Title
Validity and reliability of a custom software program using an optical flow algorithm for tissue excursion measurement on ultrasound images: a pilot study

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Purpose / Background
Ultrasonic images demonstrate real-time dynamic movement of the muscles. Zernicke RF et al. 1 measured share strain of human fascia. However, there have been no study to validate the velocity of a dynamic muscle movement. The aim of this study was to determine the reliability of a custom software program using an optical flow algorithm to measure tissue excursion on ultrasound images.

Method
One healthy adult served as a subject. The proximal gastrocnemius was chosen for ultrasonic measurement. Images were acquired during passive dorsiflexion of the ankle in the prone position with the knees in full extension. The images were loaded into a custom program called Echolizer (GLAB) and the velocity [cm/s] of tissue movement in the region of interest (ROI) was computed using an optical flow algorithm. Using ImageJ software, tissue movement was also manually measured by tracking the intersection of a fascicle and intramuscular tendon. The computed value on the y axis and manually measured values on the x axis were plotted in a scatter graph.
SPSS statistical package ver. 21 (IBM SPSS) and R2.8.1 were used for statistical analysis. The significance level was set to $\alpha = .05$.

**Result**
The correlation coefficient between the software-based and manual measurements was 0.98. Changes in the contrast of the ultrasonic images had no effect on the correlation coefficient between the two measurement methods and its regression equation was $y=0.20x+0.01$. The reproducibility of the positioning of the probe was low with an interclass correlation coefficient (1,1) of $\rho = -0.24$ and 95% confidence interval of [-0.25, 0.001].

**Conclusion**
The Echolizer program provided consistent results regardless of image contrast. The high correlation coefficient and slope of 0.20 in the regression equation between the manual and software-based results suggest that accuracy validation experiments would be required to obtain a more accurate regression equation. The low reproducibility of probe positioning should be taken into consideration when developing the measurement protocol.