THE EFFECT OF CHANGING NECK SENSORY INPUT ON NEURAL PLASTICITY AND SENSORIMOTOR INTEGRATION FOLLOWING MOTOR SKILL ACQUISITION

Victoria Berkers, Mahboobeh Zabihhosseinian, Bernadette Murphy

Faculty of Health Sciences, University of Ontario Institute of Technology, Oshawa, ON, Canada

INTRODUCTION

- With growing use of technology, such as laptops and cell phones, the neck is often bent forward with increased likelihood of cervical extensor muscle (CEM) fatigue.
- CEM fatigue leads to decreased awareness of the position of the upper limbs in 3D space.
- Individuals with subclinical neck pain have an altered response in a part of the brain, called the cerebellum (CB), when learning new motor skills.
- This suggests that altered sensory feedback from the neck, due to pain or fatigue, may change CB- primary motor cortex (M1) interactions.
- Neuroplasticity refers to the ability of neurons to change the way they respond to different inputs.
- Transcranial Magnetic Stimulation (TMS) is a technique that involves noninvasive stimulation of the neurons in the brain.
- Different techniques can be used to study either activation or inhibition.
- TMS is used over M1 to activate efferent neurons, producing a motor-evoked potential (MEP) which can be recorded using electromyography electrodes located over the target muscle.
- Cerebellar inhibition (CBI) can be used to measure changes in inhibition in the pathway between the CB and M1.
- The technique involves TMS application over the ipsilateral cerebellum to 8 ms prior to the application of TMS over the contralateral M1.
- Results in reduction in peak to peak amplitude of the MEP.
- Further research is needed to determine if CEM fatigue affects upper limb sensorimotor integration similarly to neck pain.

OBJECTIVE

I. To determine if CEM fatigue influences excitation of the CB-M1 pathway for the first dorsal interosseous (FDI) hand muscle.
II. To understand if the ability to learn an upper limb motor tracing task can be affected by CEM fatigue.

METHODS

- Subjects: 16 healthy, right-handed participants between the ages of 18-30 years.
- The Edinburgh Handedness Inventory (EHI) Questionnaire was used to determine right hand dominance.
- Participants were randomly divided into either a control group or a CEM fatigue group.
- CEM fatigue group: 4 female, 4 male.
- Control group: 4 female, 4 male.

RESULTS

- Greater disinhibition was shown at CBI50 versus CBI10+10% (P < 0.008) and at CBI50+5% versus CBI10+10% (P < 0.009).
- No significant difference in cerebellar inhibition between the control and fatigue condition groups.

REFERENCES