Assessment of Skeletal Muscle Characteristics in Female Collegiate Cheer Athletes

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Abstract

INTRODUCTION: Ultrasound is becoming a more common modality for body composition due to its accuracy, cost, and ability to perform muscle assessment. When analyzing athletes, muscle makeup (pennation angle, fascicle length, and muscle thickness) can give insight to strength progression, injury prevention, and muscle imbalances. Despite ultrasound's growing popularity there has been little comparison of muscle composition among female athletes and possible lower body imbalances. The purpose of this study is to examine training modalities and muscle architecture characteristics between legs in collegiate cheer athletes.

METHODS: Thirteen female collegiate cheer athletes (19 ± 1 years, 164.3 ± 6.8 cm, 63.0 ± 10.2 kg) were assessed for anthropometrics, a survey to assess type of training outside of cheer practice, and B mode ultrasound on both legs during a single visit. All ultrasound images were analyzed at 50% of the vastus lateralis for muscle thickness (MT), pennation angle (PA), and fascicle length (FL).

RESULTS: Type of exercise training outside of practice counts: endurance (2), resistance (2), mixed (6), and do not train (3). We observed the following characters in the right leg (MT: 21.2 ± 2.2 mm, PA: 12.3 ± 2.7 deg, FL: 99.2 ± 27.0 mm) and left leg (MT: 21.1 ± 2.4 mm, PA: 13.2 ± 2.6 deg, FL: 86.2 ± 11.0 mm) with no differences observed between legs p>0.05.

CONCLUSION: Given our sample size we observed more athletes performing a mix of endurance and resistance exercise, and no differences between legs for skeletal muscle characteristics.
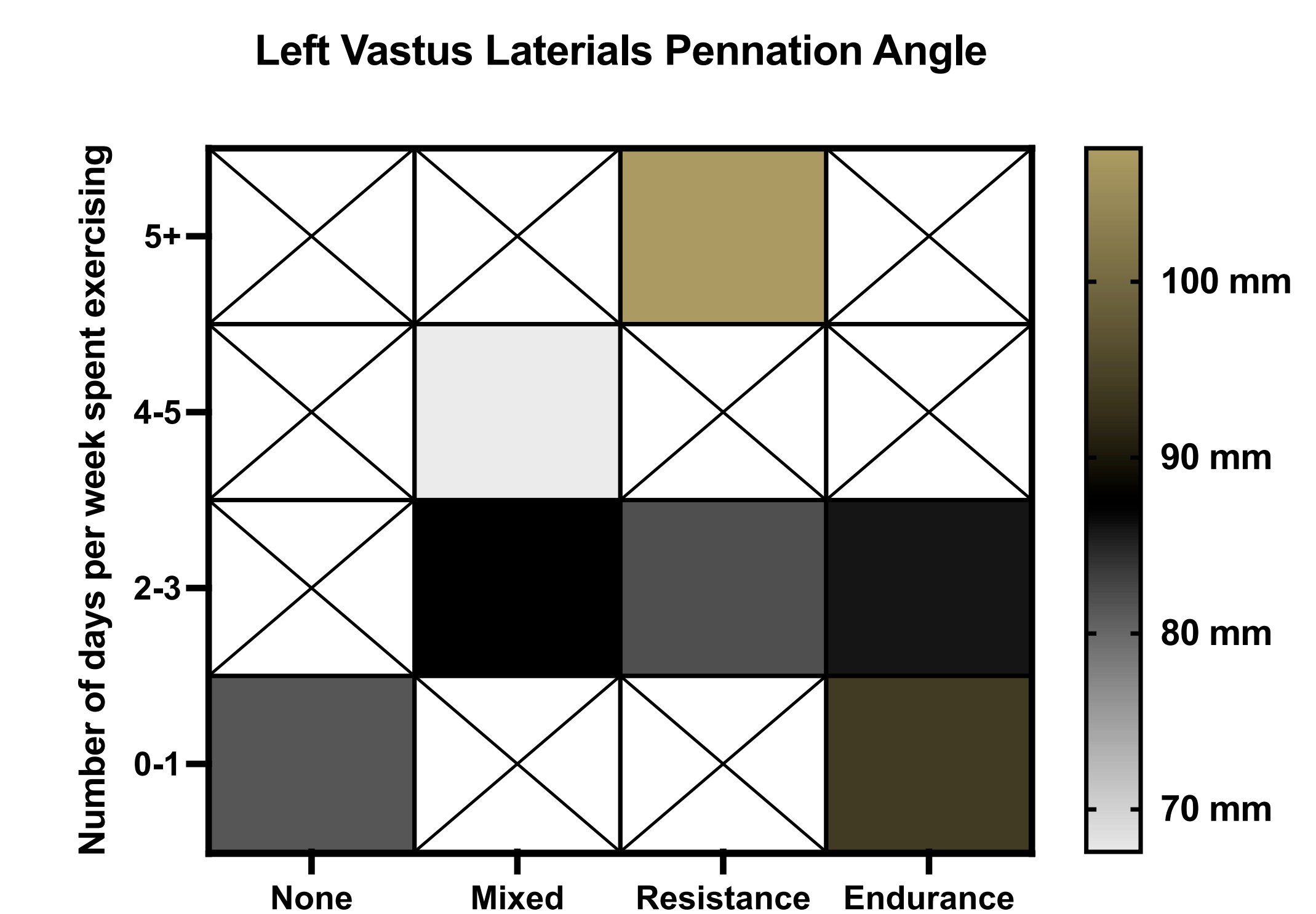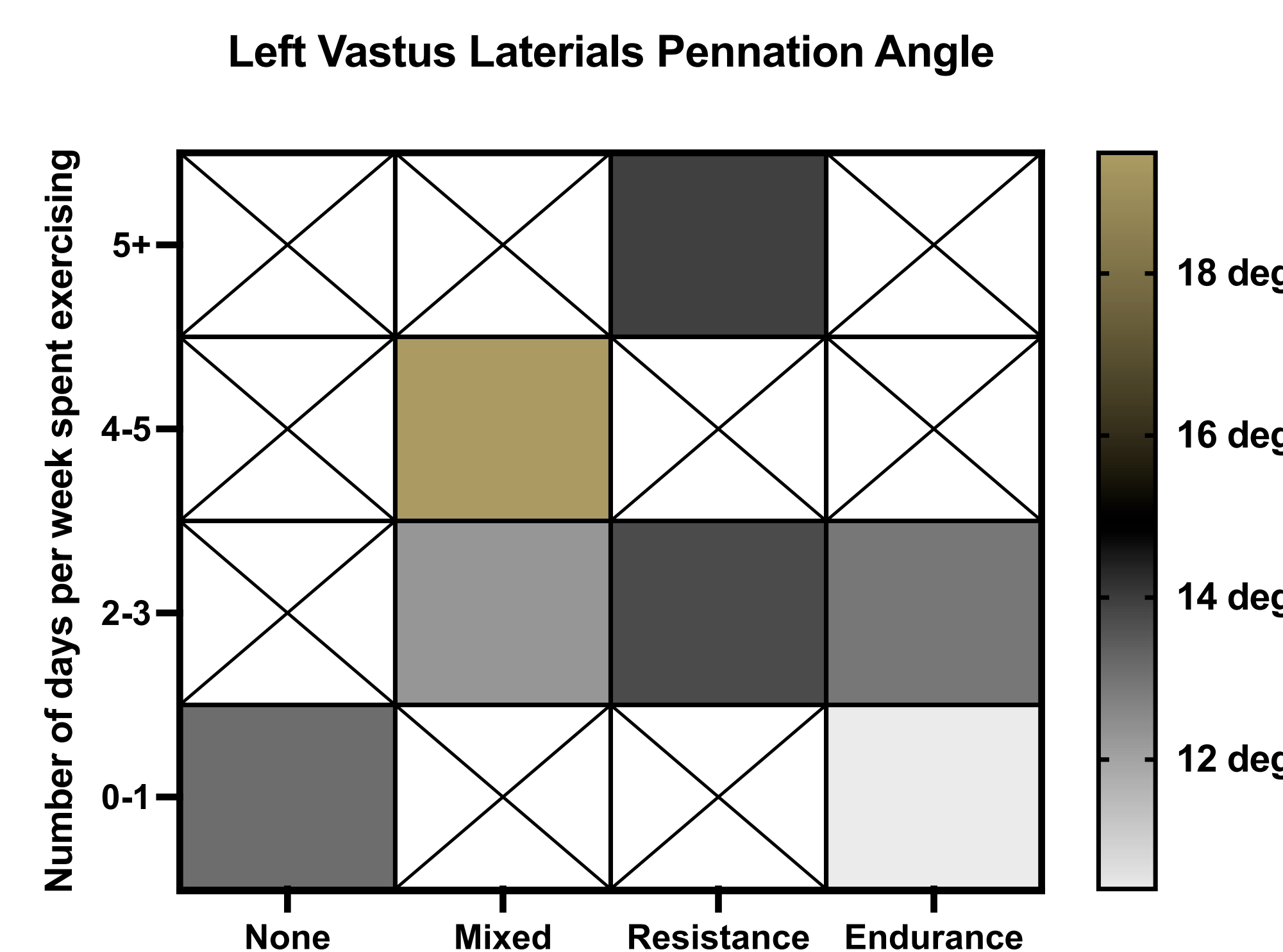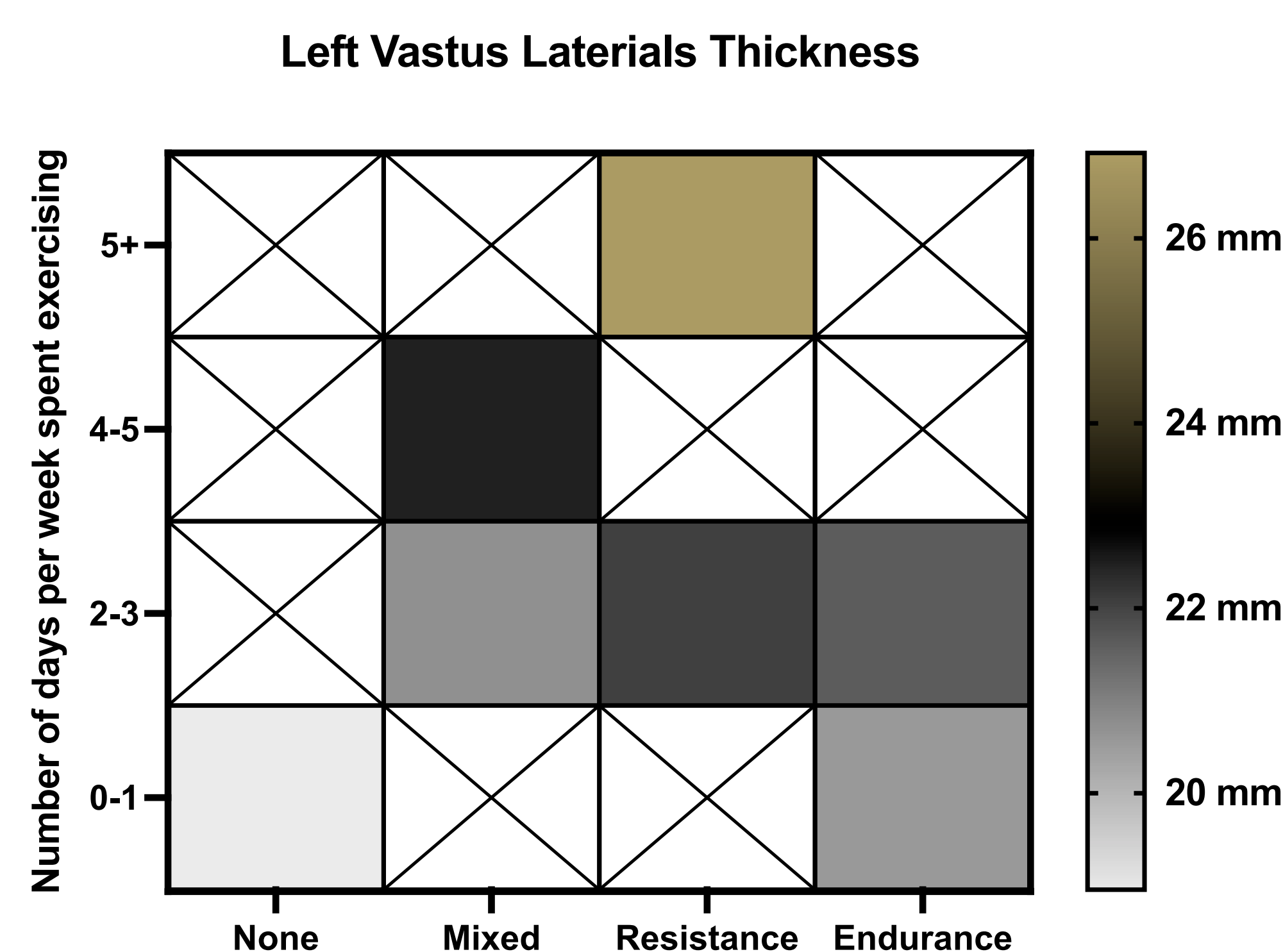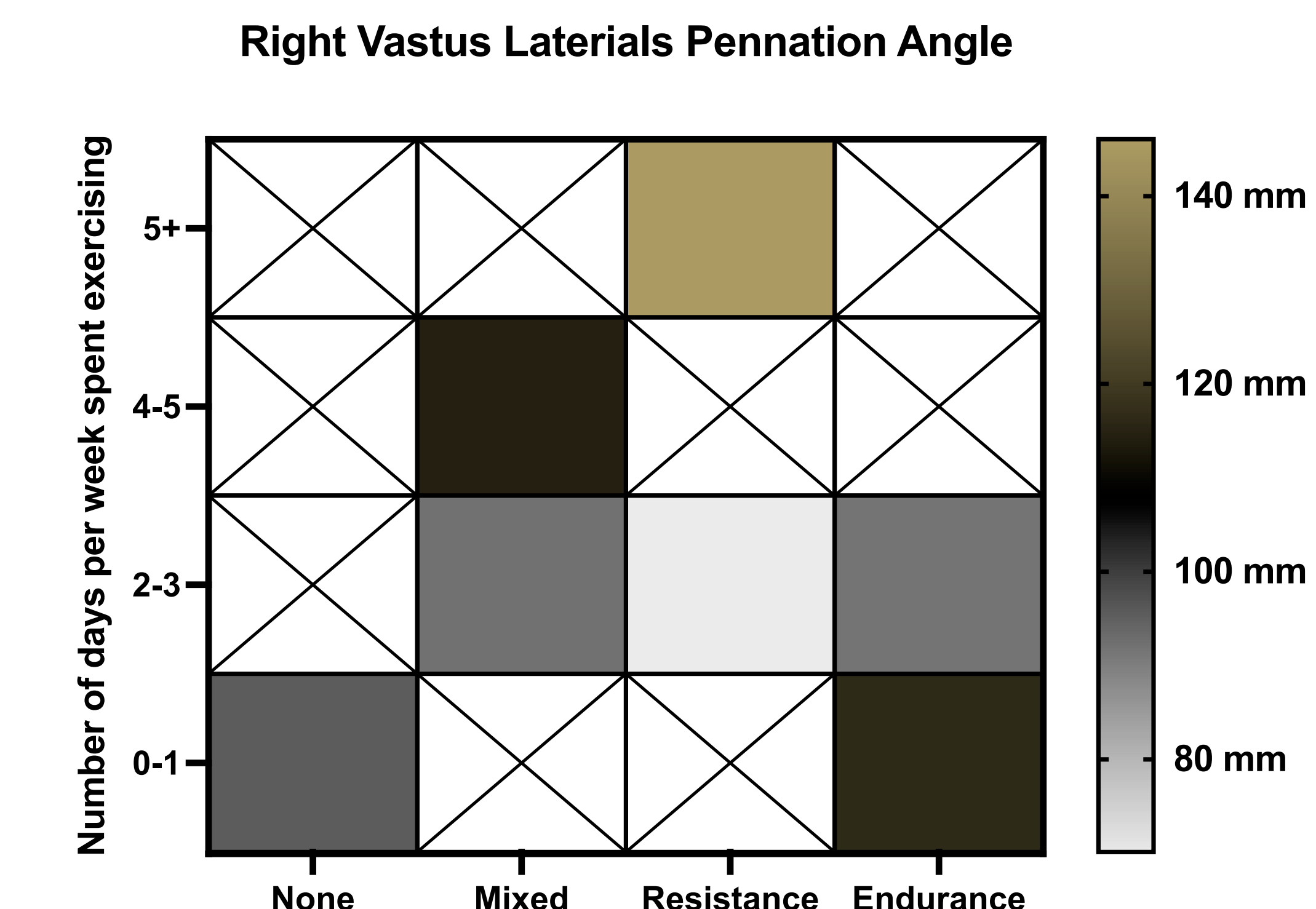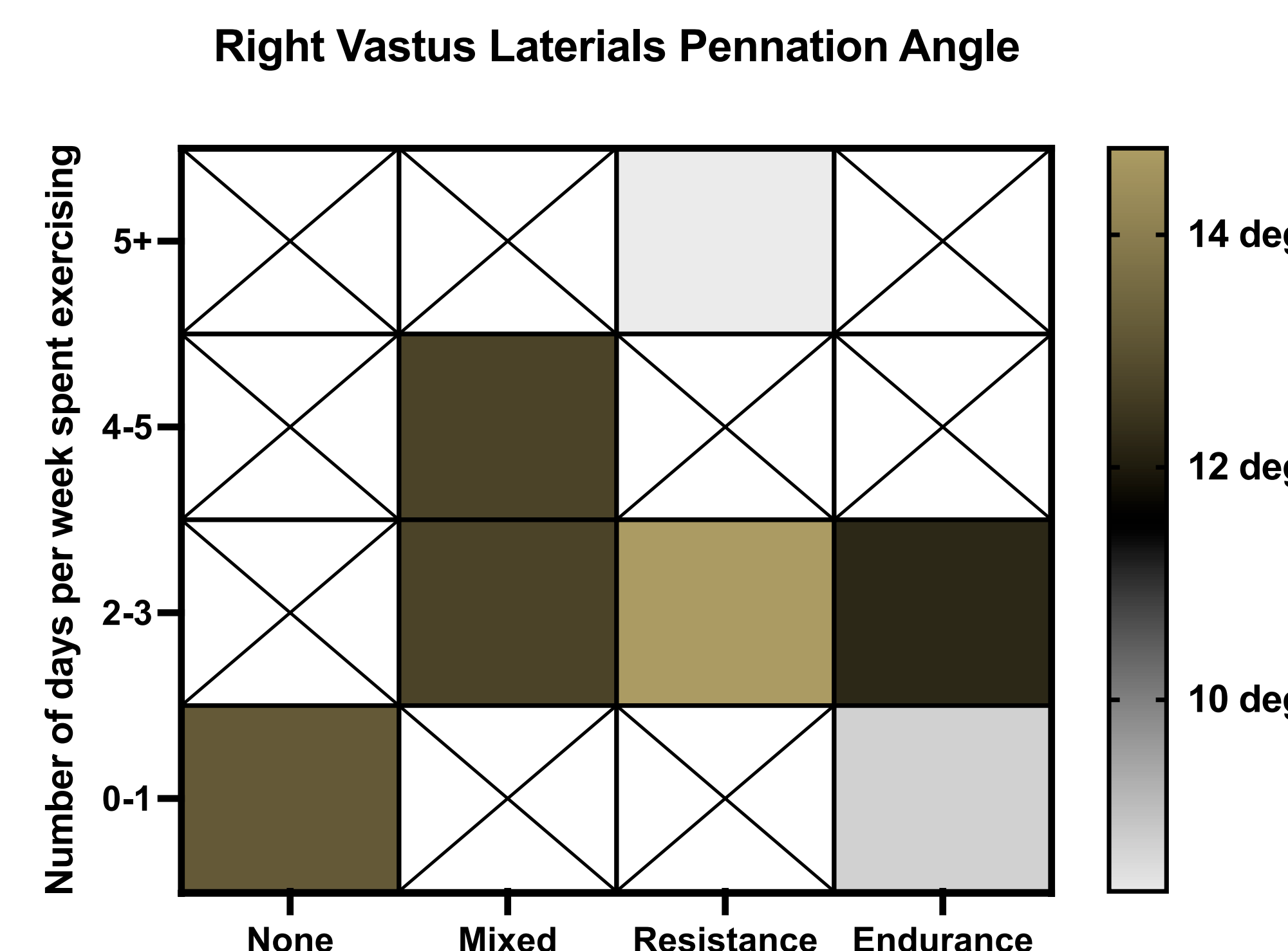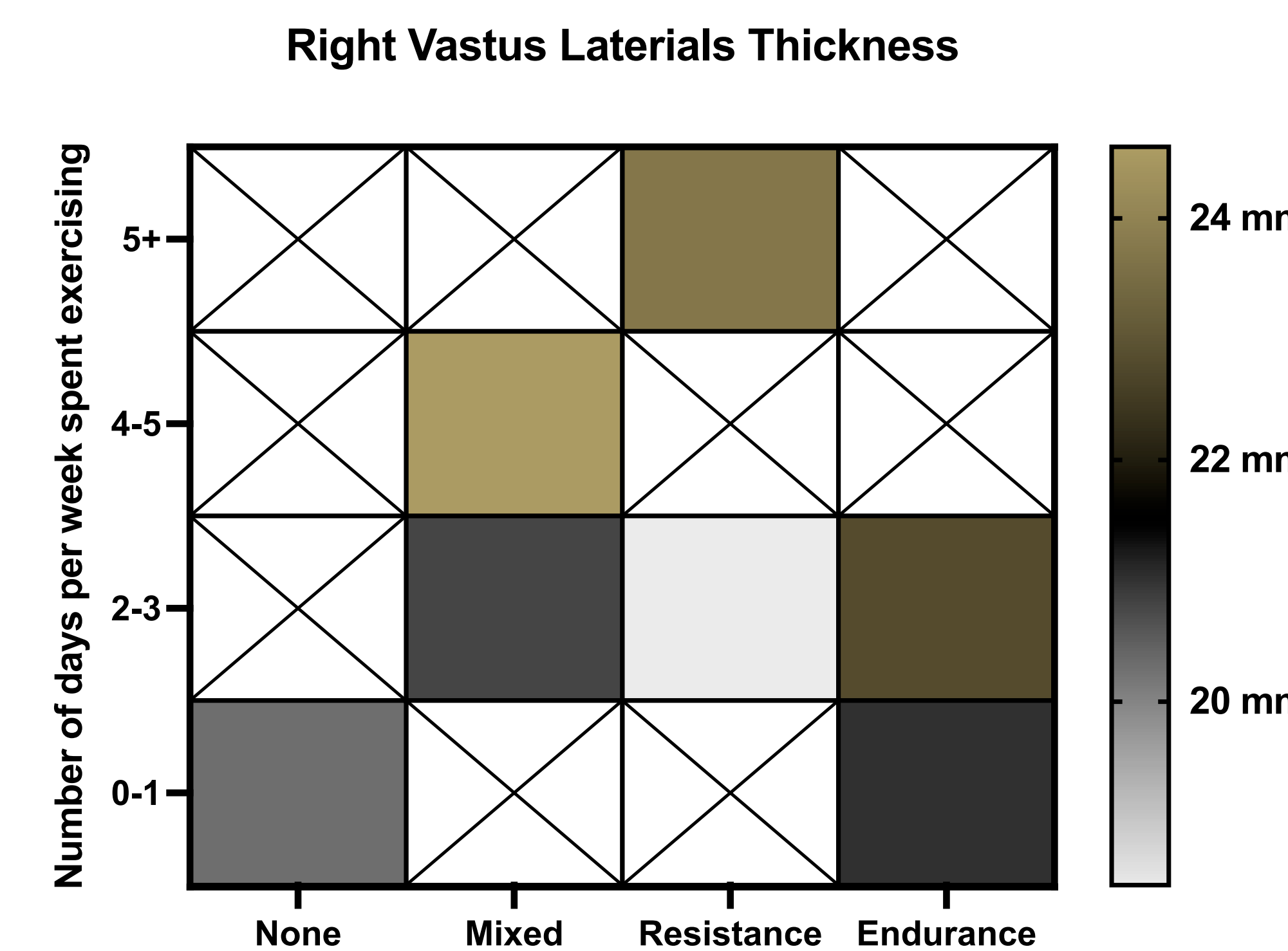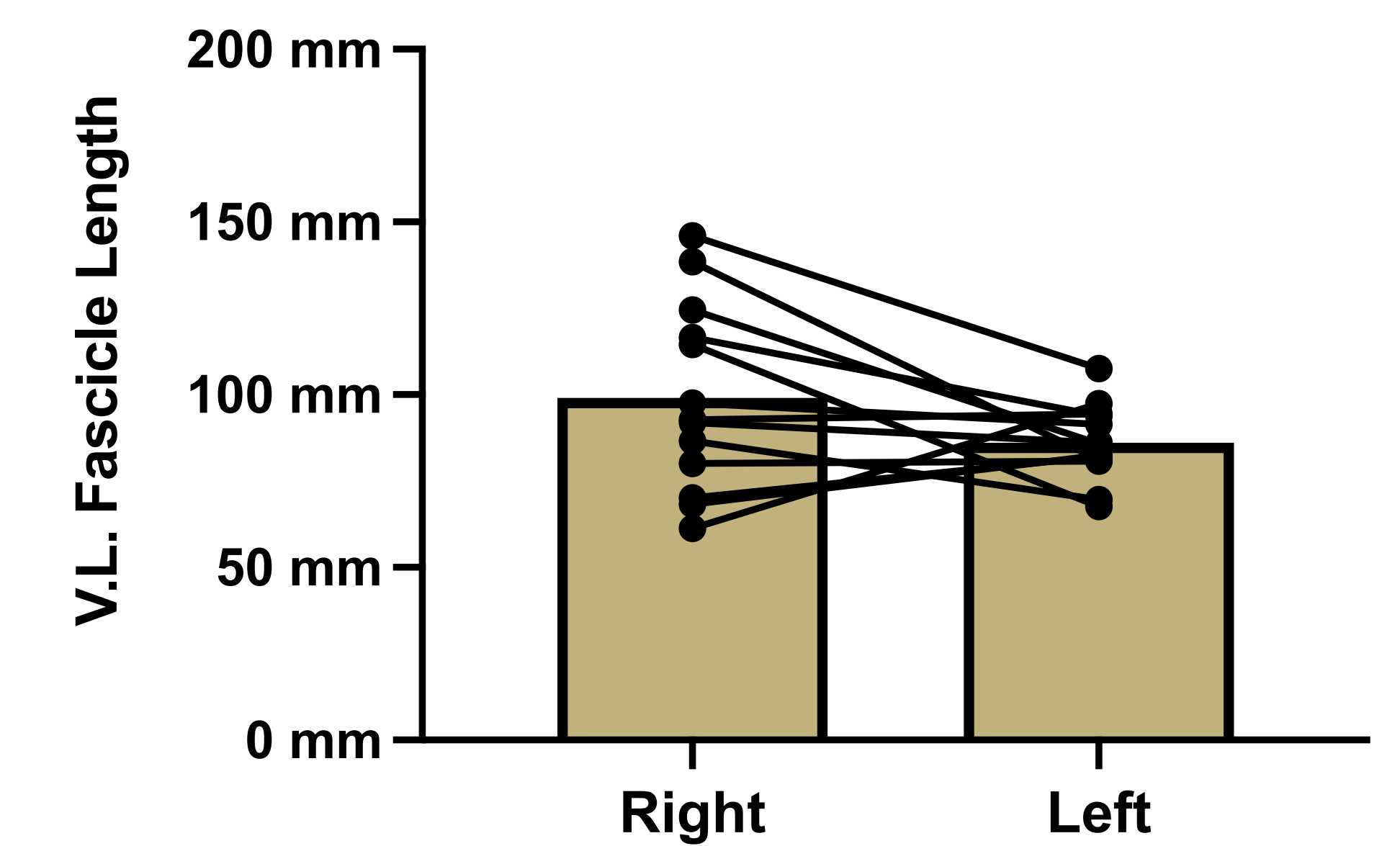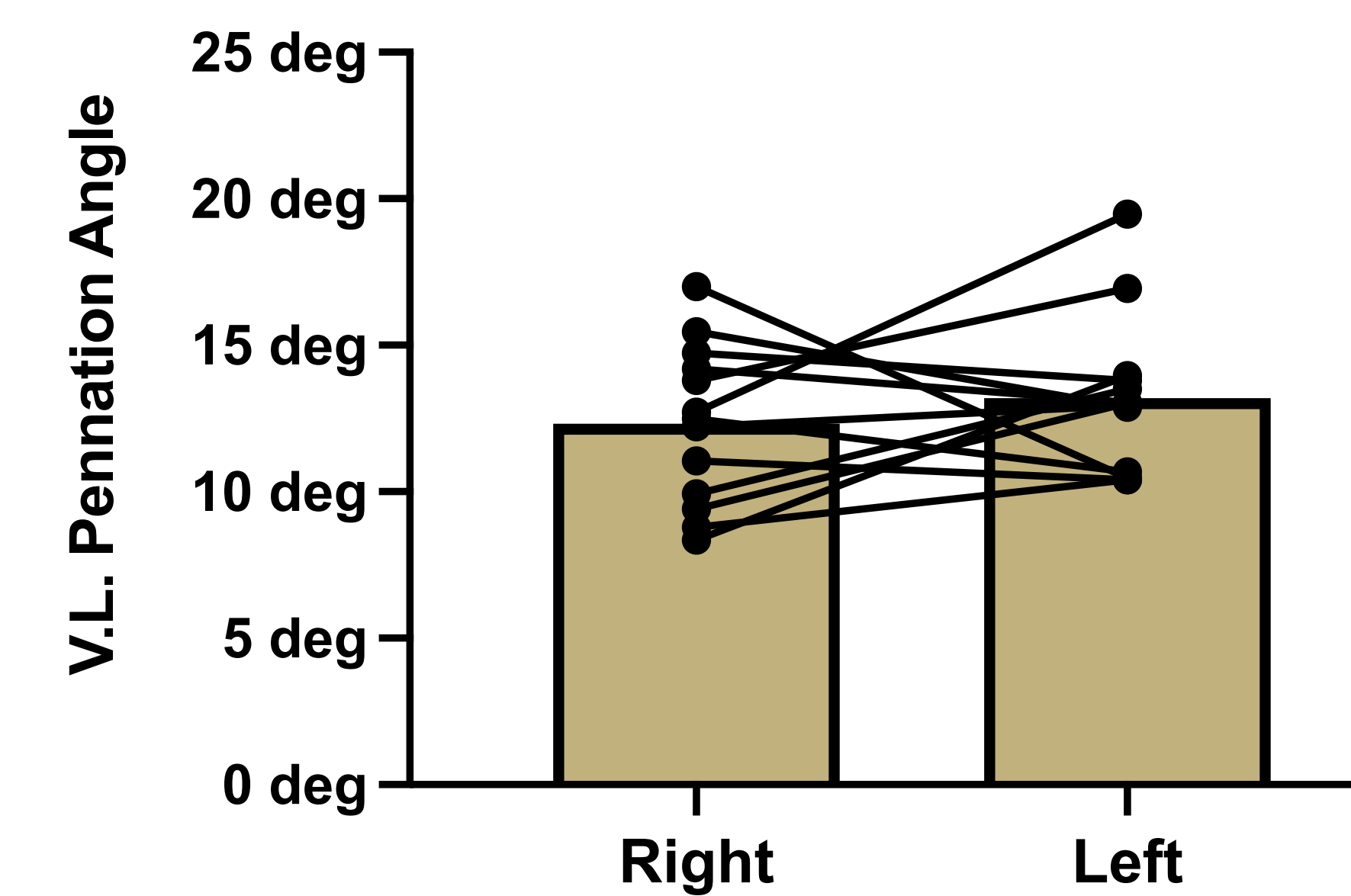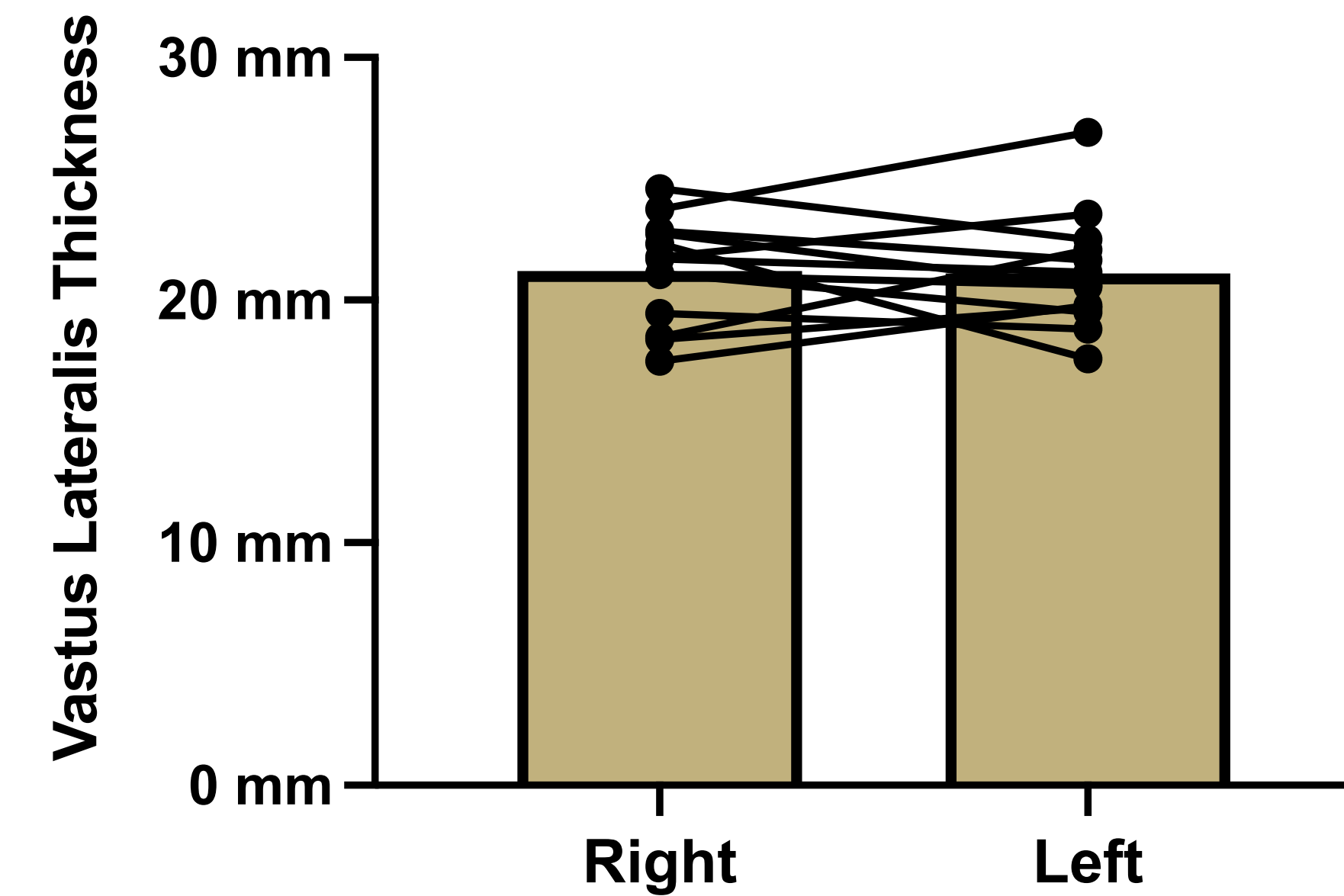
Ultrasound Overview
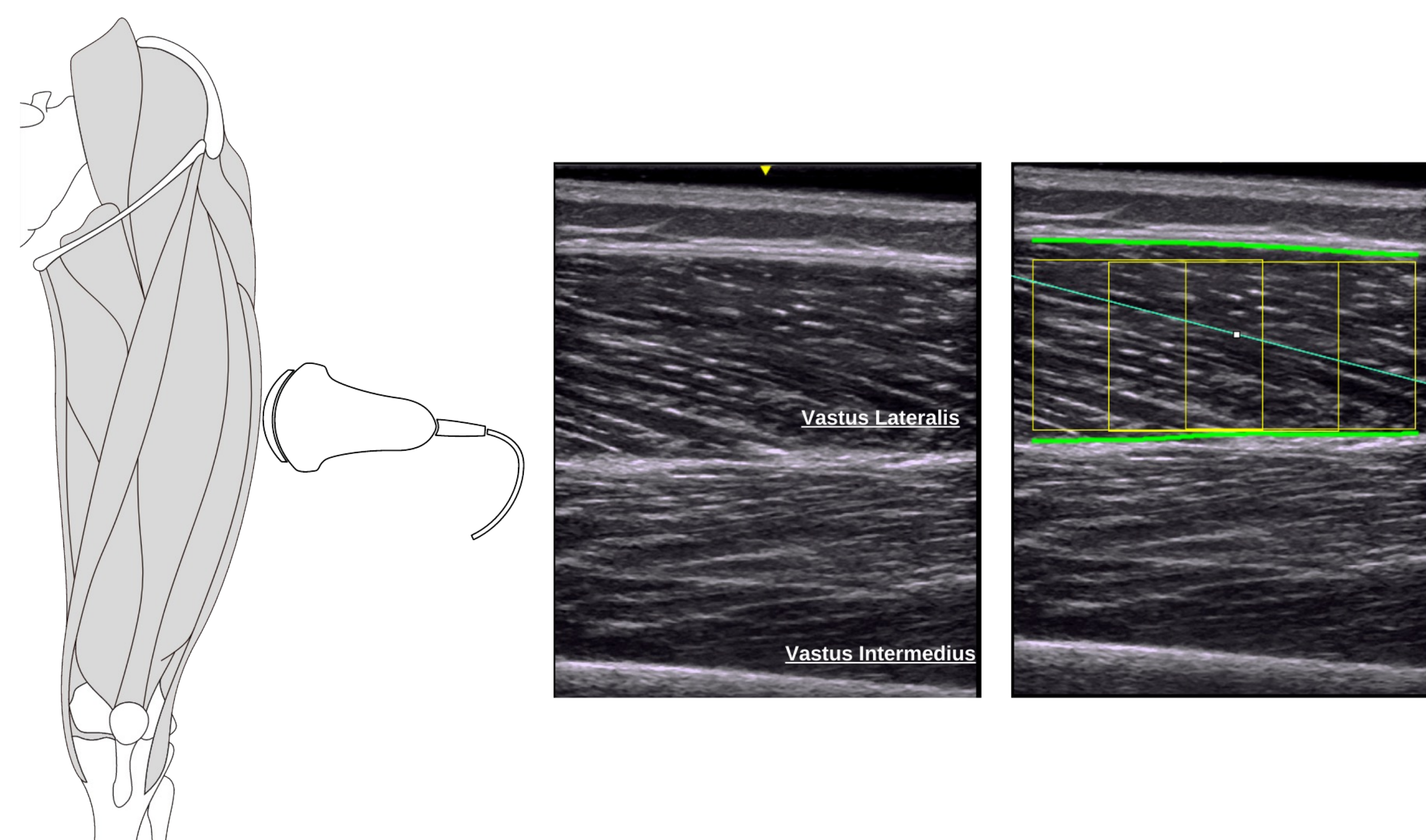
Ultrasound images were taken on both legs in a supine position at the mid point of the vastus lateralis, which was determined by measuring from the greater trochanter to the lateral epicondyle. A cross mark was made at the mid point which served as a reference point for all three images on both legs. The ultrasound images were captured (Logiq e BT12; General Electric, Fairfield, CT, USA) with a 3 to 12 MHz multi-frequency linear phase array transducer placed parallel with the vastus lateralis. The images were processed using Fiji (1) an open-source platform for analyzing biological images with the simple muscle architecture Analysis (SMA) plugin (2). All three images on each leg were analyzed in duplicate and averaged (6 measures in total).

Findings

Summary

- We observed no differences between legs for all skeletal muscle characteristics.

- However, given that cheer athletes do not have a designated strength and condition coach it is interesting to assess the exercise modality and frequency within the muscle characteristics. Due to our small sample size, we choose not to statistical analysis this data, but future work will aim to determine differences within these subcategories of exercise modality and frequency.

References

1. Schindelin, Johannes, et al. "Fiji: an open-source platform for biological-image analysis." Nature methods 9.7 (2012): 676-682.

2. Seynnes, Olivier R., and Neil J. Cronin. "Simple Muscle Architecture Analysis (SMA): An ImageJ macro tool to automate measurements in B-mode ultrasound scans." *Plos one* 15.2 (2020): e0229034.