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Presentation Abstract

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Title: Reflex inhibition of human biceps brachii decreases with practice of a fatiguing contraction

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Abstract: Some individuals demonstrate a delayed increase in biceps brachii muscle activity and longer time to failure with only three practice sessions of a sustained submaximal contraction. A potential mechanism for the slower rate of activation of the biceps brachii motor unit pools is a reduction in inhibitory sensory feedback. The purpose of the study was to examine the influence of practice on time to failure of a submaximal contraction with the elbow flexor muscles and on reflex inhibition from brachioradialis afferents onto biceps brachii motor neurons. Fifteen subjects practiced sustaining an isometric contraction (20% of maximum voluntary contraction [MVC] force) with the elbow flexors until failure. Spike-triggered stimulation was used to assess the influence of radial nerve stimulation on the discharge of 118 single motor units in biceps brachii before and after three practice sessions. Time to failure for the sustained contractions increased from 760 ± 333 s in Session 1 to 1103 ± 415 s in Session 3 ($P < 0.03$), and was accompanied by a slower rate of increase in electromyographic (EMG) activity of the short head of biceps brachii ($P < 0.05$). Stimulation of the radial nerve prolonged the interspike interval of single motor units before practice ($n = 56$; 7.2 ± 6.8 ms; $P < 0.001$), and this effect was reduced after practice ($n = 62$; 2.3 ± 3.6 ms; $P < 0.01$). The reduction was greater for motor units recorded from the short head of biceps brachii than those in the long head ($P < 0.05$), and was associated with the slower rate of increase in EMG ($r = 0.57$, $P = 0.03$). Furthermore, the decrease in reflex inhibition in the short head of biceps brachii was the main predictor of the increase in time to failure ($r2 = 0.60$, $P = 0.001$). These results demonstrate that practice reduced the inhibition from brachioradialis afferents onto biceps brachii motor units and enabled the participants to sustain the submaximal elbow flexor contraction for a longer duration.

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