

# A Study to Compare the Effectiveness of Static versus Dynamic Stretching Combined with Sports Specific Activity on Jump Performance and Flexibility in Recreational Basketball Players

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**Abstract:** *Basketball is a high intensity sport which includes maximum sprints and repeated jumps throughout a game of 40 minutes [2]. Stretching is also usually incorporated pre-exercise as it has been suggested to improve muscle flexibility, prevent muscle injury and enhance physical performance [10]. The aim of the study is to compare the effectiveness of static stretching versus dynamic stretching combined with sports specific activity on jump performance and flexibility in recreational basketball players. Primary data will be collected from the patients and 40 recreational basketball players between 18-25 years of age will be included for the study. The outcome measures of this study are Vertical Jump Test and Sit & Reach Test. The intra-group analysis showed that both the treatments are effective in terms of increasing the value of both Vertical Jump Test and Sit & Reach Test Scores. However, the inter-group analysis showed that Treatment B (Dynamic Stretch) is effective than Treatment A (Static Stretch) in terms of average increase in both the measures.*

**Keywords:** Static Stretching, Dynamic Stretching, Basketball, Jump Performance, Sports Specific Activity

## 1. Introduction

Basketball is a high intensity sport which includes maximum sprints and repeated jumps throughout a game of 40 minutes [2]. Stretching is also usually incorporated pre-exercise as it has been suggested to improve muscle flexibility, prevent muscle injury and enhance physical performance [10].

Hamstring strain are one of the most common, recurrent injuries experienced in the sporting world and often result in significant time out of sport and activity. Decreased hamstring flexibility is suggested to be one of the predisposing factors for hamstring strains and hamstring stretches are routinely used as part of a pre-exercise routine, usually after an aerobic warm-up [10]. Static stretching, considered to be the gold standard for increasing flexibility, is elongating a muscle to tolerance and sustaining the position for a long time, some of the proposed benefits of enhanced flexibility are reduced risk of injury, pain relief, and improved athletic performance [1]. More efficacy and effectiveness in movement as a result of enhanced muscle flexibility will assist in preventing or minimizing injuries and may enhance performance [1].

Dynamic stretching uses active muscular force and momentum to stretch the muscle which allows quick transition of the muscle from concentric phase of contraction to eccentric phase [2]. Dynamic stretching, when performed as a part of warm up, has been reported to increase leg extensors muscle power and strength and ultimately enhance performance [2]. Accordingly, this study

was designed to assess the effects of static versus dynamic stretching on vertical jump performance and flexibility executed before, immediately after and at the end of the sports specific activity.

## 2. Materials and Methodology

### Source of Data

Data will be collected from recreational basketball players at Jaya Sports Academy. Subjects will be selected based on the fulfillment of inclusion criteria. The purpose of the study will be explained to all subjects and consent from each subject will be obtained. The subjects were randomly assigned into either of Static Stretching (Group A) and Dynamic Stretching (Group B)

### Method of Data Collection:

Primary data will be collected from the patients and 40 recreational basketball players between 18-25 years of age will be included for the study. One time study comprising of Static, Dynamic Stretching followed by sports specific activity for both the groups.

### Study Design:

The study is based on experimental study design.

### Study Duration:

Stretching followed by 15 minutes of sports specific activity (5 minutes of full count sprint layup and 10 minutes shooting

**Inclusion Criteria:**

- Age group between 18-25
- Active Knee Extension ROM of more than 20 degrees.
- Only Male Subjects.

**Exclusion Criteria:**

- Any injuries in and around knee (Acute/Chronic)
- Any spinal pathology
- Any recent fractures or dislocations

**Outcome Measures:**

**Vertical Jump Test** – A Tape measured was placed on the wall and feet flat on the ground and were asked to reach the arm closest to the wall as high as possible and to mark the highest spot they could reach with a chalk. From the same standing position, they were asked to jump and mark the wall at the highest point of their jump. The distance between these points was considered as vertical jump distance and was measured in centimeters. Three assessments were done to check the jump performance (Pre and Post)

**Sit and Reach Flexibility Test** – It is a common measure of flexibility of the lower back and hamstring muscles. This test involves sitting on floor with legs stretched out ahead. Both knees should be locked and pressed flat to the floor. With the palms facing downwards, and the hands on top of each other or side by side, the subject reaches forward along the measuring line as far as possible. After some practice reaches, the subject reaches out and holds that position for at one-two seconds.

**3. Intervention****Group A: Static Stretching**

**Hamstrings-** Sit on the ground with both legs straight out in front of you, Bend the left leg and place the sole of the left foot alongside the knee of the right leg, Bend forward keeping the back straight.

**Quadriceps-** Holding on to a chair or wall if necessary, lift your right foot up to your bum and grab your ankle with your right hand, Now repeat with the opposite leg.

**Hip flexors-** From a kneeling position, bring the left leg out front with foot flat on the ground. Push body forward through the hips, stretching that right hip flexor.

**Hip Adductors-** Stand tall with your feet approximately two shoulder widths apart, Bend the right leg and lower the body, Keep you back straight and use the arms to balance, You will feel the stretch in the left leg adductor, Repeat with the left leg.

**Gastrocnemius-** Stand tall with one leg in front of the other, with hands pressing against a wall at shoulder height. Ease your back leg further away from the front leg, keeping it straight (but not locked) and press the heel firmly into the floor. Keep your hips facing forward and the rear leg and spine in a straight line. You will feel the stretch in the calf of the rear leg, Repeat with the other leg.

**Gluteus-** Sitting tall with legs stretched out in front of you, Bend the right knee and place the right foot on the ground to the left side of the left knee, Turn your shoulders so that you are facing to the right, Using your left arm against your right knee to help ease you further round, Use your right arm on the floor for support, You will feel the stretch along the length of the spine and in the muscles around the right hip.

**Group B: Dynamic Stretching**

**Quadriceps** – Forward lunge with opposite arm reach upward (Stretch)

While walking, subject performs a forward lunge with one leg, bringing the opposite arm lying upwards and keeping his back flat until a slight tension is felt in quadriceps.

**Hamstrings-** Leg swing to opposite hand(Stretch)

While walking, subject takes a step with right leg while swinging left leg forward. Left leg touches right hand while keeping the knee extended. Repeat the same for the other leg. Stretch occurs in hamstrings of swinging leg

**Adductor muscles** - Lateral low shuffle(Stretch)

From standing position, subject performs a lateral low shuffle alternating every three steps a lateral lunge (one for each leg)

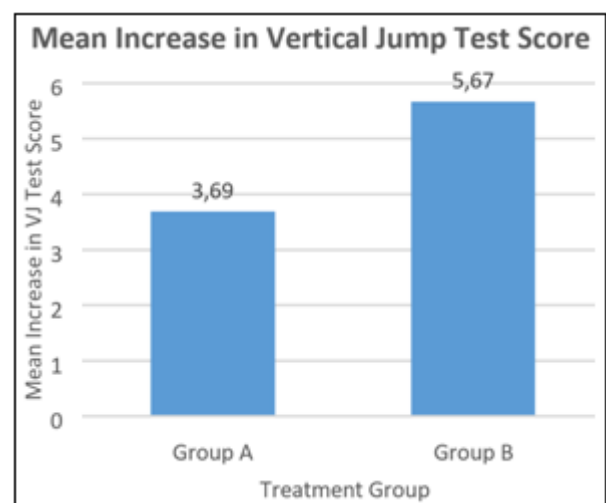
**Calf muscles** - Tip-toe walking

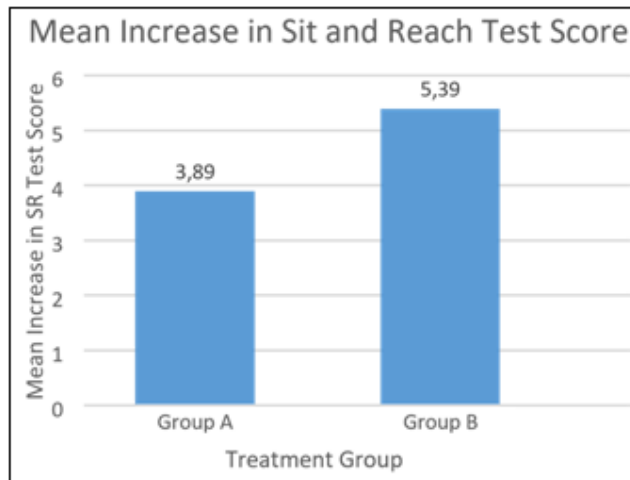
Travelling forward while completing alternating plantar flexion (tip toe) with every step forward. The aim is to raise the body as high as possible through tip toeing.

**Note:** Common for both groups (15 minutes of sports specific activity)

**Statistical Analysis:**

Twenty Subjects, who fulfilled inclusion criteria, are randomly assigned as Group A (n=20, Male - 20, Female - Nil) received static stretching along with sports specific activity. Group B (n=20, Male – 20, Female – Nil) received dynamic stretching along with sports specific activity.

**Graph 1**



Graph 2

#### 4. Discussion

Hamstring muscle injuries are one of the most common musculotendinous injuries in the lower extremity (Ekstrand & Gilquist, 1983). They occur primarily during high speed or high intensity exercises and have a high rate of recurrence.

According to Sherrington's law of reciprocal innervation, a tight muscle will inhibit its antagonist. Muscular imbalance take place in the body because of tight and weak muscles which adversely affects the normal patterns of movements. Lack of hamstring flexibility was the single most important characteristics of hamstring injuries in athletes.

Subjects were divided into two groups with 20 samples in each group. Group A received Static Stretching (SS) and Group B received Dynamic Stretching (Group B). Both the groups received sports specific warm-up activity before their respective treatments.

#### On comparing the effects of Treatments A and B in terms of change in Sit and Reach Flexibility Test Score and Vertical Jump Test Score,

The objective of the study is to find the effectiveness between Group A (Static Stretching) and Group B (Dynamic Stretching) on improving vertical jump performance and flexibility among recreational basketball players.

The evidence is **sufficient** to conclude that there is significant difference between two treatments (A and B) in terms of average increase in Sit & Reach Test Score ( $t = -2.76$ ,  $p = 0.009 < 0.05$ ) according to table 2.3.3.2. In addition, the mean increase in Sit & Reach Test Score by Treatment B (5.39) is **greater than** that of Treatment A (3.89) according to table 2.3.3.2. Hence, we conclude that Treatment B is **significantly effective than** Treatment A in terms of average increase in Sit & Reach Test Score.

The evidence is **sufficient** to conclude that there is significant difference between two treatments (A and B) in terms of average increase in Vertical Jump Test Score ( $t = -4.42$ ,  $p = 0.000 < 0.05$ ) according to table 2.3.3.1. In addition, the mean increase in Vertical Jump Test Score by

Treatment B (5.67) is **greater than** that of Treatment A (3.69) according to table 2.3.3.1. Hence, we conclude that Treatment B is **significantly effective than** Treatment A in terms of average increase in Vertical Jump Test Score.

Hence, the result of the study found that static stretching and dynamic stretching both are effective in showing immediate effects in improving vertical jump performance and flexibility of hamstring muscle.

However, when comparing static and dynamic stretching, dynamic stretching gives immediate effects in improving vertical jump performance and flexibility of hamstring muscle. This study concluded that dynamic stretching is more effective when compared with static stretching.

**Kieran O'Sullivan, Elaine Murray and David Sainsbury:** Warm-up significantly increased hamstring flexibility. Static stretching also increased hamstring flexibility, whereas dynamic did not, in agreement with previous findings on uninjured controls. The effect of warm-up and static stretching on flexibility was greater in those with reduced flexibility post-injury, but this did not reach statistical significance. Further prospective research is required to validate the hypothesis that increased flexibility improves outcomes<sup>(10)</sup>

**Gayatri Saraswate, Gajanan Bhalerao, Ashok Shyam, Parag Sancheti:** Jump performance improves immediately after dynamic stretching in basketball players which is maintained after 15 minutes of sports specific activity.<sup>(1)</sup>

#### 5. Conclusion

The intra-group analysis showed that both the treatments are effective in terms of increasing the value of both Vertical Jump Test and Sit & Reach Test Scores. However, the inter-group analysis showed that **Treatment B (Dynamic Stretch) is effective than Treatment A (Static Stretch)** in terms of average increase in both the measures.

#### Acknowledgement

It is my pleasure to express deep sense of gratitude towards **Dr. V. Balchandar(PT)**, for his encouragement and critical review of this work at regular "Thesis Meetings" and **M. K. FRANKLIN SHAJU**, an ideal supervisor who has encouraged me during the course of study.

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25	B	22	28.1	33.5	25	28.9
26	B	20	29	33.4	24.6	32.8
27	B	21	35.4	39.3	40.5	44.8
28	B	22	34.2	39.7	32.1	38.3
29	B	20	38.1	44.2	36.3	40.8
30	B	24	37.3	42.7	35.2	39.1
31	B	20	33.5	40.1	30.5	35.7
32	B	19	38.2	43.8	28.2	33.3
33	B	21	32.3	38.9	28	34.7
34	B	21	29	36.2	24.2	30.1
35	B	23	29.1	34.5	26	29.9
36	B	19	28	32.4	23.6	31.8
37	B	22	36.4	40.3	41.5	45.8
38	B	21	33.2	38.7	31.1	37.3
39	B	21	39.1	45.2	37.3	41.8
40	B	23	36.3	41.7	34.2	38.1

**Master Chart:**

S.NO	GROUP	Age	VJT_Pre	VJT_Post	SRT_Pre	SRT_Post
1	A	23	36	43.5	27	35.5
2	A	21	38	43	29.5	34
3	A	20	33	36.5	27	32.5
4	A	19	30.5	33	25.5	28
5	A	21	29	32.5	26	29.5
6	A	21	30	32.5	26	29
7	A	22	38.5	42.5	32.5	37.7
8	A	22	37	42	33.2	35.5
9	A	23	42.5	44.3	38	40.2
10	A	24	39.6	41.2	36.5	38.2
11	A	22	35	42.5	26	34.5
12	A	22	39	44	30.5	35
13	A	19	32	35.5	26	31.5
14	A	20	31.5	34	26.5	29
15	A	20	28	31.5	25	28.5
16	A	22	31	33.5	27	30
17	A	21	37.5	41.5	31.5	36.7
18	A	23	38	43	34.2	36.5
19	A	22	41.5	43.3	37	39.2
20	A	25	40.6	42.2	37.5	39.2
21	B	19	32.5	39.1	29.5	34.7
22	B	20	39.2	44.8	29.2	34.3
23	B	20	31.3	37.9	27	33.7
24	B	22	30	37.2	25.2	31.1