

# Ankle Range of Motion and Vertical Jump Height are not Affected by Six Weeks of Static Gastrocnemius Stretching

Ashley C. Hall\*, Amber M. Russell, and Jerod A. Sharp  
Faculty: John W. Carter

*Department of Physical Therapy*

**Abstract.** The purpose of our research study was to examine the effects of a 6 week chronic static stretching program on gastrocnemius flexibility and vertical jump height. Twenty-five students participated in this study. Subjects were tested for bilateral ankle ROM and vertical jump height at 0, 3, and 6 weeks. The protocol consisted of four stretches, for five repetitions, done once a day, 5 days a week, for 6 weeks. The results showed that there was no significant difference ( $p \leq 0.05$ ) in ROM and vertical jump heights between the beginning and end of the 6 week stretching program. No significant correlations were found between change in ankle ROM and change in vertical jump height.

## 1. Introduction

Stretching is often utilized in rehabilitation and conditioning programs as a means to improve performance; however, the research to support this practice is very limited. Our study was intended to provide evidence either in support of, or against this common practice, so that physical therapists and other health professionals can provide meaningful, effective, and efficient services to their patients and/or clients.

Previous research on this topic indicates that acute stretching is detrimental to performance [1]. The research on the effects of a chronic stretching program is more limited [1,2]. Studies have been conducted on how hamstring stretching or general lower extremity stretching affects various aspects of performance [2]; however, published literature revealed no studies that looked specifically at the effect of static gastrocnemius stretching on vertical jump performance.

## 2. Experiment, Results, Discussion, and Significance

### *Methods*

Each subject began warming up by riding a stationary bike at a comfortable speed for 3 minutes. Subjects were measured for passive ankle dorsiflexion. The subjects performed a stationary vertical jump, and the subject was instructed to “slap” the highest possible vane on the Vertec Vertical Leap. The highest of the three jumps was recorded.

A stretching program was then given to each subject to stretch the gastrocnemius for 6 weeks. The subjects were instructed to perform each of the 4 stretches for 5 repetitions, once a day, 5 days a week, for 6 weeks. Each repetition was to be held for 30 seconds, with a 30 second rest period between repetitions. Each subject returned and performed the jump testing again at 3 weeks and at 6 weeks following the initial testing session, along with another measurement of ankle dorsiflexion.

### *Subjects*

Twenty-five healthy college aged subjects (mean age  $\pm$  SD, 22.6  $\pm$  1.80 y; 16 female, 9 male) voluntarily participated in this study and provided written consent. Subjects were not allowed to participate if they were affected by a hip, knee, or ankle pathology or surgery from which they were still recovering. The assignment of each subject was the same.

### *Results*

The variables measured were right and left ankle ROM, maximum vertical jump height, and self-reported compliance. The subjects showed no significant increase or decrease in ankle ROM or vertical jump height over the 6-week period. Self-reported compliance was measured as the number of days out of 30 that subjects performed the prescribed stretching program. Only 19 subjects provided compliance information (mean  $\pm$  SD, 20.47  $\pm$  4.43).

No significant correlation was found between change in right ankle ROM and change in vertical jump height (-0.079). There was also no significant correlation between change in left ankle ROM and change in vertical jump height (-0.261). There was a significant correlation between change in right ankle ROM and change in left ankle ROM (0.843). Inclusion or exclusion of compliance data as a covariate did not change the significance of any data.

### *Discussion*

The results of our study show that chronic static stretching of the gastrocnemius has no effect on ankle ROM and vertical jump height. However, the 6 week stretching protocol did cause a small non-significant increase in both right and left ankle ROM.

We originally hypothesized that the 6 week stretching program would result in increased ankle ROM of both the right and left ankles. The unexpected result, of no significant change in ankle ROM, could be due to many factors: compliance, clarity of protocol, ceiling effect, dropouts, and facilities available.

### **3. Conclusion**

The results showed that there was no significant difference ( $p \leq 0.05$ ) in ROM and vertical jump heights between the beginning and end of the 6 week stretching program. No significant correlations were found between change in ankle ROM and change in vertical jump height. Based on the results from our study and conflicting evidence within the literature, further research is needed to determine if a relationship does exist between chronic static stretching, flexibility, and vertical jump height.

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[1] I Shrier. Does stretching improve performance? A systematic and critical review of the literature. *Clin J Sport Med.* 2004;14(5):267-273.

[2] DM Bazett-Jones, MH Gibson, JM McBride. Sprint and vertical jump performances are not affected by six weeks of static hamstring stretching. *Journal of Strength and Conditioning.* 2008;22(1):25-31