

The effect of elbow flexion speed and partial limb occlusion on EMG activity

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This investigation aimed to determine the neuromuscular response of the bicep brachii during heavy (6RM) dynamic resistance exercise performed to volitional exhaustion. Electromyographic (EMG) activity was compared in twelve male subjects performing dominant-limb elbow flexion exercise during four conditions: i) Explosive concentric and eccentric (SSC); ii) Explosive concentric, control eccentric (EC); iii) control (C); and iv) control with limb occlusion (CO) (110mmHg). CO and SSC are reported to increase motor unit activity when compared to control exercise (2 second flexion, 2 second extension). It was hypothesised that EMG activity will be higher in conditions of explosive exercise. Surface EMG activity was collected (Digitimer, Neurolog NL844, NL820) at 2 kHz and filtered using 500Hz (low-pass) and 10Hz (high-pass) filters (Digitimer, Neurolog NL44, NL135). Root mean square (RMS) significantly increased; SSC=71.0 ± 14.9% (P=0.004), EC=52.8 ± 10.0% (P=0.001), C=44.4 ± 11.1% (P=0.007), CO=33.9 ± 11.1% (P=0.025) and mean power frequency (MPF) significantly decreased; SSC=36.0 ± 4.2Hz (P=0.001), EC=18.0 ± 3.8Hz (P=0.002) C=17.9 ± 3.4Hz (P=0.001), CO=20.3 ± 3.2Hz (P=0.001) from the first to last repetition. The first repetition of SSC exercise displayed significantly higher MPF (17.4 ± 4.0Hz, P= 0.009) compared to C. RMS was significantly different in CO to SSC exercise (34.9 ± 10.5%, P=0.048) at the final repetition. SSC exercise demonstrated the greatest EMG response to exhaustive heavy resistance exercise and is attributed to an increase in motor unit recruitment and discharge rate. The lack of an observed difference between the EC and C exercise suggests eccentric limb speed is important for concentric muscle activation.