

# The Effects of Hamstring Stretching on Vertical Jump in Healthy Young Adults

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**Abstract.** In physical therapy, a large portion of the patient population consists of non-athletic individuals. The purpose of the study was to achieve a better understanding about the use of a stretching program prior to activities non-athletes perform that require power. Twenty-seven non-athletic individuals were measured for hamstring flexibility, performed a vertical jump, and were divided into control and treatment groups. The treatment group was assigned a 6 week stretching program while the control group continued normal activities. Pre and post sit and reach measurements were obtained for all participants. No significant correlation was found between jump height and flexibility. Hamstring flexibility and jump height did not change significantly ( $p \geq 0.05$ ).

## 1. Introduction

In physical therapy, a large portion of the patient population consists of non-athletic individuals. These individuals use power on a daily basis, such as climbing stairs, lifting objects, and running. Therefore, power activities are not only seen in sport settings, but are also used in the home and work place. Several authors have evaluated power production within the athletic population [1,2,3]; however, power is rarely explored in non-athletic populations.

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

Subjects were a sample of convenience. The first individual was randomly assigned to the control group or to the exercise group based on the flip of a coin; every successive person was placed in the opposite group. For the pre- and post-tests, subjects performed the following: a 5 minute warm-up on a stationary bike; 3 sit- and-reach trials with shoes removed and feet flat against the box; 3 counter movement jumps. At the final testing session, subjects in the stretching group returned compliance calendars.

The Vertec<sup>®</sup> jump system was used to test vertical jump because of its high validity and test-retest reliability [4]. During testing sessions, subjects performed 3 countermovement jumps, a type of vertical jump. These jumps primarily use movement by quickly flexing the knees prior to the jump. Subjects were instructed to “bend your knees then quickly jump as high as you can, hitting the highest vane that you can”, which was demonstrated once.

Subjects in the stretching group were instructed to lie supine on a flat surface to stretch the right hamstrings. The right hip actively flexed to 90°, the knee actively extended, and foot flexed with hands behind the knee. The opposite lower extremity remained flat on the surface. This active self-stretch, which was “strong but tolerable”, was maintained for 30 seconds [5]. The same procedure was performed with the opposite leg. Stretching was repeated 3 times a day, 5 days a week for 6 weeks [6].

Mean range of motion and vertical height were determined from each of the 3 trials. Hamstring flexibility and vertical jump was not significantly different between the control and stretching group from pre test to posttest. No correlation between change in flexibility and vertical jump height was found.

There is some debate over the optimal duration and frequency required to induce a significant difference in hamstring range of motion. Bandy and Irion found that subjects who held the stretch for 30 to 60 seconds for 5 days per week for 6 weeks, showed greater gains in range of motion when compared to subjects who stretched for a lesser amount of time [7,8]. Davis et al also examined time duration for stretching and found that when one static stretch was held for 30 seconds 3 days a week for 4 weeks, hamstring length increased significantly [5]. Ford et al found that, when following a daily static stretching protocol for five weeks, passive knee extension range of motion increased for all ranges using 30 to 120 second stretch durations [9].

No significant difference between the control and stretching groups could be due to the participants not doing the stretches correctly. The subjects were only given a handout and were instructed by an investigator on

proper technique after the pretest session. Ford et al required that each subject in the intervention group return each week for a review of the stretching protocol [9]. Davis et al had subjects perform the stretch under the supervision of an investigator [5]. Other researchers supervised each stretching session [7,10]. However, Bazett-Jones et al also observed the stretching protocols that the subjects performed on their own and their results showed no significant difference in hamstring flexibility [11].

The results suggest that a 6 week static stretching program may not be adequate for significantly increasing hamstring flexibility and, therefore, power output in the non-athletic population. In future studies that examine the non-athletic population, members of the stretching group should be supervised at least weekly to ensure that the stretching protocol is being followed correctly. When selecting participants, it would be advised that inclusion criteria be set to eliminate the possibility of a ceiling effect for hamstring flexibility.

### 3. Conclusions

The purpose of this study was to achieve a better understanding about the use of stretching program prior to performing activities for power output like vertical jump. After a 6 week stretching program was completed, all subjects' hamstrings and vertical jump measurements were taken to determine the effects of the program. This study found no significant difference between hamstring length for pre and post stretching in either group and, therefore, it was not expected to have a significant difference in power output in the form of a vertical jump. More research needs to be conducted to further understand the effects of stretching on power production.

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