FUNCTIONAL MAGNETIC RESONANCE IMAGING OF THE EFFECTS OF A 60 HZ MAGNETIC FIELD ON HUMAN CORTICAL ACTIVITY DURING A MENTAL ROTATION TASK

It has previously been demonstrated that Extremely Low Frequency (ELF) magnetic fields (MF) can modulate human neurophysiology. In this study Functional Magnetic Resonance Imaging (fMRI) was used to determine the effect of exposure to an ELF MF on brain regions involved in a mental rotation task.

For this task each subject was asked to compare two 3-dimensional objects which were either identical or mirror images, rotated by a certain amount of degrees in the x and y direction. Subjects had to determine if these objects were the same or different. Upon completion of this task subjects were either exposed to a 60 minute 60 Hz, 3000 μT MF or to a 60 minute sham condition, after which they completed a post-exposure mental rotation task. Functional images were analyzed to determine if there were any differences between pre- and post-exposure brain activation using BrainVoyager QX2.0.8.1480.

Significant interactions were found between sham and real exposure groups between the pre- and post- exposure activation in the intraparietal sulcus and Brodmann Area 19, regions associated with visual attention and visual processing. There was post-exposure activation in Brodmann Area 19 in the sham group as compared to the real exposure group was significant ($F = 7.426$, $p < 0.05$, $df = 1, 7$). A post-exposure decrease in activation in the intraparietal sulcus was associated with MF exposure in the real exposure group ($F = 6.676$, $p < 0.05$, $df = 1, 7$).

These results demonstrate that a 60-minute exposure to an ELF MF may affect visual attention and visual processing during the mental rotation task. Furthermore, fMRI shows promise as a valuable tool for observing the effects of ELF MF exposure on certain brain processes such as those associated with a mental rotation task.