Associations Between Ultrasound Muscle Thickness and Anthropometric Measures
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Context: Ultrasound imaging is a noninvasive way to assess muscle function by measuring muscle thickness, and changes in muscle thickness. These measures of the transversus abdominis (TrA) and lumbar multifidus (LM) have been used to identify dysfunction in low back pain individuals. However, factors exist that affect muscle thickness indicating that normalization methods should be utilized for accurate comparison across groups or individuals. Objective: To identify the association of resting muscle thickness measures of the TrA and LM muscles with anthropometric measures. Design: Cross-sectional study. Setting: Clinical laboratory. Participants: Fifty-eight participants (34 healthy, 24 history low back pain; 39 Female, 19 male; age: 23±8 years; height: 170.0±8.8cm; mass: 69.4±12.5kg; body mass index (BMI): 23.9±2.9 kg/m²). Interventions: Ultrasound imaging of the TrA and LM muscle during tabletop and standing measures. Main Outcome Measures: Resting muscle thickness of the TrA and LM muscles recorded at the end of normal respiration during tabletop and standing positions, and anthropometric measures including height, mass, BMI, hip circumference, waist circumference, waist-to-hip ratio and product of height and mass (heightxmass). Pearson’s r correlation coefficients were conducted to assess relationships in muscle thickness and anthropometric measures. Stepwise linear regression models were conducted to determine the amount of variance explained by each significant correlation. Results: Both tabletop and standing TrA resting muscle thickness were positively associated with height (Table: r=.440, P<.001, Stand: r=.410, P<.01), mass (Table: r=.671, P<.001, Stand: r=.673, P<.001), BMI (Table: r=.621, P<.001, Stand: r=.661, P<.001), Hip circumference (Table: r=.600, P<.001, Stand: r=.525, P<.001), waist circumference (Table: r=.639, P<.001, Stand: r=.571, P<.001), waist-to-hip ratio (Table: r=.361, P<.01, Stand: r=.334, P=.01), and heightxmass (Table: r=.643, P<.001, Stand: r=.637, P<.001). Resting tabletop LM muscle thickness was positively associated with height (r=.328, P=.01), mass (r=.434, P<.01), BMI (r=.363, P<.01), hip circumference (r=.296, P=.02), waist circumference (r=.369, P<.01), waist-to-hip ratio (r=.262, P=.05), and heightxmass (r=.425, P<.01). Standing LM resting thickness was only associated with height (r=.317, P=.02) and heightxmass (r=.262, P=.05). Mass was the single anthropometric measures that explain variance in resting LM table thickness (R²=.188, P<.01) and both resting TrA table and standing thickness (Table: R²=.450, P<.001, Stand: R²=.452, P<.001). Height was the only predictor that explained variance in standing LM thickness (R²=.101, P=.02). Conclusions: Resting TrA and LM muscle thickness is associated with a number of anthropometric measures. Body mass explained the most variance in resting tabletop LM thickness and both TrA table and standing measures, while height explained the most during standing LM measures. These two anthropometric measures may be appropriate normalization factors when comparing resting muscle thickness measures of clinical populations to healthy individuals. Word Count: 426