

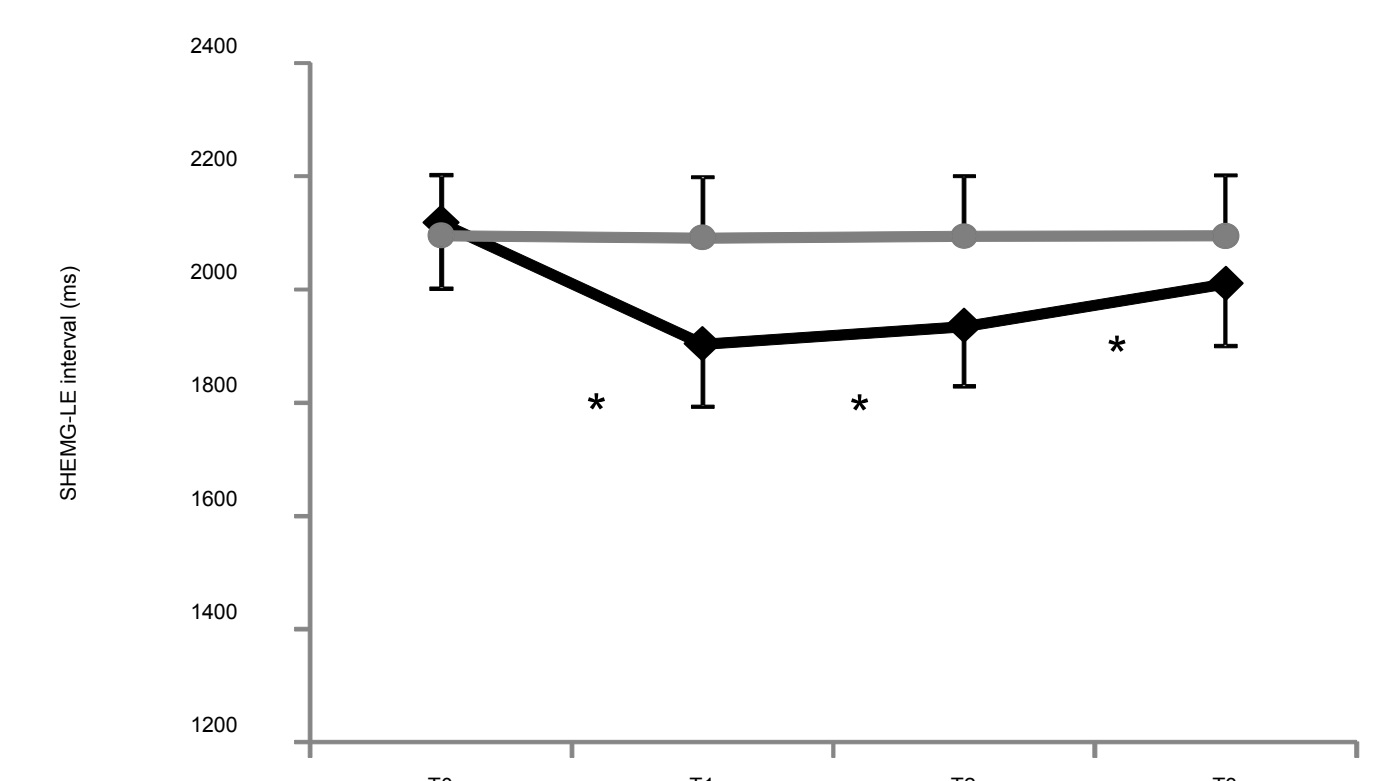
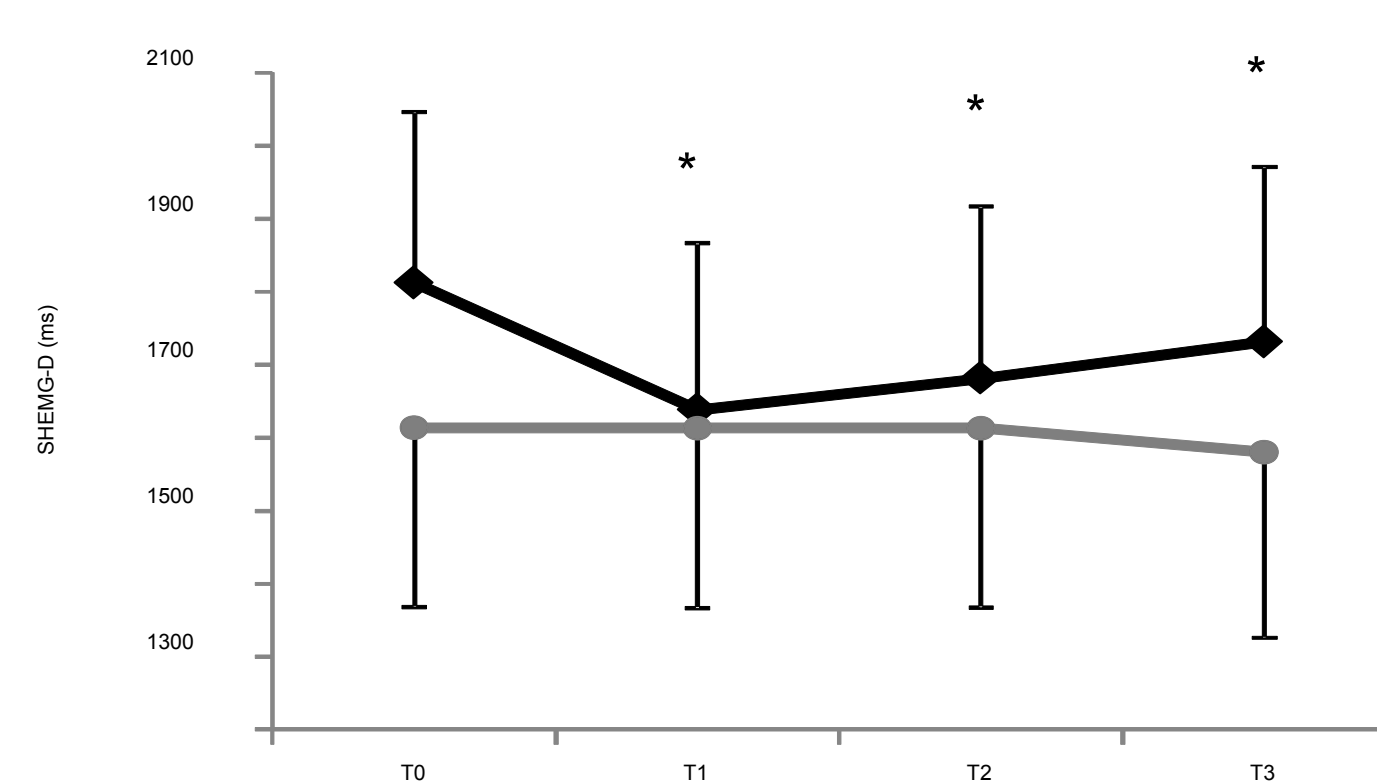
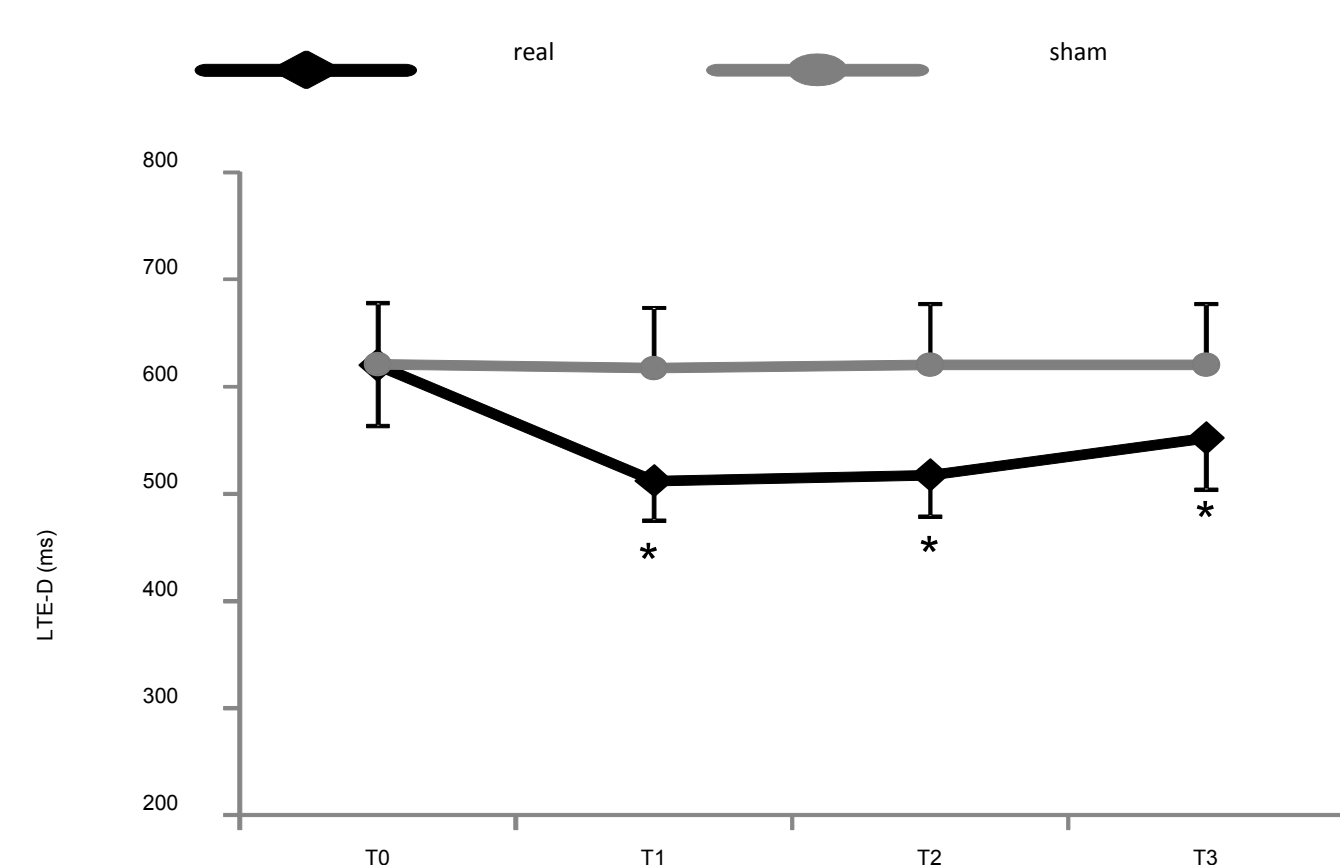
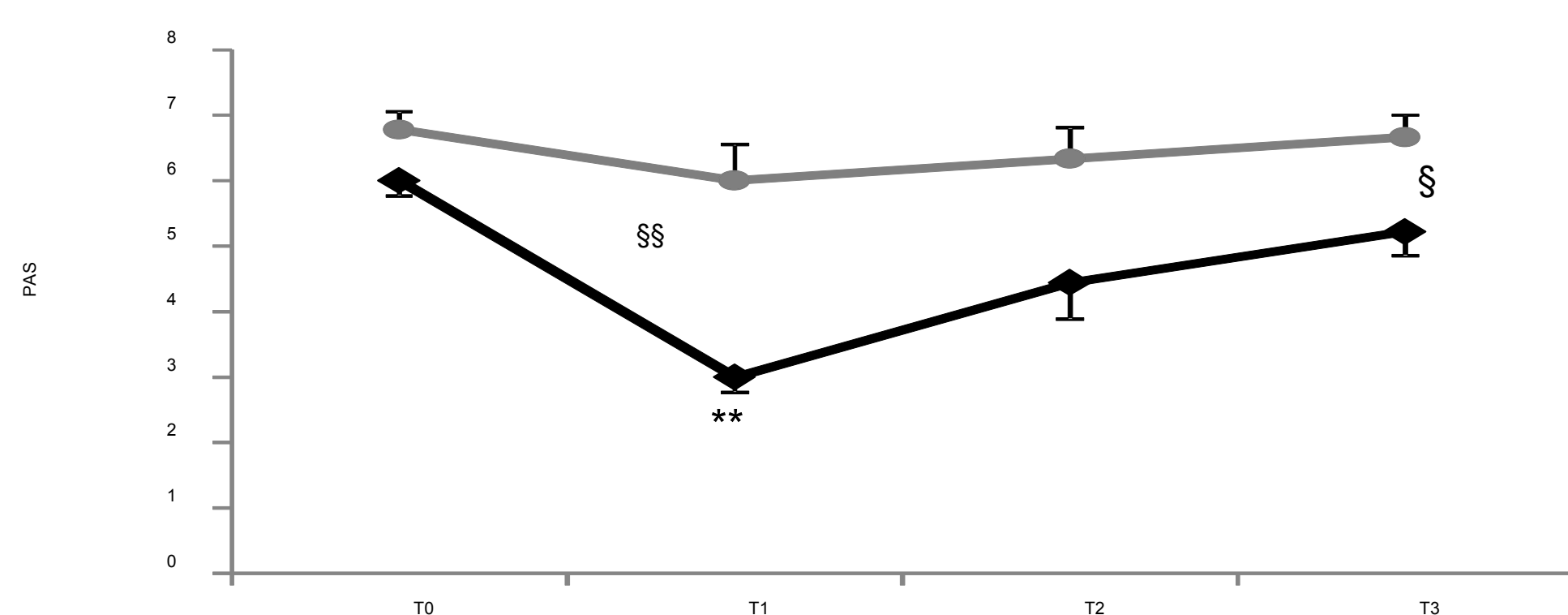
# TRANSCRANIAL DIRECT CURRENT STIMULATION (TCS) FOR DYSPHAGIA ASSOCIATED TO MULTIPLE SCLEROSIS

**Domenico A. Restivo, MD, PhD; Mario Stampanoni Bassi, MD<sup>Sx</sup>; Diego Centonze, MD<sup>S</sup>; Francesca Matta, MD; Antonino Pavone, MD**

**U.O. di Neurologia, Dipartimento di Medicina Interna, P.O. "Nuovo Garibaldi", Catania; <sup>S</sup>U.O. di Neurologia, IRCCS "Neuromed", Pozzilli (IS); <sup>Sx</sup>Dipartimento di Scienze Neurologiche, Università "Tor Vergata", Roma**

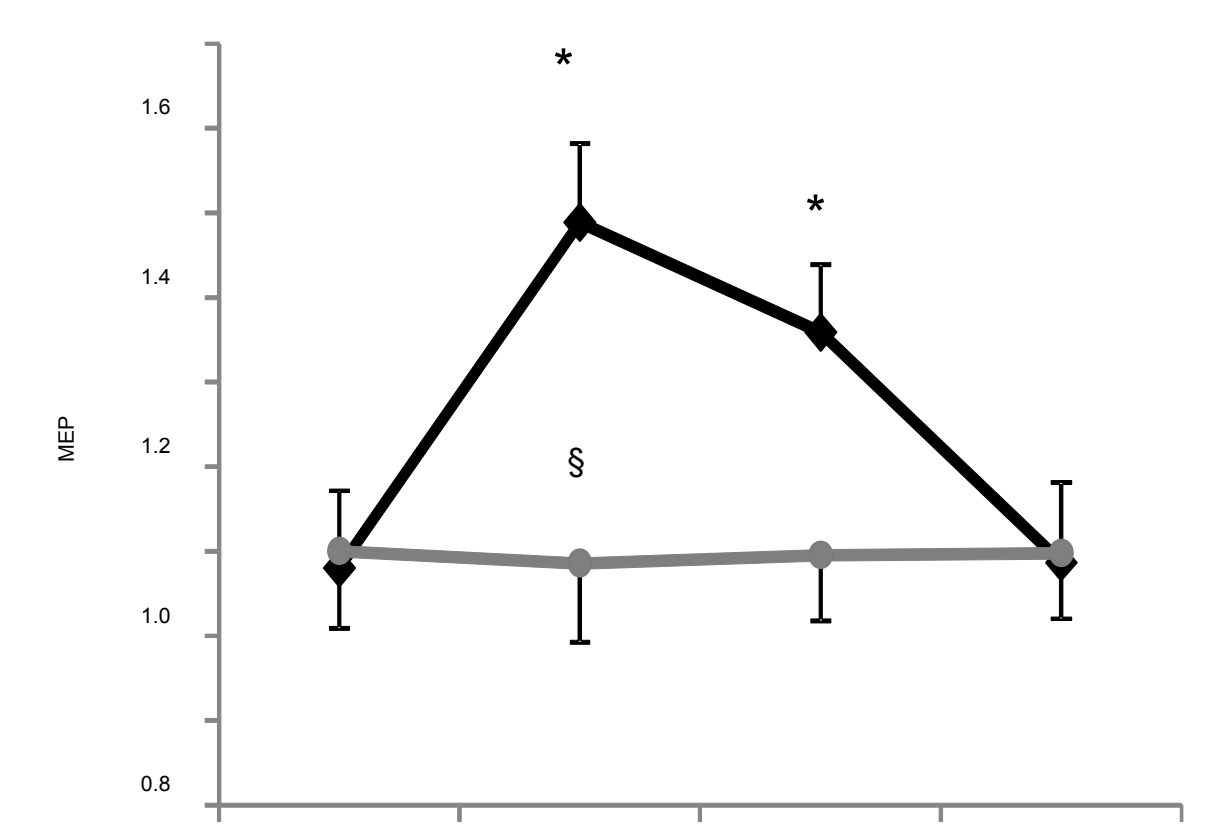
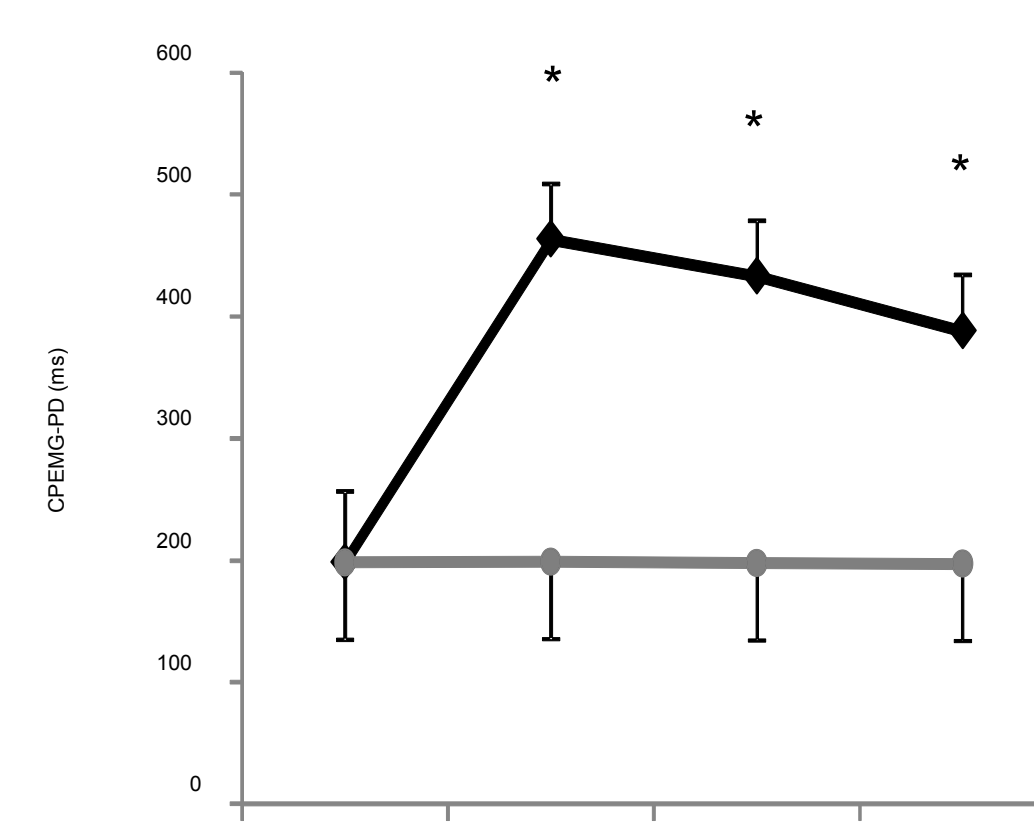
**Introduction:** Dysphagia is a very severe and life-threatening complication of MS. Its real prevalence in MS can be attested around 30-40% (Prosiegel et al., 1999). Furthermore, the aspiration pneumoniae due to dysphagia is the leading cause of death in patients with MS. No specific pharmacological treatment has been reported for swallowing disorders associated with MS, up to now. Recently, we demonstrated that intraluminal pharyngeal electrical stimulation (PS) can improve both MS-associated dysphagia and aspiration probably by increasing cortico-bulbar excitability at pharyngeal level (Restivo et al., 2013). However, Although non-invasive, intraluminal PS can result uncomfortable and it is not well tolerated by some patients. Recently, the effects of tDCS on cortical swallowing areas have been investigated in healthy subjects. we investigated whether anodal transcranial direct current stimulation (tDCS) over the pharyngeal motor area improves MS-associated dysphagia.

**Patients and Methods** Eighteen MS patients with dysphagia associated with brainstem lesion evaluated by MRI, were randomized to receive "real" or "sham" tDCS over the pharyngeal motor cortex. The motor cortex was stimulated by a figure of 8 magnetic coil connected to the magnetic Recordings were carried out by concentric needle electrodes from the contralateral CP muscle. The pharyngeal MEP amplitude was measured peak-to-peak. The hemisphere displaying the motor evoked response with the maximal amplitude was considered for cortical MEP evaluation. **Primary outcome:** The *Penetration/Aspiration Scale* (PAS). **Secondary outcomes:** the cortico-pharyngeal MEP amplitude and the following electromyographic measures were analysed: 1) duration of laryngeal transducer excursion (LTE-D); 2) duration of the EMG activity of suprahyoid/submental (SHEMG-D) muscles; 3) duration of the inhibition of the CP muscle, i.e. pause duration of EMG activity of CP muscle (CPEMG-PD), during the pharyngeal phase of swallowing; and 4) interval between onset of EMG activity of suprahyoid/submental muscles and onset of the laryngeal elevation (SHEMG-LE interval). Patients were evaluated before (T<sub>0</sub>), immediately after the last session (T<sub>1</sub>), after two (T<sub>2</sub>), and four (T<sub>3</sub>) weeks of 5 consecutive single day sessions of stimulation. **Results:** **Primary outcome:** Over the post-stimulation periods the "sham" groups maintained the mean values of the primary outcome observed at baseline (T<sub>0</sub>). For the "real" group the differences between the baseline and each of the post-stimulation periods were statistically significant: the comparison with T<sub>0</sub> showed a reduction of the PAS value at T<sub>1</sub> (P = 0.007), T<sub>2</sub> (P = 0.042), and T<sub>3</sub> (P = 0.034). **Secondary outcomes:** The differences between the two groups at each post-stimulation time were significant only for the CPEMG-PD and the MEP amplitude: the CPEMG-PD measured in the "real" group increased with respect the "sham" group at T<sub>1</sub> (P = 0.019) and T<sub>2</sub> (P = 0.015); the MT significantly increased as compared to "sham" at T<sub>1</sub> (P = 0.011), T<sub>2</sub> (P = 0.019) and T<sub>3</sub> (P = 0.034). The comparison between baseline and each of the post-stimulation time showed significant differences only of the "real" group across all the secondary parameter



## References

- Prosiegel M et al. J Neurol 1999;246: 277-82
- Bergamaschi R et al. J Neurol Sci 2008;269:49-53
- Restivo et al., Eur J Neurol 2006
- Restivo et al., Neurology 2013
- Restivo et al., Brain Stim 2013; 6(3):418-423
- Jefferson et al., Am J Physiol Gastrointest Liver Physiol 2009;297:G1035-1040



**Conclusions:** Our preliminary findings suggest a potential benefit of anodal tDCS over pharyngeal motor cortex for the treatment of MS-associated dysphagia.