Strenuous concentric and eccentric isokinetic exercises: specific fatigue patterns?

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The aim of this study was to compare the fatigue respectively induced by strenuous concentric and eccentric exercises on the knee flexor and extensor muscles.

Twelve healthy sedentary male subjects (24.3 ± 2.5 years old) underwent two isokinetic sessions of exercises on the dominant leg, using a Cybex-Norm dynamometer. Three series of 12 maximal contractions, at 60°.s\(^{-1}\) velocity, separated by 30-seconds intervals, were proposed for both muscular groups. Through the first session, half of the experimental group performed a concentric (CONC) protocol while the others started with the eccentric (ECC) mode; two weeks later, the other contraction mode was completed by each subject. The isokinetic data analysis focused in particular on the total work parameter.

As expected, the total work cumulated through the 3 preset series was significantly higher for the ECC than for the CONC mode. The difference in fatigue resulting from the contraction mode increased throughout the exercise: a third series/first series CONC work ratio showed values of 0.72 and 0.77 (significant decrease, p<0.001) respectively for quadriceps and hamstrings, while the ECC ratio remained higher than 0.85 for both muscle groups.

In the ECC mode, Q and H behaved differently, with respective ratio of 0.95 (non significant decrease between third and first series) and 0.86 (significant decrease, p<0.001). This finding could suggest that hamstrings fatigue more than quadriceps as a consequence of strenuous ECC exercise. That specific feature could be hypothesized as representing a risk factor of hamstring muscle injury. Such possible role calls for further investigations.