Tongue Motor Training – Behavioral and Neurophysiological Aspects

M. Kothari[1,2], P. Svensson[1,3], J. Jensen[2], A. Kjaersgaard[2], L. Baad-Hansen[1], and Jørgen Feldbæk Nielsen[2]

[1] Section of Clinical Oral Physiology, Department of Dentistry, Aarhus University, Aarhus, Denmark
[2] Hammel Neurocenter and Rehabilitation Center, Hammel, Denmark
[3] MIND Lab, Center for Functionally Integrative Neuroscience, Aarhus University Hospital, Aarhus, Denmark

The purpose of this overall project was to elucidate the influence of different tongue training paradigms on behavioral motor learning and cortical plasticity.

Study I

In this study, the improvement of training success during 2 training paradigms – Tongue Protrusion Task (TPT; 1N and 3N force levels) and the Tongue Drive System (TDS) were investigated in 16 healthy participants. Subject-based reports of motivation, fun, pain and fatigue between the 2 paradigms were also compared. Performance improved during training in all sessions. The mean relative increase in success was highest in TDS. Training with the TDS was rated as more fun, less painful, less fatiguing, and more motivating compared with TPT. In conclusion, force level and complexity of tongue training influences behavioral aspects of tongue motor learning.

Study II

The primary aim of this study was to investigate the effect of different training types and secondary to test gender differences on the training-related cortical plasticity induced by three different tongue training paradigms: 1. Therapeutic tongue exercises (TTE), 2. Playing computer games with the tongue using TDS and 3. TPT. 48 participants were randomized into 3 groups with 1 h of TTE, TDS, or TPT. Stimulus–response curves of motor evoked potentials (MEPs) and motor cortex mapping for tongue muscles and first dorsal interosseous (FDI; control) were established using transcranial magnetic stimulation (TMS) at three time-points: (1) before tongue training, (2) immediately after training, (3) 1 h after training. Subject-based reports of motivation, fun, pain and fatigue were

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evaluated. The resting motor thresholds of tongue MEPs were lowered by training with TDS and TPT but not by TTE. Tongue MEP amplitudes increased after training with TDS and TPT but not with TTE. Men had higher MEPs than women in the TDS group. No significant effect of tongue training on FDI MEPs was observed. The tongue cortical motor map areas were not significantly increased by training. Training with TDS was most motivating and fun and TTE was rated most painful. These findings suggest a differential effect of tongue training paradigms on training-induced cortical plasticity and subject-based scores of fun, motivation and pain in healthy subjects.

Study III

This study aimed to investigate the influence of tongue-disability, age and gender on motor performance using the TDS. In s*tudy IIIa*, eleven tongue-disabled patients and 11 age and sex-matched controls participated and in *study IIIb*, 16 healthy elderly and 16 healthy young participants volunteered for 30 min and 40 min tongue training with TDS respectively. In *study IIIa*, tongue-disabled patients performed poorer than healthy controls and men performed better than women. In *study IIIb*, healthy young participants performed better than healthy elderly but there was no effect of gender. In both studies, performance improved over time. Tongue disability, gender and age had an effect on the outcome of motor performance and learning.

References

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