

Title: Evaluation of Achilles Tendon Stiffness as Measured by Shear Wave Elastography In Female College Athletes Compared to Nonathletes

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## **Abstract**

### **Introduction**

We sought to utilize a noninvasive technology to assess the effects of activity on Achilles tendon stiffness and define baseline Achilles tendon stiffness in female college athletes compared to nonathletes. We hypothesized that training status and exercise may impact Achilles tendon stiffness.

### **Methods**

32 college-age females were prospectively enrolled (n=17 varsity athletes and n=15 non-athletes). Demographic characteristics, activity level, prior injuries were recorded. SWE was used to assess Achilles tendon stiffness bilaterally for all subjects, both at baseline and following two minutes of exercise. Student t-tests were used to compare the mean elastography measurements between participants stratified by athlete status and pre/post exercise stimulus. Analysis of variance (ANOVA) was used to compare the mean proximal, middle and distal Achilles tendon elastography measurements.

### **Results**

Athletes had stiffer tendons than nonathletes ( $8.60 \pm 1.58$  m/s vs.  $8.25 \pm 1.89$  m/s;  $p = 0.016$ ). Exercise stimulus decreased average tendon stiffness ( $8.57 \pm 1.74$  m/s vs.  $8.28 \pm 1.72$  m/s;  $p = 0.047$ ). Tendon stiffness was greatest proximally and least stiff distally with significant differences between each region ( $p < 0.001$ ). Additionally, there was a significant two-way interaction between weekly training status and foot dominance ( $p = 0.010$ ). Post hoc analysis showed that this result was due to differences in tendon stiffness between the dominant and nondominant lower extremity in nonathletes ( $7.73 \pm 2.00$  m/s vs.  $8.76 \pm 1.62$  m/s;  $p < 0.001$ ).

### **Conclusion**

Female varsity collegiate athletes have higher baseline achilles tendon stiffness as measured by SWE compared to nonathletes. Mean tendon stiffness varies based on achilles measurement location. SWE is a quick, cost-effective, and noninvasive imaging modality that can be used to evaluate tendon stiffness and elasticity. This may prove useful to evaluate injuries in female college athletes and may play a role in risk stratification or clinical follow-up during rehabilitation.