Static vs. Dynamic Stretching on Vertical Jump and Standing Long Jump

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Introduction

Our research study looked at the effects of two different kinds of stretches, static and dynamic, on lower extremity power movements. For many years, stretching before athletic competition has been recommended to prepare the athlete for the event. It is thought that stretching reduces the risk of injury, decreases muscle stiffness, increases range of motion, alleviates pain, and improves athletic performance [1,2,3]. Despite recent inconclusive evidence of the benefits of stretching, the American College of Sports Medicine (ACSM) still adopts the idea of stretching before or after competition. In addition, the National Strength and Conditioning Association (NSCA) guidelines state that stretching before competition will improve performance and functional abilities [8]. Other research has been conducted to determine which type of stretching, static or dynamic, is better for improving strength, speed, power, and force production [1,4,5,6,7,9]. Research has also been done to find the effects of static stretching on balance, reaction time, and movement time [6]. To our knowledge, no study has looked at the effects of static versus dynamic stretches on vertical jump and standing long jump, two of the most common ways to measure lower extremity power production. Our study found helpful information that could be used to provide safe, effective, and reliable ways to help patients or athletes perform to their optimum level of physical function.

Design, Results, Discussion, and Significance

Participants were selected with a random sample of convenience and consisted of 34 males, ages 14-18, which completed consents forms and subject health questionnaire forms. Exclusion criteria consisted of any injury in the previous three months, chronic pathology in the previous six months, or use of any illegal substance or steroids. No subjects were excluded. Two instruments were used to measure jump performance in our study: Vertec and Standing Long Jump Test Mat. Participants were instructed on stretching techniques, warm-up, vertical jump and standing long jump procedures. Participant's initial reaches for vertical jump were recorded followed by a warm-up consisting of a five minute jog. After the warm-up, pretest measures were taken for vertical jump and standing long jump (3 trials of each). Following the pretest, the participants then performed the static stretch intervention to 5 different groups of muscles: Hamstrings, gluteal muscles, hip flexors, quadriceps, and gastrocnemius/soleus complex. Following, the stretching routine posttest measures were taken for vertical jump and standing long jump (3 trials each). The results for the pre-test and posttest were recorded in a table. The dynamic testing group followed the same procedure except they performed dynamic stretches versus static stretches for the intervention. There were also 5 dynamic stretches: straight leg march(hamstrings), flick backs(flickbacks), high knees,(hamstrings and glutes), straight leg skip(gastroc/soleus complex) 15 reps per leg, and skips (glutes, quads, and hip flexors) 5 reps per leg. Using a paired t-test ($p<.05$) a significant difference was found within the static group for vertical jump. Using a two-way mixed analysis of variance statistics revealed a significant difference ($p=.029$) between the static and dynamic groups for vertical jump. Numerous reasons are hypothesized why static versus dynamic stretching created a change in jump performance. They include: changes in the muscle tendon unit, changes in core temperature of the muscles, neuromuscular efficiency, and a change in neural drive to the motor units of the muscle[4,10,15]. Static stretching causes a more compliant muscle tendon unit which prevents a muscle from being able to store as much elastic energy in its eccentric phase, therefore decreasing the amount of force that can be produced. Static stretching also causes a decreased neural drive due to a decreased reflex sensitivity following the

stretch. Dynamic stretching increases neuromuscular efficiency. This means that muscles are stretched according to their synergistic patterns as well as movement is rehearsed in a more specific pattern than static stretching. Dynamic stretching actually increases neural drive by increasing core temperature.

Conclusion

There was a significant difference between static and dynamic stretching on vertical jump, but not on standing long jump. No significant difference was found with any of the standing ling jump data due to technical difficulties with the long jump mat sliding on the gym floor. Static stretching resulted in a decrease of performance while dynamic stretching resulted in an increase in performance. Our findings suggest that when performing vertical jump, those individuals who perform dynamic stretching will perform better than those who perform static stretching. Thus, athletes performing lower extremity power movements should choose a dynamic stretching routine rather than a static stretching routine immediately prior to competition to see greatest performance results.

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Table: 1
Vertical Jump Data

	Pre-test			Posttest		
	1st	2nd	3rd	1st	2nd	3rd
Static	56.77(8.87)*	58.04(7.75)*	59.09(7.01)*	56.70(7.83)*	56.25(8.52)*	56.62(7.19)*
Dynamic	59.69(8.27)	60.36(9.13)	61.55(8.36)	61.48(7.40)	62.37(7.86)	62.00(8.09)

Mean (+/- SD) pre-test and posttest measurements in centimeters for static and dynamic stretch groups[a].

* Delineates significant difference within the group.

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