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» Journal Abstract

Reliability of knee muscle strength and fatigue measurements

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Different methods for assessing knee muscle strength and fatigue have been developed in recent years, and further methodological research is necessary in order to find feasible methods for use in various population groups. We aimed at investigating the intra- and inter-rater reliability of maximal knee muscle strength and fatigue measurements in healthy subjects. Thirty subjects, 13 men and 17 women, participated in the study. Three repeated assessments with one-week intervals were performed. Maximal isometric torque (Nm) of 5 s and fatigability of knee extensors and flexors during maximal isometric contractions of 30 s were assessed with a knee dynamometer. The reliability of three FATigue Indices (FATI1 ,FATI2 and FATI3) was evaluated. The three fatigue indices are all based on the calculation of the Area Under the Force vs. time Curve (AUFC). In FATI1 the calculation is based on the entire contraction period 0 to 30 s; FATI2 is a modified version of FATI1, where the first 5 s period is omitted from the calculation; and in FATI3 the highest mean value during the period 0–5 s serves as the Time Point of Maximum (TPM) value of the muscle torque. The inter-rater reliability coefficients (Intraclass Correlation Coefficient, ICC) of the isometric extension and flexion torques were 0.97-0.99 and the intra-rater reliability coefficients were 0.97-0.98, respectively. The inter-rater reliability coefficients (ICC) of the fatigability assessments were 0.79-0.87 for FATI1, 0.78-0.80 for FATI2 and 0.80 - 0.88 for FATI3, and the inter-rater reliability coefficients were 0.70-0.84 for FATI1, 0.55-0.56 for FATI2 and 0.73-0.82 for FATI3. The highest level of fatigability was observed in FATI3. Maximal isometric flexion torque correlated with FATI1 in flexion ($r=-0.45$, $p<0.05$) and FATI3 in flexion ($r=-0.46$, $p<0.05$). Isometric torque of knee extensors and flexors can be reliably measured with a knee dynamometer in healthy middle-aged subjects. All fatigue indices were reliable in test-retest assessments, and the indices FATI1 and FATI3 were also reliable in inter-rater assessments.

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