

Neurophysiology of Acute Mobile Phone Exposure and its Relevance to Occupational Health & Safety

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Introduction

The issue of mobile phone-related health effects has been prominent in both community and occupational forums in recent years. Corresponding to this there has been considerable research conducted to determine whether acute exposure to mobile radio technologies affects human neurophysiology such as performance, sleep and awake electroencephalography (EEG). This has resulted in a number of reports of adverse health effects, with the majority of these not standing up to the test of replication. For example, Koivisto et al (2000) reported effects on working memory, and in particular the 'n-back' task. Koivisto et al originally reported improved reaction time on the most difficult version of the n-back (3-back), but these results were not replicated (Haarala et al 2003; Krause et al 2007).

However, there have been some replicated findings that suggest the possibility that mobile phones (MPs) affect human neurophysiology. For example, sleep electroencephalography (EEG) has been reported to be affected by mobile phone exposure prior to sleep (Huber et al, 2000). Huber et al's increase in 11.5-12.25 Hz spectral power in the first non-REM period of sleep was replicated by Loughran et al (2005), with the same result subsequently found using a subset of the same participants who participated in Loughran et al (2005) (Croft et al, 2008a). Similarly, although early reports were inclusive in relation to possible effects of mobile phone exposure on the awake resting EEG, there have recently been strong replications of increases in this band (8-12 Hz) by Curcio et al (2005) and Croft et al (2008b).

Whether such effects are relevant to occupational health however, remains to be evaluated. The purpose of the present presentation is to provide a summary of human neurophysiology research, and to interpret this in relation to occupational health and safety issues. To this end, research assessing potential effects of mobile phones on human neurophysiology are summarised. These include those pertaining to performance (reaction time and accuracy), sleep (EEG and sleep quality), awake spontaneous EEG, awake event-related EEG, and awake event-related potentials. Interpretations of these findings are then presented in light of occupational health and safety issues. It should be noted that this presentation will not separate the literature based on differences between occupational and non-occupation exposure limits, but will rather look at research pertaining to different limits as a whole, and consider whether this literature provides any evidence of health and safety issues relevant to occupational hygiene.

It is argued that the only mobile phone-related bioeffects that stand up to replication are the reports of changes to sleep and awake spontaneous EEG (within the 11.5-12.25 Hz and 8-12 Hz bands respectively). The functional consequences of these changes are discussed in terms of possible effects on cognition and health. The presentation argues that these findings are of great interest academically, but that there is no evidence that these effects represent important considerations for occupational health and safety issues. Specifically, there is currently no evidence that these effects relate to important changes to cognitive performance, nor to adverse health effects.

References

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