

EFFECTS OF DYNAMIC STRETCHING WHEN COMBINED WITH SPORTS SPECIFIC ACTIVITY ON JUMP PERFORMANCE IN BASKETBALL PLAYERS

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ABSTRACT

Background: In basketball, jumping quickly as well as maximally is equally important. Stretching is quite often included as part of warm up exercises but the effects of dynamic stretching on performance and whether it has a sustained effect is not clearly understood.

Study Purpose: The purpose of this study was to examine the effect of dynamic stretching when combined with sports specific activity on jump performance in basketball players.

Study Design: Quasi Experimental Study

Method: Forty basketball players, aged 15 - 25 years took part in the study. Subjects were asked to perform the dynamic stretching exercises and 15 minutes of sports specific basketball activity which consisted of 10 minutes shooting and 5 minutes sprint layup. Vertical jump test was assessed pre-stretching, immediately after stretching and after 15 minutes of sports specific activity.

Results: Significant improvement in vertical jump performance was seen immediately after stretching of 41.9 ±2.30 cm to 44.06±2.29 cm (p<0.0001). After 15 minutes of basketball activity there was maintenance of jump performance seen 44.37±2.32 cm (p=0.053).

Conclusion: Jump performance improves immediately after dynamic stretching in basketball players which is maintained after 15 minutes of sports specific activity.

KEY WORDS: Basketball, Dynamic Stretching, Sports Specific Activity, Jump Performance.

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INTRODUCTION

Basketball is a high intensity sport which includes maximum sprints and repeated jumps throughout a game of 40 minutes. Inclusion of

stretching exercises as a part of warm-up during pre-training or pre-competition is very common in sports and many studies support their effectiveness [1-3]. The warm-up protocol is

specifically designed to prepare the body for exercise by increasing muscle temperature and blood flow to muscles and stretching is known to increase range of motion, reduce injuries, decrease stiffness and improve athletic performance [4,5]. American College of Sports Medicine (ACSM) also recommends the idea of stretching before competition [6]. Though effects of stretching on performance is a debatable topic, some authors believe that it improves performance [7-9] and reduces risk of muscle injury while some say it has negative effect on performance [10,11]. 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. 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 [12]. In many team sports, like basketball, the stretching period is followed by sport-specific activity, of usually 15 minutes duration. Whether and in which way, when dynamic stretching exercises are combined with sports specific activity affects jump performance in basketball players is not completely understood. Accordingly, this study was designed to assess the effects of dynamic stretching on vertical jump performance executed before, immediately after and at the end of the sports specific activity (i.e. 15 minutes- 10 minutes of shooting phase and 5 minutes of sprint layup).

METHODOLOGY

After approval from the ethical committee of the institute, this study included athletes between the age 15-25 (mean age 20.72), playing basketball actively for at least 2 years (average training years 4.85), with no injury and those who were willing to participate. The demographic details of the participating players have been represented in *Figure 1*. For the Vertical jump test, a tape measure was placed on the wall and the player had to stand with their side to 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 your jump.

The distance between these two points was considered as the vertical jump distance and was measured in centimeters. Best of three jumps was considered. *Figure 2* clearly explains the method followed for assessment and intervention in the form of a timeline.

The players were given a general warm up of 10 minutes jog after which a vertical jump assessment was done. Then the players were demonstrated and asked to perform dynamic stretching exercises as given in *Table 1*. Each exercise was performed along a full basketball court two times each way. Immediately after which vertical jump assessment was done. The players then performed 15 minutes of sports specific activity which consisted of 5 minutes of full court sprint layup and 10 minutes of shooting. After this, the final vertical jump assessment was done

Statistical Analysis: To evaluate the results the SPSS package 16 was used. To determine the difference between the vertical jump performance immediately after stretching and after sports specific activity, paired t-test was used. The level of significance was accepted as $p < 0.0001$.

RESULTS

A significant increase in vertical jump height was found immediately post dynamic stretching of around average 2.16 cm indicating positive effect of the same ($p < 0.0001$) as seen in *Table 2*. Post 15 minutes of basketball activity, there was maintenance of jump performance seen ($p = 0.053$), indicating that effects of stretching persist if combined with sports specific activity as seen in *Table 3*.

The mean and standard deviation for all three vertical jump performances have been represented in *Figure 3*.

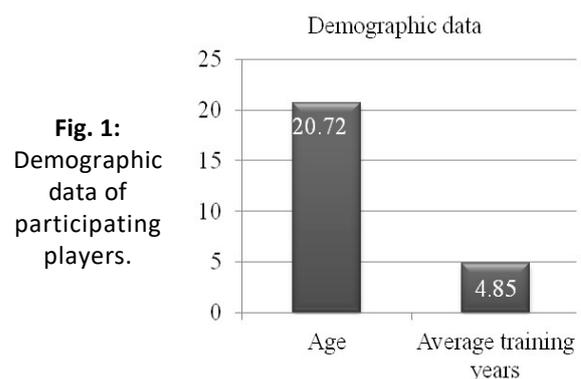


Fig. 1: Demographic data of participating players.

Table 1: Dynamic Stretching Protocol.

Muscle	Stretch	Description
exercise for quadriceps	forward lunge with opposite arm reach upward	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
exercise for hamstrings	leg swing to opposite hand	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
exercise for adductor muscles	Lateral low shuffle	From standing position, subject performs a lateral low shuffle alternating every three steps a lateral lunge (one for each leg)
exercise for calf muscles	Tip-toe walking	Traveling 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.

Table 2: Descriptive statistics for jump performance pre stretching and post stretching

Pre stretching (mean + std dev)	Post stretching (mean + std dev)	p value
41.9 ±2.30 cm	44.06±2.29 cm	<0.0001

Table 3: Descriptive statistics for jump performance post stretching and post activity

Post stretching (mean + std dev)	Post activity (mean + std dev)	p value
44.06±2.29 cm	44.37±2.32 cm	0.053

Fig. 2: Timeline of assessment and intervention.

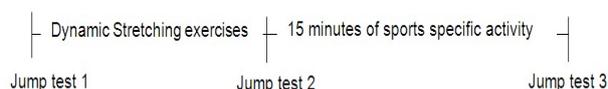
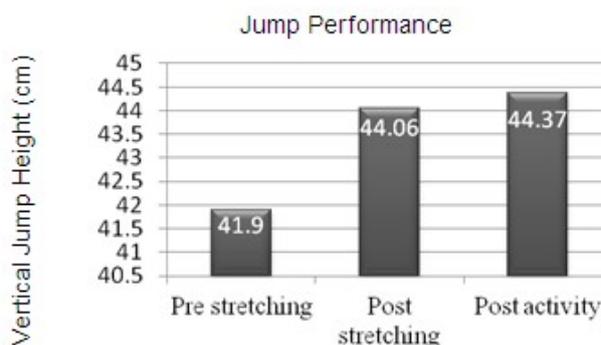


Fig. 3: Vertical jump performance in pre-stretching, post-stretching and post activity phase.



DISCUSSION

This study investigated the effects of dynamic stretching when combined with sports specific activity on jump performance in basketball players. This study shows that there was an increase in jump performance immediately after the dynamic stretching exercises and the improved jump performance was maintained after 15 minutes of sports specific activity. These

findings were similar to that observed in study by L.Parsons and N.Maxwell⁶, in which they attributed the improvement in jump performance as dynamic stretching increases neuromuscular efficiency. They further explained that due to dynamic stretching, muscles are stretched according to their synergistic patterns as well as movement is rehearsed in a more specific pattern and it actually increases neural drive by increasing core temperature. Similar results were seen in a study by Fletcher and Jones [17] where they suggest that the rehearsal of specific movement patterns through active dynamic stretching may increase coordination, which allows the muscle to transition more quickly and therefore with increased power, from the eccentric to the concentric phase of contraction.

After dynamic stretching there is elevation in heart rate and muscle as well as body temperature [17,18] which improves muscle performance. The voluntary contractions associated with dynamic stretching have been reported to enhance excitability of the motor unit and improve kinesthetic sense leading to improved proprioception and preactivation [9] and increase nerve impulse transmission leading to favorable changes in the force-velocity relationship [20] and the decreased inhibition of antagonist muscles. Turki O et al [21] concluded that 10 minutes of dynamic stretching is sufficient to potentiate vertical jump performance characteristics.

This study also shows that effects of dynamic stretching are sustained after 15 minutes of sports specific activity. The sustenance of improved jump performance can be attributed

to a warm up consisting of a combination stretching and sports specific movement patterns. Similar results were seen in study by Mandy T. Woolstenhulme et al [13], they reported a 3 cm increase in vertical jump height for the ballistic stretching group following 20 minutes of basketball play. They thought ballistic stretching provided a more specific warm-up to the muscle, which was similar to the muscular movements, performed in basketball. Giuseppe Annino et al [12] reported slight improvement in jump performance immediately after dynamic stretching but decrease in performance after 20 minutes of shooting phase in basketball players. Results similar to this study were seen in a study by Young and Behm on rugby players, where they have reported increase in jump performance when stretching was combined with sports specific activity such as sprints.

In basketball, jumping quickly as well as maximally is equally important. Athletes are required to generate quick bursts of movement resulting in maximal jump in as little time as possible. Few studies have reported that the jump performance has returned to baseline when no physical activity was performed in between 14. While in this study, athletes performed sports specific activity like sprint lay ups and shooting which helped to maintain the effects of dynamic stretching.

CONCLUSION

Jump performance improves immediately after dynamic stretching in basketball players which is maintained after 15 minutes of sports specific activity.

Conflicts of interest: None

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