Surface-distributed low-frequency asynchronous stimulation delays fatigue of stimulated muscles

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References:

Abstract:
Introduction: One important reason why functional electrical stimulation (FES) has not gained widespread clinical use is the limitation imposed by rapid muscle fatigue due to non-physiological activation of the stimulated muscles. We aimed to show that asynchronous low-pulse-rate (LPR) electrical stimulation applied by multipad surface electrodes greatly postpones the occurrence of muscle fatigue compared with conventional stimulation (high pulse rate, HPR). Methods: We compared the produced force vs. time of the forearm muscles responsible for finger flexion in 2 stimulation protocols, LPR (fL510 HZ) and HPR (fH540 HZ). RESULTS: Surface-distributed low-frequency asynchronous stimulation (sDLFAS) doubles the time interval before the onset of fatigue (104680%) compared with conventional synchronous stimulation. Conclusions: Combining the performance of multipad electrodes (increased selectivity and facilitated positioning) with sDLFAS (decreased fatigue) can improve many FES applications in both the lower and upper extremities.

Keywords:
functional electrical stimulation; grasp; multipad electrodes;