Reliability of force per unit cross-sectional area measurements of the first dorsal interosseus muscle.

Abstract

Background: Force per unit cross-sectional area (CSA) measurements of the first dorsal interosseus (FDI) muscle have previously been used as a measure of strength, although the reliability of these techniques has not been reported.

Purpose: To determine the test-retest reliability of maximum voluntary isometric force (MVIF), CSA and force per unit CSA measurements of the FDI muscle, using a custom-built dynamometer and ultrasonography.

Methods: Following approval from the institutions ethical advisory committee, twenty-seven recreationally active participants, thirteen males (age 22 ± 6 years; height 1.80 ± 0.05 m; body mass 77.5 ± 6.7 kg) and fourteen females (age 24 ± 5 years; height 1.65 ± 0.05 m; body mass 65.1 ± 0.1 kg), completed MVIF and CSA measurements on two separate occasions (Trial 1 and Trial 2) under the same conditions, less than 7 days apart. Reliability was determined using ratio systematic bias and limits of agreement (rLoA), intra-class correlation (ICC), coefficient of variation (CV) and paired samples t-tests.

Results: MVIF of the FDI muscle was not significantly different between trials (mean ± SD; 31.8 ± 7.6 N vs. 31.6 ± 7.3 N, P=0.63); rLoA between trials were 1.00 x/÷ 1.09, ICC = 0.990 and CV = 3.22%. CSA of the FDI muscle was not significantly different between trials (22.6 ± 6.9 vs. 22.9 ± 6.9 mm^2, P=0.31); rLoA between trials were 0.98 x/÷ 1.19, ICC = 0.979 and CV=6.61%. Force per unit CSA was not significantly different between trials (1.49 ± 0.43 vs. 1.46 ± 0.44 $N \cdot mm^2$; P=0.18); rLoA were 1.02 x/÷ 1.17, ICC = 0.985 and CV = 5.76%.

Conclusions: The techniques used to determine MVIF and CSA of the FDI muscle were reliable and can be combined to calculate force per unit CSA. This technique can be used to assess both acute and longitudinal changes in muscle function between and within populations.