**Title:** **An acute session of high-frequency, low-intensity, wide-pulse electrical stimulation evokes fatigue adaptations in an intrinsic foot muscle**

1James DC, 1Mileva KN and 2Solan MC

1Sport & Exercise Science Research Centre, School of Applied Sciences, London South Bank University, UK.

2Department of Trauma and Orthopaedic Surgery, Royal Surrey County Hospital, Guildford, Surrey, UK.

**Background:** Compromised intrinsic foot muscle strength and tonic control underlie a variety of common over-use injuries associated with the foot and ankle complex. The abductor hallucis (AH) muscle plays an important role in the support of the longitudinal arch. Due to its superficial location, neuromuscular electrical stimulation represents a viable option as a strengthening modality.

**Objective:** To investigate the effects of an acute session of high-frequency, low-intensity wide-pulse electrical stimulation (WPS) applied to AH on peripheral muscle excitability and contractility.

**Design:** Within-day**-**repeated-measures design comprising a WPS intervention session.

**Setting:** Laboratory.

**Participants:** Nine healthy male volunteers free from any orthopaedic, neurological or vascular pathology identified as exclusion criteria.

**Intervention:** Participants received 24 x 15-sec of 2-sec alternating WPS (20Hz-100Hz-20Hz), interspersed with 45-sec rest, to the motor point area of their right AH. Square wave (1-msec) pulses (400 V) were delivered (constant current) at a stimulation intensity of 150% motor threshold.

**Main Outcome Measurements:** Medial plantar nerve stimulation at 130% maximal Mwave (Mmax130) was performed at PRE, POST and 30 minutes after (RET) WPS. Dependent variables were: latency (msec), peak amplitude (mV), area (mV•s-1) and duration (a.u; Mmax130area/P-P Mmax130) of Mmax130; and electromechanical delay (EMD; msec), peak (pTw; N) and half relaxation time (HRT; msec) of the evoked twitch force.

**Results:** At POST, an increased latency (p<0.01), area (p<0.05) and duration (p<0.0001) were observed in Mmax130. Latency and duration were still significantly elevated at RET (p<0.01 & p<0.0001, respectively). Also, HRT was significantly increased at POST (p<0.01) and RET (p<0.05).

**Conclusions:** In healthy persons, an acute intervention of WPS induces lasting peripheral fatigue in AH muscle, which is required for gains in muscle strength in response to training. The clinical implication of our findings is that WPS appears to be a worthwhile rehabilitation modality for persons with suboptimal neuromuscular foot function.