

Acute Impact of an Extremely Low Frequency Magnetic Stimulus on Human Neurophysiological Function - Magnetophosphene perception

Background: Magnetophosphenes are classified as colourless, flickering lights that are perceived with closed eyes in the dark, and upon exposure to a magnetic field (MF). Uncertainties exist involving the MF threshold for magnetophosphene perception.

Methods: Forty subjects will be enrolled in this experiment aiming to provide a frequency-response curve of magnetophosphene perception under MF exposure. Subjects will sit in a whole head MF exposure device wearing a 64-channel MRI-compatible EEG cap. Subjects will be exposed to a MF with a frequency of 5-300 Hz, in the form of an increasing flux density ramp (increasing magnetic field flux density from 0-100 mT), until phosphene perception is achieved. A button press will indicate the threshold of magnetophosphene perception. Experimental outcomes will be compared using standard repeated within-subjects ANOVAs with a between-subject factor.

Results: EEG data will be continuously recorded and a time series analysis in the time and frequency domains will be performed on the three occipital electrodes (O1, O2, Oz) for each frequency condition. The expected results will provide a frequency response curve for magnetophosphene perception upon exposure to a MF of frequencies ranging from 5-300 Hz.

Discussion & Conclusion: We hypothesize that retinal rod cells are responsible for this phenomenon, however, it is possible that perception of coloured phosphenes at higher frequencies indicates cone activation.

Interdisciplinary Reflection: This research is crucial in allowing for the refinement of international guidelines to protect workers and the public from MF adverse effects, and it will offer the potential for diagnostic and therapeutic applications.