

## SWACSM Abstract

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### Acute Stretching Effect on Hamstring Muscle Stiffness using Elastography.

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#### ABSTRACT

Having first been introduced in the 1990s, shear wave elastography (SWE) has more recently been used to investigate intrinsic muscle stiffness. While studies have shown SWE to be an effective way of determining muscle stiffness, few have been conducted to measure the effects of stretching on the hamstring muscles. **PURPOSE:** to determine if there is a measurable difference of hamstring muscle stiffness with acute stretching using ultrasound elastography. **METHODS:** 16 subjects participated in this study (11 men and 5 women). Mean age  $23.4 \pm 2.6$  yrs for men and  $21.2 \pm 1.5$  for women. Mean height (cm) is  $180.3 \pm 4.7$  for men and  $172.7 \pm 2.5$  for women. Mean weight (kg) is  $76.8 \pm 9.7$  for men and  $70.0 \pm 14.9$  for women. Participants lay supine and positioned to  $90^\circ$  hip and  $90^\circ$  knee flexion. Each participant came in for two sessions that consisted of (1) static stretching and (2) PNF stretching protocols. Maximum ROM of the knee joint, force, and muscle stiffness of the biceps femoris (BF), semimembranosus (SM) and semitendinosus (ST) were recorded both before and 1 minute after stretching. **RESULTS:** After accounting for age, weight and height, there was no significant difference between the use of static and PNF stretching techniques on either velocity ( $p = 0.4805$ ) or kPa ( $p = 0.5423$ ) stiffness values. Both static and PNF stretching resulted in significant reductions in both velocity and kPa stiffness ( $p < .0001$ ) with the SM decreasing significantly more than the BF or ST. ROM increased significantly and force of stretch at endpoint decreased significantly ( $p < .0001$  and  $p = 0.0004$  respectively), but there was no significant difference between stretch techniques on ROM ( $p = 0.1312$ ) or force ( $0.2183$ ). **CONCLUSION:** Stiffness as measured using SWE decreases following an acute stretching session for both static and PNF stretching techniques. This suggests alterations to intrinsic muscle characteristics beyond just "stretch tolerance" as suggested in previous literature. Changes in both ROM and force also support this claim. Further research on retention of decreased stiffness are needed as acute stretching has previously been shown to be temporary. Longer term stretching studies to determine if intrinsic muscle stiffness changes models plastic deformation are also needed and may help better elucidate duration and stretch technique differences.