MATERIALS AND METHODS

40 healthy subjects (20 men and 20 women; mean age 23±3 years) were enrolled after giving written informed consent. Subjects performed, on two trials (with a 1-week interval), two elbow flexions: (1) at 20% maximal voluntary contraction (MVC) for 120 s, and (2) at 60% MVC held until exhaustion, interspersed with five minutes of rest. The experimental procedure was randomly conducted on both arms and, in the second session, the order was inverted. sEMG signals were detected from the biceps brachii using bi-dimensional arrays (Figure 1). CV was estimated with a multichannel algorithm on single differential signals (Farina and Merletti, 2003), whereas FD was computed with a numerical algorithm using non-overlapping signal epochs of 1s (Mesin et al 2009). Test-retest reliability was examined for CV and FD slope, using ICC2,1 (Intraclass Correlation Coefficient) and Bland Altman plots.

RESULTS

The ICC value of CV slope during the 20% MVC contraction was negative (Table 1), showing dependence on days and trials larger than dependence on subjects (Rainoldi et al 2001). On the contrary, high levels of reliability were found for CV slope during the 60% MVC contraction (ICC = 0.78). Eventually, moderate to high levels of reliability were identified for FD slope, at 20% and 60% MVC (ICC = 0.67 and 0.82, respectively). Bland & Altman plots are shown in Figure 2.

CONCLUSIONS

Given the fact that at 20% MVC, fatigue is almost absent (Beretta-Piccoli et al 2015), the inter-subject variance for the variables considered was very low, so that the relative reliability of CV became even negative, and the absolute reliability depicted in the Bland & Altman plots (Figure 2) resulted in very narrow clouds. Subsequently, as the 60% MVC contraction was instead fatiguing, as highlighted by much more negative slopes, the relative reliability of CV and FD slopes were higher (ICC = 0.78 and 0.82, respectively). The results suggest therefore that during an isometric fatiguing contraction, CV and FD slopes, are reliable variables, with potential application in clinical populations to evaluate peripheral and central contributions to muscle fatigue.

REFERENCES