

# Effectiveness of Bosu Ball and Agility Training in Enhancing Dynamic Balance and Speed in Post - Operative Jumper's Knee among Basketball Players

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**Abstract:** *Background:* Jumper's knee is the most frequent injuries in sports and it has upset many professional sporting careers. The term "jumper's knee" was first introduced by Blazina, a gradual insidious onset of aching in the knee centered over the infrapatellar or suprapatellar region, especially localized to the superior or inferior poles of the patella. Patellar tendinopathy is primarily a condition of relatively young (15 - 30 years old) athletes, especially men, who participate in sports such as basketball, volleyball, athletic jump events, tennis, and football, which require repetitive loading of the patellar tendon. Basketball is the sport with the highest incidence of patellar tendonitis, hence why it is also known as Jumper's knee. Several studies identify the joints as the most damaged in sports injuries, with the knee and the ankle being the most affected in basketball. Studies show 32% of professional basketball players have patella tendonitis while amateur players have 11 - 14% prevalence. NBA players with higher efficiency ratings and higher playing times are more at risk. For patients in the early stages of patellar tendinitis, conservative treatment is the method of choice. Patients with end - stage (Blazina III to IV) disease who have suffered a complete tendon rupture need surgery. Both arthroscopy and open surgery are commonly used. After surgery, dynamic balance and speed ability of the patient will be drastically reduced. It is necessary to improve the dynamic balance and speed among patients so that they can return to their sport. Hence, the need of the study is to find out the effectiveness of BOSU ball and agility training in enhancing dynamic balance and speed in post - operative jumper's knee among basketball players. *Methodology:* This is an experimental study design comparing the pre - post type done at Tagore College of Physiotherapy. In this study, 20 subjects were included based on the inclusion criteria. The study was conducted over a period of 12 weeks. The first 6 weeks dynamic balance training was given to the players using BOSU ball as three stages. Immediately, after completing the dynamic balance training, players were intended to start agility training for a period of 6 weeks. Total 72 sessions in 12 weeks for 35 - 50 minutes, repetition 2 times per day, and 3 days a week. The pre - test and post - test values of dynamic balance on Star excursion balance test (SEBT) and Stork balance test were taken for analysis using paired t test. Similarly, pre - test and post - test values of speed on ¼ court sprint test and 30 - meter sprint test were taken for analysis using paired t test. *Result:* The statistical reports that the pre - test and post - test mean values and standard deviation values of SEBT were obtained. The pre - test mean and standard deviation values of Stork balance test were 36.55±5.92. The post - test mean and standard deviation values of Stork balance test were 139.65±22.25. The pre - test mean and standard deviation values of ¼ court sprint test were 3.9904±1.0703. The post - test mean and standard deviation values of ¼ court sprint test were 3.4452±0.477. The pre - test mean and standard deviation values of 30 meter sprint test were 5.5165±0.9409. The post - test mean and standard deviation values of 30 meter sprint test were 4.8040±0.8765. On the basis of results received, the study states that there was significant improvement in dynamic balance and speed. The result shows that, the effectiveness of BOSU ball and agility training in enhancing dynamic balance and speed in post - operative jumper's knee among basketball players. *Conclusion:* The study concludes that BOSU ball and agility training were effective on improving dynamic balance and speed in post - operative jumper's knee among basketball players.

**Keywords:** Jumper's knee, Basketball players, BOSU ball training, Agility training, Dynamic balance and Speed, Star excursion balance test, Stork balance test, ¼ court sprint test, 30 - meter sprint test

## 1. Methodology & Procedure

**Study Design:** Experimental study.

**Sample Size:** A total number of 20 subjects were selected.

**Study Sampling Method:** The sample were selected by voluntary method.

**Study Setting:** Physiotherapy Department, Tagore College of Physiotherapy. Basketball ground – Tagore College of Physiotherapy

**Study Duration:** Study was conducted for the period of 12 weeks [Total sessions - 72 = 2 times a day, 3 days per week].

### Inclusion Criteria:

- Age: 18 – 25 years.
- Gender: Male
- Sport: Basketball
- Basketball players with jumper's knee who underwent surgical intervention.
- Players willing to return to sport activity.

### Exclusion Criteria:

- Age above 25 and below 18 years.
- Gender: Female
- Previous injury on lower limb.
- Sport: Other than basketball

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Prior to the study, procedures were presented orally and in written form. Subjects agreeing to participate signed an institutionally approved consent form.

The training group trained at the same time of day, three days a week, two session a day throughout the study.

During the training, all subjects were under direct supervision and were instructed on how to perform each exercise. In this study, I have selected the basketball players aged between 18 to 25 years who underwent surgical intervention for the condition Jumper’s knee and willing to return back to their sport.

Subjects after going through pain management and strengthening program (immediate to late post - operative phase of rehabilitation) with muscle power more or equals to grade 3, were selected for balance training using BOSU ball followed by agility training to enhance their balance and speed respectively. Prior to the training program, Pre - test values were taken into account during the assessment of subjects.

The balance training program was planned to be Stage 1 (first and second weeks), Stage 2 (third and fourth weeks), and Stage 3 (fifth and sixth weeks) according to the athletes’ adaptation to use of unstable surface equipment.

The athletes who were successful in all movements the passed to the next stage. As the training levels of all athletes were similar, they were found to be successful in the same sections of all exercises, and no issues were experienced in passing to the next stage.

Each training unit lasted 35 minutes at the beginning and 50 minutes at the end of the six week (36 training units in total) study. A training unit was completed in three stages, namely, standardized warm - up protocol (5 to 10 minutes), main phase (20 to 35 minutes) and closing practices (5 to 10 minutes). Every two weeks, different exercises were performed and a total of 8 different exercises were planned and diversified from simple to difficult and applied to the subjects.

**2. Data Analysis**

**Star Excursion Balance Test:**

**Table 1:**

The table showing the difference between the pre - test and post - test values of experimental group regarding the improvement in dynamic balance in post - operative jumper’s knee players using SEBT scale.

| Direction         |             | Mean   | SD   | T value | P - value |
|-------------------|-------------|--------|------|---------|-----------|
| Anterior          | Pre - test  | 129.28 | 1.43 | 33.65   | P<0.01    |
|                   | Post - test | 139.53 | 1.62 |         |           |
| Antero - Lateral  | Pre - test  | 144.06 | 2.65 | 25.17   |           |
|                   | Post - test | 154.66 | 1.78 |         |           |
| Lateral           | Pre - test  | 152.71 | 2.24 | 13.91   |           |
|                   | Post - test | 161.15 | 2.35 |         |           |
| Postero - Lateral | Pre - test  | 145.47 | 2.23 | 21.24   |           |
|                   | Post - test | 155.39 | 2.79 |         |           |
| Posterior         | Pre - test  | 125.5  | 1.85 | 30.67   |           |
|                   | Post - test | 136.2  | 1.19 |         |           |
| Postero - Medial  | Pre - test  | 121.35 | 1.15 | 22.62   |           |
|                   | Post - test | 130.85 | 1.61 |         |           |
| Medial            | Pre - test  | 100.48 | 1.52 | 16.77   |           |
|                   | Post - test | 109.25 | 1.78 |         |           |
| Antero - Medial   | Pre - test  | 109.62 | 2.00 | 18.09   |           |
|                   | Post - test | 117.33 | 1.95 |         |           |

The obtained value t value is greater than the table value at the significant level of 0.01. Hence the statistical report states that there was significant improvement in dynamic balance after the training in the experimental group.

**Stork Balance Test:**

**Table 2:**

The table showing the difference between the pre - test and post - test values of experimental group regarding the improvement in dynamic balance in post - operative jumper’s knee players using Stork balance test.

| Mean     |             | SD       |             | T test  | Significance |
|----------|-------------|----------|-------------|---------|--------------|
| Pre test | Post - test | Pre test | Post - test | 26.2324 | P<0.01       |
| 36.55    | 139.65      | 5.92     | 22.25       |         |              |

The Pre - test mean value and standard deviation values of Stork balance test were 36.55 and 5.92. The post - test mean value and standard deviation values of Stork balance test were 139.65 and 22.25.

The obtained value t value is greater than the table value at the significant level of 0.01. Hence the statistical report states that there was significant improvement in dynamic balance after the training in the experimental group.

**Court Sprint Test:**

**Table 3:**

The table showing the difference between the pre - test and post - test values of experimental group regarding the improvement in speed in post - operative jumper’s knee players using ¼ court sprint test

| Mean     |             | SD       |             | T test | Significance |
|----------|-------------|----------|-------------|--------|--------------|
| Pre test | Post - test | Pre test | Post - test |        |              |
| 3.9904   | 3.4452      | 1.0703   | 0.477       | 2.9499 | P<0.01       |

The Pre - test mean value and standard deviation values of  $\frac{3}{4}$  court sprint test were 3.9904 and 1.0703. The post - test mean value and standard deviation values of  $\frac{3}{4}$  court sprint test were 3.4452 and 0.477.

The obtained value t value is greater than the table value at the significant level of 0.01. Hence the statistical report states that there was significant improvement in speed after the training in the experimental group.

### 30 - Meter Sprint Test:

**Table 4:**

The table showing the difference between the pre - test and post - test values of experimental group regarding the improvement in speed in post - operative jumper's knee players using 30 - meter sprint test.

| Mean     |             | SD       |             | T test  | Significance |
|----------|-------------|----------|-------------|---------|--------------|
| Pre test | Post - test | Pre test | Post - test |         |              |
| 5.5165   | 4.8040      | 0.9409   | 0.8765      | 14.5228 | P<0.01       |

The Pre - test mean value and standard deviation values of 30 - meter sprint test were 5.5165 and 0.9409. The post - test mean value and standard deviation values of 30 meter sprint test were 4.8040 and 0.8765.

The obtained value t value is greater than the table value at the significant level of 0.01. Hence the statistical report states that there was significant improvement in speed after the training in the experimental group.

## Results

The BOSU ball training and agility training had an effect on the players' dynamic balance and speed level respectively and significant differences were observed between the measures of pre - test and post - test in a 12 weeks session. Initially, dynamic balance training was performed by the players using BOSU ball as a 6 weeks session. At the end of 6<sup>th</sup> week post test results were recorded. Then, agility training started as a 6 weeks session to enhance the players' speed. The pre - test mean and standard deviation values and post - test mean and standard deviation values of Star excursion balance test were mentioned in the table 1. The pre - test mean and standard deviation values of Stork balance test were 36.55±5.92. The post - test mean and standard deviation values of Stork balance test were 139.65±22.25. The pre - test mean and standard deviation values of  $\frac{3}{4}$  court sprint test were 3.9904±1.0703. The post - test mean and standard deviation values of  $\frac{3}{4}$  court sprint test were 3.4452±0.477. The pre - test mean and standard deviation values of 30-meter sprint test were 5.5165±0.9409. The post - test mean and standard deviation values of 30-meter sprint test were 4.8040±0.8765. On comparing the measurements specifically, the result of the above-mentioned outcome measures had revealed that dynamic balance and speed were significantly improved.

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