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# To compare immediate effect of static and dynamic stretching on sprint and jump performance in healthy school children

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## ABSTRACT

The aims of this study were to compare the immediate effects of stretching static and dynamic stretching on sprinting and vertical jump performance of healthy school children. Ninety healthy school children (mean age = 11 yrs, range8–15 yrs) were randomly assigned into three groups: Static(SS), Dynamic (DS) and control group(NS) pre- and post-treatment immediately tests were performed to examine the effects of stretching on 10 m sprint run(10SR), Sargent vertical jump test (VJH). Following the warm-up period, subjects immediately began their stretching program. Subjects performed 5 sets of static (30 sec on alternate leg 2 repetitions) in (SS) and dynamic stretching (20 sec on alternate leg 10 repetitions) in (DS); in the control condition they do not performed stretching. Results from one way ANOVA revealed a significant difference on 10m sprint test ($p<0.0307$). Static stretching hindered 10SR and VJH by 1.07% and 1.3% respectively, Dynamic stretching improved 10SR and VMJ by 6.7% and 1.31% respectively, in control group 10SR and VMJ hindered by 4.5% and 4.55% respectively. In conclusion, the use of dynamic stretching is preferable for its immediate effect on jumping and sprint performance in healthy school children.

**Keywords:** 10 m sprint run, Sergeant vertical jump height, Dynamic, Static, Stretching

## INTRODUCTION

Stretching is described as any therapeutic maneuver designed to increase the extensibility of soft tissues, thereby improving flexibility and ROM by elongating structures that have become shortened and hypomobile overtime. There are various techniques of stretching, such as static, ballistic, propioceptive neuromuscular facilitation, and dynamic stretching [1]. Flexibility is an important component of physical fitness [8].Stretching during the warm-up has become a traditional practice in preparing for exercise or athletic events and it is demonstrated as an effective means to increase range of motion and prevent risk of injury [4,7]. Static flexibility is usually defined as the ability to move a joint through a normal range of motion (ROM), whereas the ability to move a joint quickly with little resistance to the movement is defined as dynamic flexibility (Van Gyn 1984).

Static stretching is performed by placing muscles at their greatest possible length and holding that position for a period of time. Dynamic stretching is performed by moving through a challenging but comfortable range of motion repeatedly [8].

Sprint is defined as run at full speed over short distance. Sprinting requires power that involves numerous muscles. The primary muscles used in sprinting are hamstrings (semimembranosus, semitendinosus and biceps femoris), calf muscles (gastrocnemius and soleus), quadriceps (the vastus medialis, vastus lateralis, vastus intermedius and rectus femoris), glutei (gluteus maximus, gluteus minimus and gluteus medius) and abdominal Muscles. The length of the step depends on the force developed by the extensor muscles of the hip (m. gluteus maximus), knee (m. Vastus lateralis, m. rectus femoris) and ankle joint (m. gastrocnemius) in the contact phase. Execution of the contact phase is one of the most important generators of sprint velocity efficiency [5].

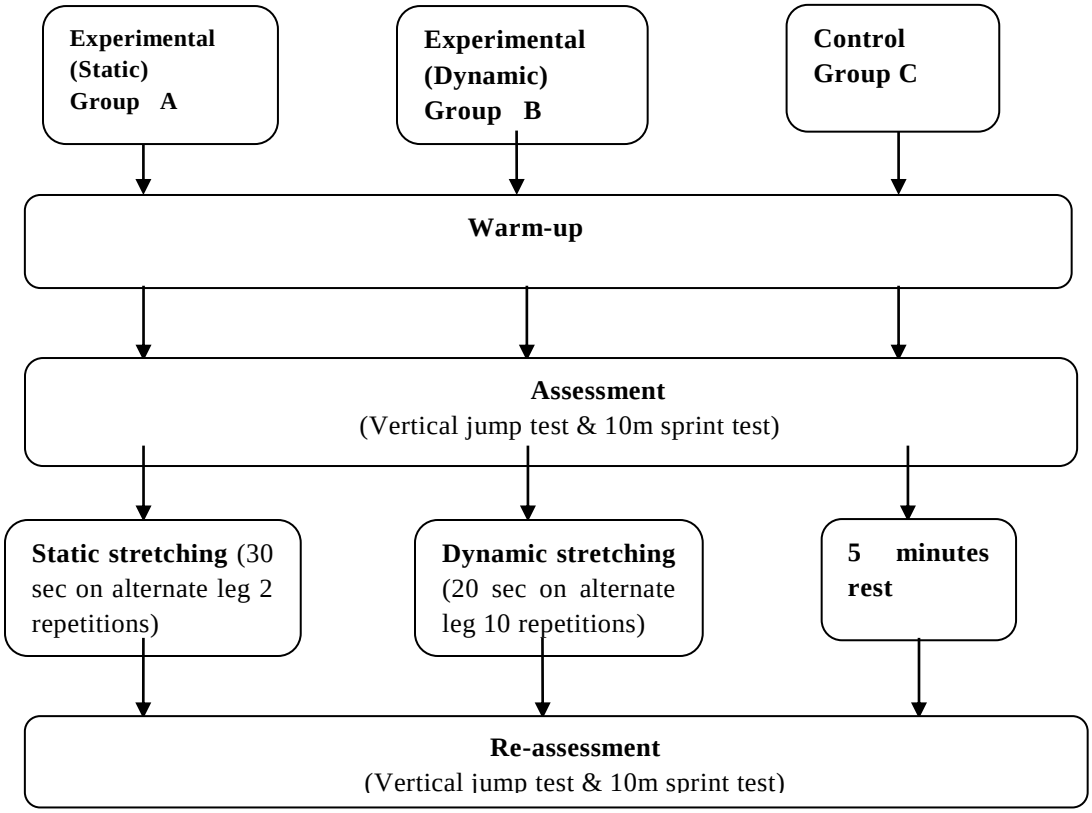
In case of vertical jump, the sequence of muscle activation follows proximal to distal pattern with activation of hip muscles followed by the knee and ankle muscles. During the preparatory phase that involves flexion at hip and knee joint and dorsiflexion of ankle joint. During the take-off phase the muscles ligaments joint capsules extend the hip, knee and plantar flex the ankle. So the above test requires muscle flexibility, strength and ROM Optimal ROM in a joint enhances sport performances because it provides proficiency in functional movement. Therefore, increased ROM, joint flexibility and performance are directly proportional to each other. Regardless of the form of stretching selected and implemented, it is imperative that the shortened muscle remains relax [6]. Marquee mc found significant association between 10m sprint and CMJ. Children in their growing age have relative disproportion between long bone length and adjacent musculature so tendency of muscles to go in tightness is more.

## MATERIALS AND METHODOLOGY

An Experimental Study simple random sampling was carried out in schools and 90 Subjects in were selected. The Inclusion Criteria were both males and females in the age group of 8-15 years and Subjects with normal BMI according to IAP growth chart. Exclusion Criteria were 1.Individuals playing outdoor sports professionally. 2. Subjects with any musculoskeletal condition. 3. Females in menstrual cycle. 4. Subjects with any neurological, cardiovascular and congenital conditions. 5. Subjects unwilling to participate.

- **Study type**: Experimental
- **Sample size**: Control group(n=30) and experimental group(n=60)
- **Type of sampling**: Simple random sampling
- **Sample size:** 90
- **Outcome measure:** Vertical jump test, 10m sprint test.
- **Materials :** Consent form, Data collection format, Stopwatch, Pen, Paper, Stamp pad, Chart paper, Weighing machine, Measuring Tape, Height chart ,Cones

## Procedure




## STATIC STRETCHING (GROUP A)

The static stretching protocol consisted of

1) Hamstrings: Sit on the ground with both legs straight out in front, 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.
2) Quadriceps: Holding on to a chair or wall if necessary, lift your right foot up to your buttocks and grab your ankle with your right hand, Now repeat with the opposite leg.
3) 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.
4) 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.
5) 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.

## Dynamic stretches protocol (DS)

The dynamic stretching protocol consisted of

1) Walking lunge: From a standing position, Step forward with right leg and lower your body to 90 degrees at both knees.
2) Knees to Chest: The subject contracted hip flexors intentionally with knee flexed to bring the thigh to the chest.
3) Side Lunge: stretch Standing with feet hip-width apart, step out to the side with your right foot. Keep left leg straight and bend into a lunge in the right leg.
4) Straight Leg Kicks: From a standing position with both legs straight, the hip flexors were contracted to swing the leg forwards.
5) Side leg-swings: From a standing position, Swing your straight leg left to right in wide arcs between the wall and your standing leg.

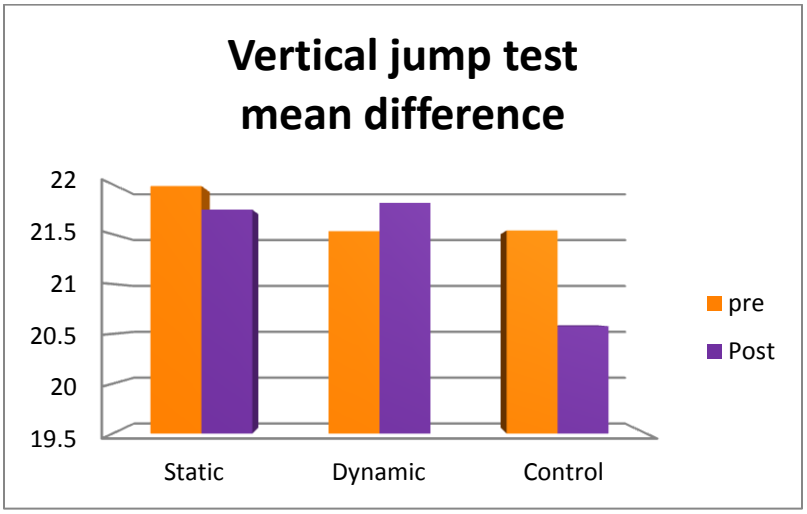
The control group was given no stretching and 5 mins rest was given.

## RESULTS

The graph 1 shows mean pre and post vertical jump height (cms) taken after static, dynamic and control group. The graph represents that there was no significant increase in the vertical jump height.

**Table 1:**

| Static stretching | | Dynamic stretching | | control | |
|---|---|---|---|---|---|
| PRE | POST | PRE | POST | PRE | POST |
| 21.9810 | 21.7467 | 21.528 | 21.812 | 21.537 | 20.577 |



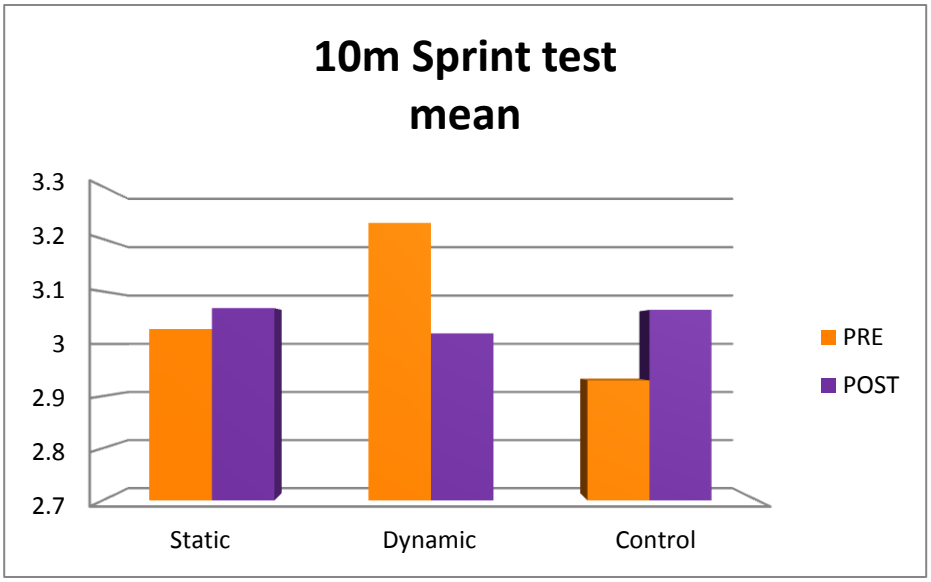

**Graph representing vertical jump height (cms) pre and post mean of experimental groups and control group.**

The graph shows mean pre and post 10m sprint time (secs) taken after static, dynamic and no stretching protocol.

**Table 2:**

| Static stretching | | Dynamic stretching | | control | |
|---|---|---|---|---|---|
| PRE | POST | PRE | POST | PRE | POST |
| 3.0283 | 3.068 | 3.2306 | 3.02 | 2.93 | 3.065 |

## Graph 2




**Graph representing vertical jump height (cms) pre and post mean of experimental groups and control group.**

The following table represents data with respect to difference between mean stretching values on **Vertical jump test**. Descriptive statistics including P value, standard deviation and mean were calculated. Comparison of three groups and values was calculated using one way ANOVA test.

**Table 3**

| Statistical analysis | static | Dynamic | Control |
|---|---|---|---|
| Mean | 0.6800 | 0.5050 | 1.00 |
| SD | 3.114 | 4.203 | 2.076 |
| P value | 0.1053 | | |
| Significance | Not significant | | |

The following table represents data with respect to difference between mean stretching values on **10 m sprint test**. Descriptive statistics including P value, standard deviation and mean were calculated. Comparison of three groups and values was calculated using one way ANOVA test.

**Table 4**

| Statistical analysis | static | Dynamic | Control |
|---|---|---|---|
| Mean | 0.0396 | -0.2106 | 0.1343 |
| SD | 0.3454 | 0.3019 | 0.7601 |
| P value | 0.0307 | | |
| Significance | significant | | |

## DISCUSSION

The study was designed to find out the immediate effects of static and dynamic stretching on sprint and vertical jump performance. 90 school children with normal BMI according to IAP growth chart were selected and divided into static group (group A), Dynamic group (group B) and control group (group C) of which group A were given

static stretching exercises, group B were given dynamic stretching exercise and control group no stretching exercises. In the study, vertical jump test and 10m sprint test were the tools used to evaluate effect of static and dynamic stretching before and after stretching.

The current study demonstrates that stretching was efficient in improving the sprint performance as the result obtained in sprint performance is statistically significant, since the mean value indicate that there was significant difference in pre and post values of all three group. But the pre and post value of experimental group B was more significant it shows that dynamic stretching is more efficient in improving sprint performance.

In case of vertical jump test the result obtained by ANOVA is not significant but when the pre and post mean was compared dynamic stretching improved the vertical jump performance while static and control group deteriorated it in which control reduced the vertical jump height more than the static.

The mechanisms responsible for the reduction in sprint and vertical jump after static stretching or their improvement after performing dynamic stretching are not fully clarified. Several factors, which probably play a negative or positive role in sprint and vertical jump, have been previously reported such as neural inhibition mechanical factors reduced muscle temperature after SS and reduced blood flow. **Evans** [17] reported decreased muscle temperature after static stretching. The result of this study was similar to the study conducted by **Young WB** [10], where static stretching had a negative influence on vertical jump performance. **Keitaro Kubo** [12] in his study concluded that static stretching decreased the viscosity of tendon structures but increased the elasticity which suggests that static stretching can improve ROM since the viscosity is reduced which results in less muscle contractions and this can be one of the possible reason in deterioration of performance and he also explained the reduction in the hysteresis of the muscle tendons. Hysteresis is the loss of energy as heat due to internal damping. The reduction of energy dissipation in the tissues after stretching may have caused the decreased tendon hysteresis in a similar vein. **Balaji Palaniappan** [16] found passive static stretching was beneficial for improving vertical jump height in apparently healthy adults.

While in case of dynamic stretching the factors responsible for improving the performance factors are related to increased temperature and decreased stiffness of the muscles and joints; increased transmission rate of nerve impulses; changes in the force velocity relationship; and increased glycogenolysis, glycolysis, and high-energy phosphate degradation. In addition to these temperature related changes, neuromuscular phenomena possibly activated by the dynamic stretching could potentially enhance performance.

However, **Erica Taylor Perrier** [11] found improvement in CMJ performance when compared with static and no stretching group in which Twenty one recreationally active males were recruited and stretching protocol was given and they were assessed in sit-reach test and CMJ on force Platform. **Jeffrey C. Pagaduan** [18] also concluded general warm-up with dynamic stretching posted superior gains in countermovement jump performance in twenty-nine male football players. **Iain M. Fletcher and Bethan Jones** [13] found increase in 20m sprint performance after dynamic stretching in trained rugby players. They found that decrease in sprint time after static stretching is due to musculotendinous unit (MTU) compliance, leading to a decrease in the MTU ability to store elastic energy in its eccentric phase

The control group showed deterioration in both the performance since there was no stretching protocol given to them. But when compared with static stretching group the performance was higher in static stretching group compared to control group. This finding may imply that performance of SS instead of no stretching is favorable to sprint and vertical jump test.

## CONCLUSIONS

This study can be concluded by stating that dynamic stretching had effect in improving the vertical jump and sprint performance of school children while static stretching impaired the performance. But when individual performance was taken into consideration for significance, sprint performance was improved with dynamic stretching in school children.

Thus dynamic stretching is one technique which should be incorporated in pre-event sports.

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