The Effect of Static, Dynamic, and No Stretching Protocols on Agility and Vertical Jump Performance

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Introduction

- Static and dynamic stretching can help individuals prepare for exercise, recover from an injury, and increase flexibility (1).
- Static stretching involves stretching a muscle just before the onset of pain, and holding that stretch for a certain period of time (2).
- Dynamic stretching involves moving a limb through its full range of motion, and repeating that motion back and forth for a defined time/repetition interval (2).
- Static stretching may decrease power and agility performance due the inhibition of the stretch reflex and elongation of the muscle tendon (1,3).
  - Quick stretches of a muscle cause a contraction of that same muscle due to muscle spindle activity (2).
  - Static stretching may alter muscle spindle activity, inhibiting this reflex. (1)
  - Static stretching also elongates the tendon of muscles, causing the stretch shortening cycle to take longer and limiting how fast force can be produced by muscle (1).
- Dynamic stretching may enhance force produced from the muscle spindle stretch reflex, and not overly elongate muscle tendons. This may allow more force to be provided for agility and power performance.

Purpose

- The purpose of this study was to identify which stretching protocol is most beneficial for agility and vertical jump exercise.
- It was hypothesized that dynamic stretching would be most beneficial for agility and vertical jump performance.

Methods

- Subjects consisted of 9 injury free, recreationally active (at least 150 minutes of exercise/week) college aged males between ages 18-22 (height= 178.76 SD=2.74 cm, weight= 75.74 SD=16.32 kg, body fat= 9.62% SD=4.81%).
- Participants attended three testing sessions in which they performed a 400m jog, and then completed either a static, dynamic, or no-stretching protocol.
  - The static stretching protocol consisted of quadricep holds, plantar flexor stretches, hamstring flexion exercises, adduction and abduction stretching exercises, and a latissimus dorsi wall stretch.
  - The dynamic stretching protocol consisted of plantar flexors exercises, split leg squats, leg swings, lateral squats, shoulder wall slides, and a thoracic mobility exercise.
- Immediately following the stretching protocol, subjects completed three countermovement vertical jumps, measured by the Just Jump Mat.
- Following vertical jump testing, subjects completed the Illinois Agility Test 3 times.
- Only the best vertical jump performance and agility test scores were used for data analysis.
- A One Way Repeated Measures ANOVA test was used for data analysis.

Results

- No significant differences were found within subjects for the Illinois Agility Test (F (2,16) = 2.31, p = .13) or countermovement jump (F (2,16) = .14, p = .875).

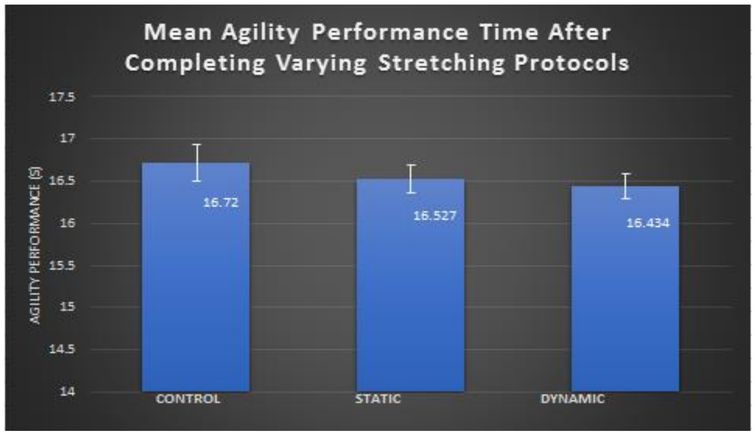

Figure 1: Average Completion Times of the Illinois Agility Test with Varying Stretching Protocols

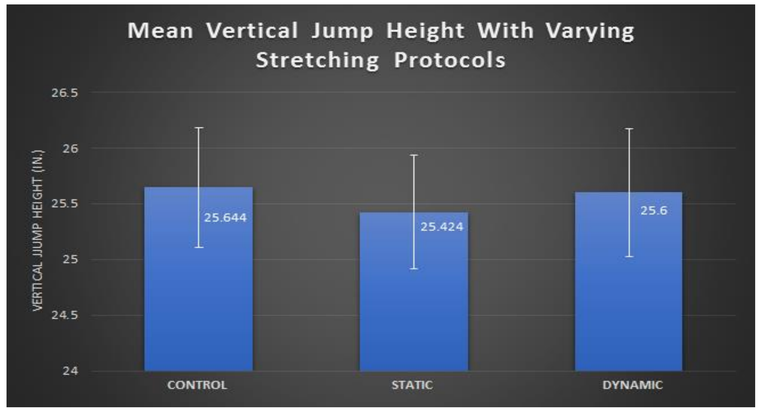

Figure 2: Mean Vertical Jump Height (in.) with Varying Stretching Protocols as Measured by the Just Jump Mat

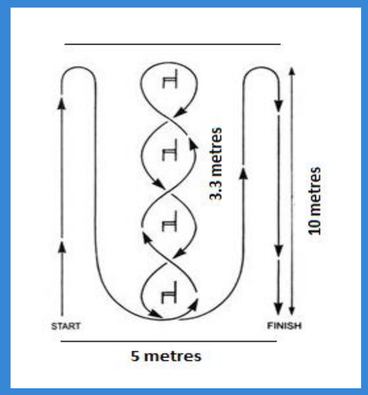

Figure 3: Diagram of Illinois Agility Test

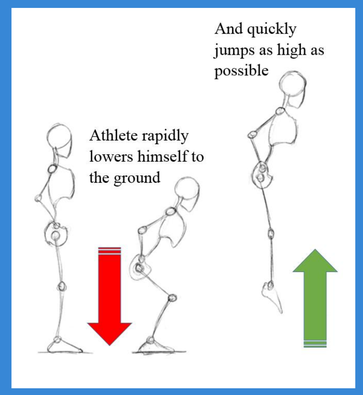

Figure 4: Diagram illustrating countermovement jump

Discussion

- Contrary to previous studies, neither a static, dynamic, or control stretching protocol was more advantageous for agility or vertical jump performance (1,3).
- The lack of significant differences between treatments could have been due to too much time between the stretching routines and the performance tests (≈ 1:00-1:30), and during rest periods in between testing (≈ 1:30 to 2:00).
  - The extra time before and in between testing trials would allow muscle proprioceptors (muscle spindles and Golgi tendon organs) to reset, negating any effect the stretch would have (3).
  - Dynamic and static stretching routines may not have been aggressive enough to alter the muscle spindle firing rate or tendon length of muscle.
  - If muscle spindle firing rate was not altered by dynamic stretching, or inactivated by static stretching, the stretch reflex would not be changed, and force production would not vary between stretching protocols. Similarly true, if tendon resting length was not stretched further with static stretching, then the stretch shortening cycle would not have been altered and force production not hindered (3).
  - However, in previous studies, shorter stretching durations and fewer stretches still produced significant results (1). Tendon length and muscle spindle activity was most likely altered in the current study, despite not finding differences in results.
- These results suggest that neither a static or dynamic stretching protocol is more advantageous for athletes or exercisers. Future research should examine the contributions made by both the stiffness of tendons and muscle spindle reflexes during agility and vertical jump exercise. These variables most likely changed during this research despite not finding significant differences.

Conclusion

- No difference in vertical jump or agility performance was observed between static, dynamic, and control stretching protocols.

Literature Cited

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Acknowledgments

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