

## Liste-78

### **RE-CONDITIONING OF PARETIC WRIST EXTENSOR MUSCLES BY FUNCTIONAL ELECTRICAL STIMULATION IN TETRAPLEGIC INDIVIDUALS - CONTRACTILE AND METABOLIC PROPERTIES.**

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Purpose: Two different conditioning protocols, high resistance type (Hr) vs. low resistance type (Lr), in 12 C5/6 tetraplegics were evaluated.

Methods: The stimulation was performed 30 min. per day, 5 day a week for 12 weeks, and involved dynamic loaded contractions. The Hr-regimen employed a frequency of 30 Hz and the duty circle was fixed to 5 sec on / 20 sec off. The Lr-regimen employed a frequency of 15 Hz and the duty circle was gradually changed from 5/20 to 5/5 sec. The non-trained arm was used as an internal control. Before and after training, maximal voluntary contraction (MVC), as well as electrically stimulated peak tetanic tensions at 15, 30 and 50 Hz (Po15, Po30 and Po50), and fatigue resistance (FR) were measured. The metabolism of the paretic muscle were evaluated by use of <sup>31</sup>P phosphorus nuclear magnetic resonance spectroscopy, (<sup>31</sup>P-NMRS). This method evaluates the relative amount of phosphorus metabolites in the in vivo situation during electrically induced contractions, for example the phosphocreatine, (PCr), and the ATP.

Results: FR improved with 42% and 41% (Student t-test,  $p < 0.01$ , for both groups) in response to training, in the Hr-group and Lr-group. In the Hr-group, Po15 the cumulated Po50+Po30+Po15 and MVC improved significantly with 19%, 18% and 34% ( $p < 0.05$ ), respectively. During, 40 sec of maximal stimulation at 10 Hz, in the magnet, the time tension integral tended to improve in the Hr-group and the anaerobic ATP-production rates decreased with 29% ( $p < 0.05$ ). The contractile efficiency, i.e. ATP consumption divided by the time tension integral, improved after training in the Hr-group with 38% ( $p < 0.05$ ) and the half-time of PCr recovery was shortened with of 52% ( $p < 0.05$ ). In contrast no changes in strength or <sup>31</sup>P-NMRS figures were observed in the Lr-group after training.

Conclusion: Increased FR of the paretic wrist extensor muscles in tetraplegic individuals was demonstrated with both protocols. However, only the Hr-group was able to demonstrate increased muscle force and improved muscle metabolism after training, indicating that the Hr-protocol is superior to the Lr-protocol for conditioning of paretic muscles.