The day my brain was turned off by a magnet

By Roger Highfield
(Filed: 22/01/2005)

Snap! As the machine fires the first magnetic pulse, my scalp feels like it is being pinched and puckered.

After rotating a knob on a box of electronics, Prof John Rothwell holds a giant black key against my head once again. Crack! Now it feels like someone is tapping my forehead with a pen. From the inside. Curious.

Snap! Snap! Nothing happens. "I was stimulating your brain," he says.

Another twiddle. Snap, snap, snap! My arm becomes possessed. It twitches and jerks with each flick of the switch. Prof Rothwell is satisfied. He is ready to boost my brain by zapping my temporal lobe with bursts of magnetic energy.

Roger Highfield and Prof Rothwell

Roger Highfield 'enjoying' the TMS experience

I am in a laboratory in the Institute of Neurology in Queen Square, London, having the top of my brain "tickled", as Prof Rothwell calls it, using transcranial magnetic stimulation (TMS), one of the trendiest tools in neuroscience.

And even though I am recovering from a bibulous Institute of Physics awards celebration the night before, Prof Rothwell manages to improve my brain power.

The first practical demonstration of TMS was made 20 years ago by Prof Anthony Barker at the University of Sheffield. Since then, it has become a relatively simple, non-invasive, and - usually - painless way to interfere with the workings of the most complex known object in the universe: the human brain.

This week, in the journal Neuron, Prof Rothwell and colleagues at University College London describe how they have improved TMS so that it can boost and fade

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specific parts of the brain for more than an hour. All it takes is 40 seconds of magnetic stimulation. I was happy to become a guinea pig as Prof Rothwell shoots electrical pulses through a copper coil in the shape of a figure of eight, held against my scalp. For a moment, this induces tiny electrical currents inside my brain.

Inside the brain: click to enlarge

Initial safety tests reveal no long-lasting effects. "I have had it done lots of times," says Prof Rothwell. For me, TMS was disconcerting rather than painful. Mild headache and transient light-headedness can sometimes result, though not in my case.

I was trying it because I wanted to investigate claims by Prof Allan Snyder, director of the Centre for the Mind at the University of Sydney, who believes TMS can act as "a creativity-amplifying machine". His colleague, John McDougall, said: "We have shown, and other groups have verified, that TMS enhances the ability to draw and proof-read."

Prof Rothwell was sceptical but, after testing the Sydney-style stimulation on people, was surprised to report that TMS does seem to amplify brain power. "It worked. I can't believe it," he says. Now it is my turn to have bursts of magnetic pulses beamed at my temporal lobe.

I do two simple tests. In the first, I have to remember a series of numbers. I manage eight maximum. Then a series of words. I can dredge up half a dozen or so.

To improve my performance, Prof Rothwell peps up my temporal lobe, just over my left ear. When he energises the coil, a nerve lights up in my jaw to produce pain of the kind dentists create effortlessly.

Prof Rothwell moves the coil about my scalp to find a spot which he can stimulate without making my face twitch too much. Then follows a series of magnetic pulses for 20 seconds. Not painful but my teeth grind. After five minutes, we repeat the tests. My word recall is as hopeless as before. Remarkably, my ability to recall numbers improves from eight to nine.

Will we see the day when students resort to magnetic brain-boosting? Disconcertingly, Prof Rothwell replies: "I don't believe you can get some improvement without losing something else."

He informs me I have just 20 minutes to make use of my turbo-charged brain. Within that time, I get on the wrong tube train. A simple mistake or a side effect of TMS? Only more research can reveal why my expanded encephalon let me down.

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