MOBILE TELEPHONES, SLEEP AND COGNITIVE PERFORMANCE

We have good evidence to belief that pulsed electromagnetic fields (EMF) as used for mobile telecommunications are able to interact with the waking and sleep electroencephalogram (EEG; Huber et al., 2003). We know that these interactions can outlast the exposure and seem to be dependent on the pulsed nature of the exposure. Other, repetitive stimulations, e.g. visual checkerboard or simple tones, may also lead to long-lasting changes in brain activity, i.e. induce cortical plasticity (Clapp et al., 2005; Teyler et al., 2005). Hence, the question arises whether the pulsed EMF used for mobile telecommunication is able to induce such long-lasting changes? Indeed, a recent paper shows that mobile telephones operating in the GSM frequency range affect cortical responsiveness (Ferreri et al., 2006) –initial evidence for the induction of cortical plasticity, which presumably represents the basic mechanism of learning and memory.

There is increasing evidence of a close relationship between learning and sleep. For example, the performance in numerous learning paradigms seems to benefit from sleep (Born et al., 2006). Thus, a major goal of our project is to investigate whether the EMF-induced changes in the sleep EEG are capable to interact with sleep-dependent learning processes. In other words, we will investigate whether reports of EMF exposure-related memory performance benefits e.g. Koivisto et al., 2000; and the EMF exposure-associated changes in the sleep EEG may share a common mechanism.

Children and adolescents show increased sleep need (Jenni and Carskadon, 2004). At the same time numerous studies show an increased potential for cortical plasticity in children and adolescents. Together with the increasing concern that children and adolescents are more vulnerable to GSM EMF we have been provided with a conclusive rational to conduct our experiment in adolescents.

In summary, our project explores mechanisms of how EMF pulses affect cortical activity during sleep and how this change might be translated into changes in cognitive performance.

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