

Wi-Fi alters brain activity in young adults

Two new studies^{1, 2} have found that electromagnetic fields from Wi-Fi transmitters can alter electrical brain activity and decrease a measure of attention in young adults when performing a memory task. These are the first reports to look at the effects of Wi-Fi on brain function.

Previously, changes in learning and memory, reaction times and altered EEG brain activity have been associated with exposures to mobile phones and other microwave electromagnetic fields. These new results show that Wi-Fi can also have a detrimental effect on attention and mental activity, as well as potentially affecting brain development in children and young people (which is dependent upon electrical brain activity).

The attractiveness of Wi-Fi as a learning tool in schools is significantly decreased if it could be damaging the cognitive abilities and brain development of pupils.

1. Papageorgiou and colleagues published in the Journal of Integrative Neuroscience in June 2011 that Wi-Fi signals decrease a measure of attention in young men whilst using their working memory. Working memory is keeping information readily available in the brain, to be used whilst carrying out a task. It is used in activities such as problem solving, decision making, planning, reasoning and monitoring.

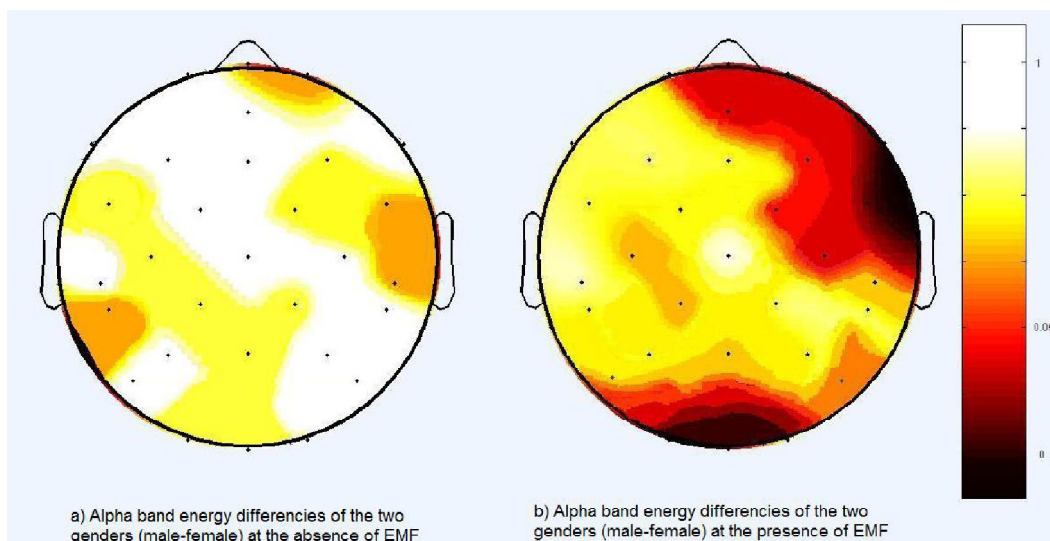
The group measured electrical activity on the surface of the brain of young men and women in their early 20s whilst performing a task designed to stimulate working memory. They used a version of the Hayling Sentence Completion test. At a set point after hearing the sentence, a peak voltage was recorded on the scalp, called the P300 (part of an event-related potential). P300 amplitude is thought to be an index of mental activity and attention. The amplitude of the P300 peaks were greatly decreased in the young men and slightly increased in the young women when a Wi-Fi access point, positioned 1.5m away, was switched on. In the presence of a Wi-Fi signal the men's p300s were significantly lower than the women's. Exposures were carried out blind, meaning that the participants did not know whether the Wi-Fi was on or not. Microwave electrical fields were 0.49V/m at head position (2.4GHz), well within the range of exposures experienced by someone using a Wi-Fi-enabled device such as a wireless laptop or tablet computer.

1. Papageorgiou C. C., Hountala C. D., Maganioti a. E., Kyprianou M. A., Rabavilas A. D., Papadimitriou G. N., Capsalis C. N. 2011. Effects of Wi-Fi signals on the p300 component of event-related potentials during an auditory hayling task. Journal of Integrative Neuroscience 10(2):189–202.
<http://www.ncbi.nlm.nih.gov/pubmed/21714138>

2. Maganioti and colleagues (2010) found that Wi-Fi signals significantly decreased EEG electrical activity (alpha and beta frequencies) in cortical brain areas of young women whilst they were performing a short memory task (Wechslet test). EEG signals, measured with electrodes on the scalp, contain a range of activity frequencies which are divided into the bands delta (0-4Hz), theta (5-7Hz), alpha (8-13Hz) and beta (14-30Hz). In the Wechslet test the subjects repeated a series of numbers, either in the same or opposite orders to the ones presented. This study found that the EEG activities of young women were changed, but men were not affected.

Wi-Fi signals were as described in study 1: 1.5m from a Wi-Fi access point; microwave electric fields of 0.49V/m (2.4GHz); carried out under blind conditions, so that the participants were not aware of when the Wi-Fi was switched on or off.

Altering the brain activity of children and young people by the presence of a Wi-Fi signal for prolonged periods of time may affect brain development.



p-values of the differences in head EEG electrical activity between male and female subjects in the absence and presence of the Wi-Fi signal. 0.05 and below represents a significant difference. Taken from Maganioti *et al* 2010.

2. Maganioti A. E., Papageorgiou C. C., Hountala C. D., Kyprianou M. A., Rabavilas A. D., Papadimitriou G. N., Capsalis C. N.. 2010. Wi-Fi electromagnetic fields exert gender related alterations on EEG. 6th International Workshop on Biological Effects of Electromagnetic fields.

<http://www.istanbul.edu.tr/6internatwshopbioeffemf/cd/pdf/poster/Wi-Fi-%20ELECTROMAGNETIC%20FIELDS%20EXERT%20GENDER.pdf>

Wi-Fi exposes users to lower electromagnetic field strengths than mobile phones do. But the studies described above demonstrate that signals from Wi-Fi transmitters are still able to influence normal human physiology, with changes in gender-related brain activity.

Wi-Fi-enabled laptops have previously been found to damage human sperm DNA and decrease sperm motility³. A Wi-Fi router was shown to stimulate irregular and fast heart rates in some people⁴ (unpublished), as has been reported for DECT cordless telephones⁵.

3. Avendano C. *et al.*, 2010. American Society for Reproductive Medicine 66th Annual Meeting: O-249.

<http://wifiiinschools.org.uk/resources/laptops+and+sperm.pdf>

4. Havas 2010. www.youtube.com/safeschool#p/u/3/KN7VetsCR21

5. Havas M. *et al.*, 2010. European Journal of Oncology Library Vol. 5: 273-300.

<http://www.icems.eu/papers.htm?f=/c/a/2009/12/15/MNHJ1B49KH.DTL> part 2.