention, post readings of high jump test were performed.
**Result:** Comparison between pre and post vertical jump height is extremely significant.
**Conclusion:** The present study concluded that squat jump training was effective in improving high jump performance.

**Keywords:** high jump, squat jump

## 1. Introduction

The vertical jump is an essential skill that is utilized in more highly competitive sports. Many training regimens strive to maximize vertical jump ability to improve an athlete‘s performance in their respective sports and the skill used to reach a point high above the ground from a jump can often determine the difference between success and failure, wins and losses. Jumping and quick movements often requires muscular strength and power. In order to increase vertical jumping, one needs to pay special attention to the factor of power. Power is the creation of muscular force and velocity or as an instant value during a given movement [4].

The vertical jump is a test of hip and thigh power production. In order to jump higher the subject must generate more power by increasing the strength and velocity of muscle contraction. A strength training program using squat as the main exercise increases the strength of key muscles involved in vertical jump. Program training drills are believed to develop explosiveness, the ability to use strength as quickly and forcefully as possible. By bridging the gap between strength and speed the subject can optimize power production [2]. The use of traditional resistance training programmes that require lifting a heavy load at a slow velocity of movement has generally been considered the primary method of increasing power production. This has been based on the notion that because power is equal to force multiplied by velocity, increasing maximal strength enhances the ability to improve power production [1].

Explosive leg power is a key ingredient to maximizing vertical jump performance. Plyometric training is an important element of the training programme of most top-level jumpers, including high jumpers [2]. During plyometric, or stretch-shortening, exercises the muscle is rapidly stretched (eccentric contraction) and then shortened to accelerate the body upward, as in a countermovement jump [1]. Velocity specificity of resistance training is one of the most argumentative issue in the science of muscle strength and power development. Heavy resistance training using more loads and slow velocities of concentric muscle actions may lead to improved strength (high force and low velocity portion of the force velocity curve). Power training uses lighter resistances and higher velocities of muscle action, might result in increased force output at higher velocities and increased rate of force development [3].

The squat vertical jump is a technique widely used to develop concentric leg extensor power; particularly in plyometric and power training programs [5]. Vertical jump height measurement is a simple method that favourably compares with isokinetic testing as a measurement of knee extension power [6]. Vertical jump height was calculated by subtracting the standing reach height from the jump height [7].

During a vertical jump, the jumper must overcome body weight, and the resultant force acting on the jumper’s center of mass cm. Is *F*GRF *mg*, where *F*GRF is the ground reaction force acting on the jumper, *m* is the jumper mass, and *g* is the acceleration due to gravity [8].

Warm-up is considered to be a factor and is regularly used by athletes in order to avoid injuries and achieve high performance during training. Warm-up consists of a common and a specific part. The common part focuses on the increase of the core and muscle temperature, cellular metabolism and the joint range of motion [6].

A variety of training methods are therefore used to increase strength and power in sports in order to enhance physical performance and specific team sport performance that is sprinting and jumping [9].

This study was limited for 6 weeks squat jump training. Participants were trained for 2 days a week (every Wednesday and Saturday) with gradual increase in the height of the step for consecutive weeks.

Squats and plyometric were performed only twice pre week to allow sufficient recovery time between workout sessions [1].

## 2. Methodology

Thirty participants from Dr. APJ Abdul Kalam College of Physiotherapy were selected for project using simple random sampling was done. All participants were screened for inclusion and exclusion criteria. The basic height of the participant was assessed, the pre readings of high jump test were taken and the interventions (Squat Jump Training) were given for 6 weeks. Participants were trained for 2 days a week (every Wednesday and Saturday) with gradual increase in the height of the step for consecutive weeks. After the complete period of intervention, post readings of high jump test were performed.

## 3. Data Analysis and Result

The present study "Effect of squat jump training on performance of high jumping in young female students" was conducted in department of Cardio-Respiratory Physiotherapy in Dr. APJ Abdul Kalam College of Physiotherapy; Loni, Taluka Rahata District Ahmednagar, Maharashtra, India. Thirty participants (n=30) were evaluated using high jump test. Data for each subject was collected and recorded by the principal investigator. Demographic data was collected and analysed for Height, Weight and BMI. The data was coded and entered into Microsoft Excel spread sheet. Analysis was done using Fig pad INSTAT demo version. Data was collected and presented in tabular form and analysed by using the Students paired "t" test.

**Table 1:** Demographic data representing parameters Height, Weight, BMI.

| | Mean ± Standard deviation | p value |
|---|---|---|
| Height | 160.13 ± 5.29 | <0.0001 Extremely Significant |
| Weight | 54.36 ± 5.44 | |
| BMI | 21.12 ± 1.53 | |

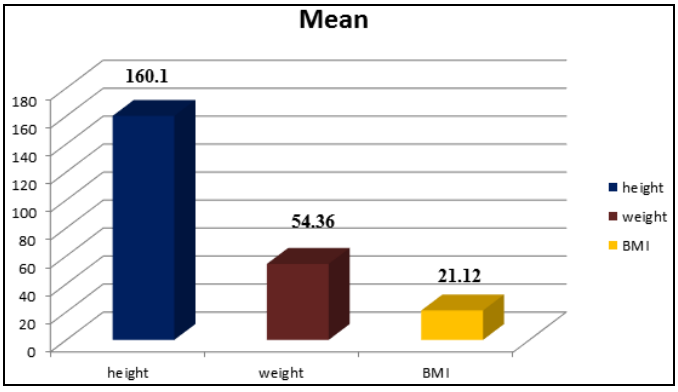


**Fig 1:** Representing demographic data of height, weight and BMI.

**Table 2:** Demographic data representing Basic Height, Pre reading, Post reading.

| | Mean ± Standard deviation | P value |
|---|---|---|
| Basic Height | 203.53 ± 7.55 | <0.0001 Extremely Significant |
| Pre reading | 225.13 ± 5.17 | |
| Post reading | 228.6 ± 4.38 | |

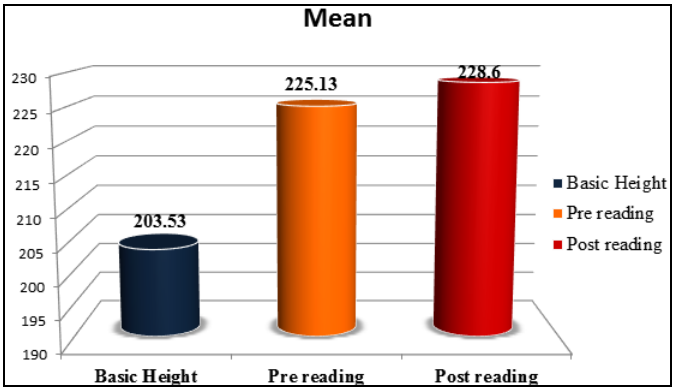


**Fig 2:** Shows the representation of Basic height and its pre and post values.

**Table 3:** Vertical Jump Height

| Group | Mean ± Standard deviation | t value | p value |
|---|---|---|---|
| Pre | 22.03 ± 5.17 | 10.846 | <0.0001 Extremely Significant |
| Post | 25.2 ± 4.38 | | |

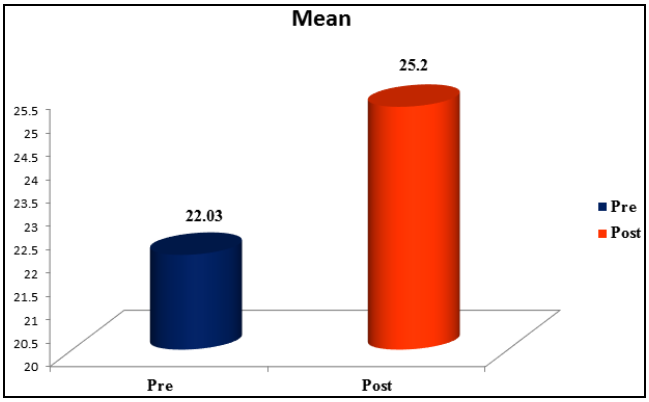


**Fig 1:** Shows the comparison between pre and post vertical jump height.

## 4. Result

**Result no 1:** Mean value of parameters Height, Weight and BMI were 160.13 ± 5.29, 54.36 ± 5.44 and 21.12 ± 1.53 respectively.

**Result no. 2:** Mean value of Basic Height, pre-test reading and post-test reading were 203.53 ± 7.55, 225.13 ± 5.17 and 228.6 ± 4.38 respectively.

**Result no 3:** In the present study we observed that comparison between pre and post vertical jump height is extremely significant using student paired 't' test with p value is <0.0001 and t value is 10.50 with 29 degrees of freedom.

## 5. Discussion

The present study "Effect of Squat Jump Training on Performance of High Jumping in Young Female Students" was carried out in Dept. of Cardio-Respiratory Physiotherapy, Dr. APJ Abdul Kalam College of physiotherapy, Loni, Tal-Rahata, Dist- Ahmednagar, and Maharashtra, India- 413736. The results shows that comparison between pre and post vertical jump height is extremely significant using paired students to test in which p value is <0.0001 and t value is 10.500 with 29 degrees of freedom. The Pre mean ± standard deviation was 22.03±5.17 and post 25.0± 4.38 respectively. The study resulted in 6-week training program to enhance

jumping ability and power production in physically active subjects led to similar increases in jumping height.

**Basic Height-** Before the interventions were given the basic height of the participants was assessed by simply raising the hand in standing position to the wall and readings were noted.

After the basic height of the participant was assessed, the pre readings of high jump test were taken and the interventions (squat jump training) were given for 6 weeks. After the complete period of intervention, post readings of high jump test were performed. The pre mean & standard deviation was 22.03±5.17 and the post was 25.2±4.38 respectively.

For augmenting jumping performance in healthy individuals training with plyometric has been extensively used. Such exercise improves different type of jumps like Squat Jump (SJ), Counter Movement Jump (CMJ), Depth Jump (DJ), and Long Jump (LJ) [16]. A squat program by itself has a significant effect in increasing hip and thigh power as measured by the vertical jump. The dynamic nature of parallel squat is highly conductive to enhancing neuromuscular efficiency. This in turn allows for excellent transfer of power to other biomechanically similar movements that require a powerful thrust from the hips and thigh, such as vertical and horizontal jump [1].

Some authors have shown that participants with low levels of strength exhibit significant improvement in vertical jump ability, regardless of the training stimulus, while previously strength-trained participants may exhibit limited improvements in vertical jump ability [3]. Weight and plyometric training programs involve eccentric and concentric contractions. Previous studies have documented that strength was increased more during the low velocity movement of the phase of eccentric contraction than during the high velocity of this phase. For that reason, weight training program may stimulate greater strength adaptations [15].

Several studies have shown the effectiveness of plyometric and high resistance training in improving vertical jump and strength performance.

Similar study was conducted on the effect of six weeks of squat, plyometric and squat-plyometric training on power production concluded that a combined athletic parallel squat and plyometric training program increases hip and thigh power production significantly more, as measured by the vertical jump, than either a separate squat or plyometric program [1].

M.C. Marques *et a*l., observed that Relationship between strength parameters and squat jump performance in trained athletes

Balaji Palaniappan *et al.,* observed that there was significant increase in vertical jump performance in normal and healthy male participants after static stretching of the three groups of muscle such as the quadriceps, hamstrings and the calf muscles. Passive static stretching can be helpful to improve vertical jump performances while performing explosive type sports activities [17].

Rahman Rahimi *et al.,* concluded that short term plyometric training is capable of increasing the vertical jumping ability, muscular strength and anaerobic power but it is the combination with weight training and is even more beneficial [15].

Macit Ozge *et al.,* concluded that the positive correlation between vertical jump height and jump-biceps femoris should be considered and that flexors and extensors are effective in jumping. Therefore, muscle length becomes longer while joint angle is widen during contraction [18].

## 6. Conclusion

The present study concludes that squat jump training was effective in improving high jump performance after 6 weeks of intervention. Hence the present study rejects the null hypothesis and accepts the alternate hypothesis.

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