Chair of Human Movement Science
Department of Sport and Health Sciences
Technical University of Munich

TUM

Thesis

Neurophysiological Changes and Their Effects on Motor Learning Ability Following Soccer Heading

Background

In recent years, there has been growing concern around the aspect of heading in the game of soccer and its potentially deleterious effects on brain health. While evidence of long-term consequences, to this date, remains insufficient, routine soccer heading has been shown to result in acute neurophysiological changes, as observed by using single pulse transcranial magnetic stimulation (TMS). Although the observed increase in corticomotor inhibition may be reflective of heading-induced disturbances within the motor pathway, these alterations need to be interpreted in the context of other behavioral data, such as subjects' ability to learn a motor task. However, this potential link between a prolonged period of corticomotor inhibition following soccer heading and motor learning has not been investigated yet.

Objective

The main objective of this project is to further elucidate the acute neurophysiological effects of soccer heading and, more specifically, investigate a potential relationship between changes in corticomotor inhibition and motor learning ability. Possible research questions may focus on the nature of the motor task (simple vs. complex; implicit vs. explicit) or different phases of the motor learning process (online vs. offline).

Methods

Transcranial Magnetic Stimulation (TMS)

Electromyography (EMG)

Motor Learning Task (e.g. SRTT)

Contact
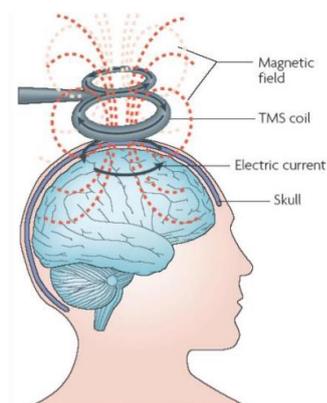
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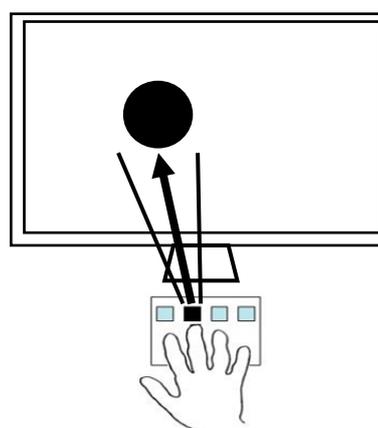
Fig. 1: Transcranial magnetic stimulation (TMS).

Fig. 2: Serial reaction time task (SRTT).

Literature

Di Virgilio, T. G., et al. (2016). Evidence for Acute Electrophysiological and Cognitive Changes Following Routine Soccer Heading. *EBioMedicine, 13,* 66-71.

Cantarero, G., et al. (2020). Repeated Concussions Impair Behavioral and Neurophysiological Changes in the Motor Learning System. *Neurorehabilitation and Neural Repair (34)* 9, 804-813.