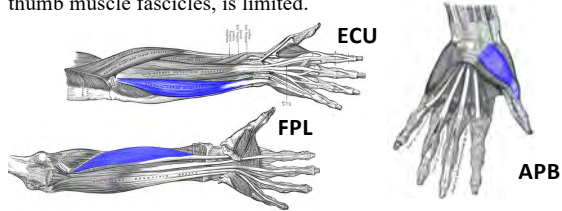


UF Measuring Fascicle Lengths in Extrinsic and Intrinsic Thumb Muscles Using Extended Field-of-View Ultrasound

Taylor R. Rakauskas, Tamara Ordonez Diaz, Jennifer A. Nichols

Introduction

- Muscle fascicle lengths are an important tool for understanding the force-length and force-velocity properties of muscles [1].
- Ultrasound is accepted as a reliable measurement for muscle fascicles [1,2,3,4].
- The number of ultrasound studies examining the upper limb, especially thumb muscle fascicles, is limited.

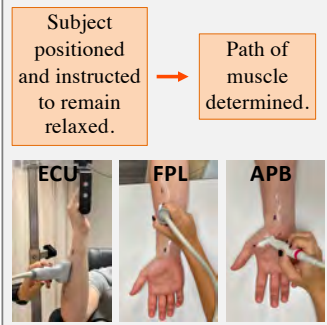


OBJECTIVE: to test the reliability and validity of measuring muscle fascicle lengths of extrinsic and intrinsic thumb muscles using extended field of view ultrasound (EFOV-US) imaging.

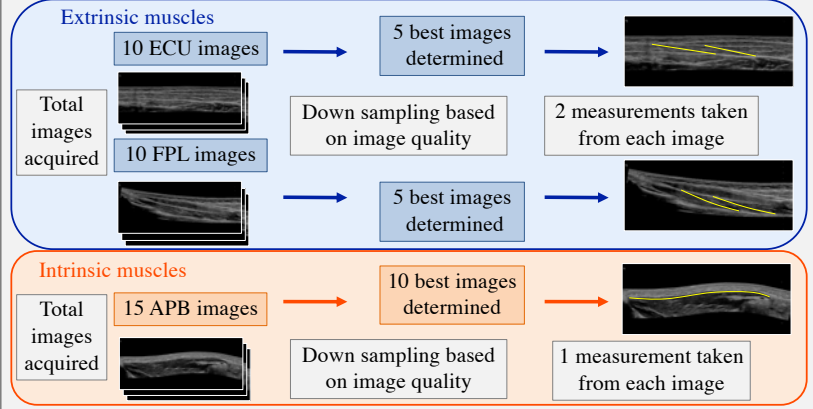
Methods

DATA ACQUISITION

Eight healthy adult subjects (4 female, avg. age 21.6 ± 1.3 years, avg. height 175.85 ± 8.26 cm).



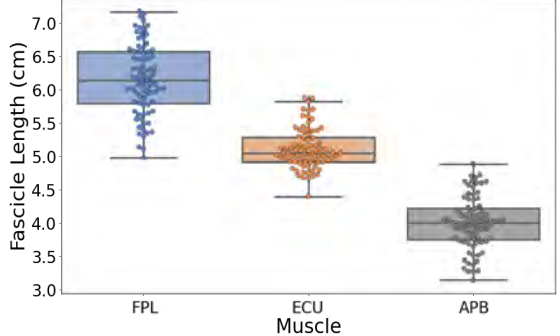
DOWN SAMPLING



ANALYSIS
Two-sided t-tests were performed to compare the subject averages with those reported in the literature.

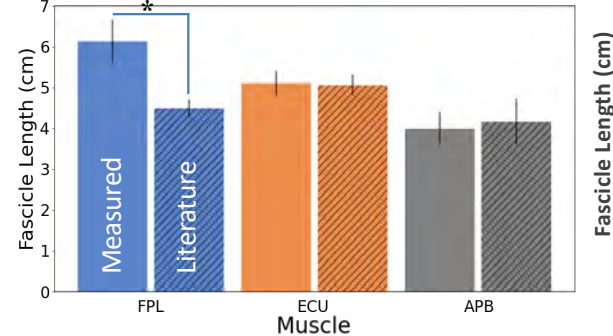
Results and Discussion

Reliable fascicle length measurements were found for each muscle.



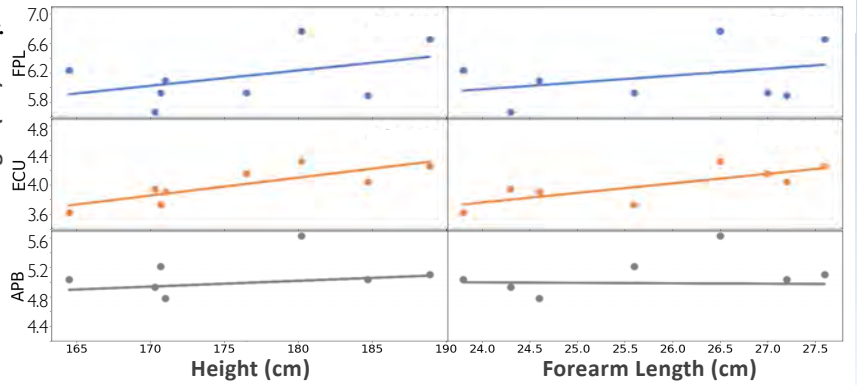
Mean Fascicle Lengths: ECU (5.12 ± 0.3 cm), FPL (6.15 ± 0.53 cm), and APB (4.0 ± 0.4 cm)

Measurements for the ECU and APB were found to be consistent with the literature [4,5,6], but FPL images were consistently larger.



Possible reasons for the FPL discrepancy include limb posture during measurement and prior studies involving cadaveric specimens.

Varying correlations with height and forearm length highlight the need to directly measure thumb muscle fascicle lengths, instead of relying upon anthropometric scaling.



ECU measurements were strongly correlated with subject height ($r^2 = 0.67$) and forearm length ($r^2 = 0.60$). FPL ($r^2 < 0.2$) and APB ($r^2 < 0.1$) measurements were only weakly correlated.

References: [1] Arnold et al. *J Exp Bio*, 2013. 216 p. 2150-2160. [2] Kwah et al. *J Appl Physio*, 2013. 114 p. 761-9. [3] Noorkoiv et al. *J Appl Physio*, 1985. 109(6) p. 1974-9. [4] Adkins et al. *J Biomech*, 2017. 63 p. 179-185. [5] Lieber et al. *J Hand Surg*, 1992. 17(5) p. 787-798. [6] Jacobson et al. *J Hand Surg*, 1992. 17(5) p. 804-9.

CONCLUSION: EFOV-US was found to be a reliable tool for measuring muscle fascicle lengths of extrinsic and intrinsic thumb muscles. Continuing to measure thumb muscle fascicle lengths *in vivo* will inform our understanding of hand forces and hand pathologies.