

Could concept? It's a brainwave

A therapy that trains brains to alter mental state may help ADHD, says David Mattin

In a South London clinic a young girl is sitting with an electrode attached to her scalp, staring intently at a computer screen. Every so often there is a ping and on the screen, which shows a simple graphic of sea and sky, another bird appears, hovering above the water. That's a signal that in the game Lara Hargrave, 10, is playing, using only her brain waves to control the action, she has just scored a point.

No, this isn't some new teenage computer craze. It's a high-tech brain therapy called neurofeedback that Lara's mother Juliet claims has significantly alleviated her daughter's attention deficit hyperactivity disorder (ADHD). Practitioners claim that the therapy, which centres on the idea that the electrical activity in our brains can be trained to become healthier, has achieved dramatic results on attention disorders, depression, epilepsy, even incontinence.

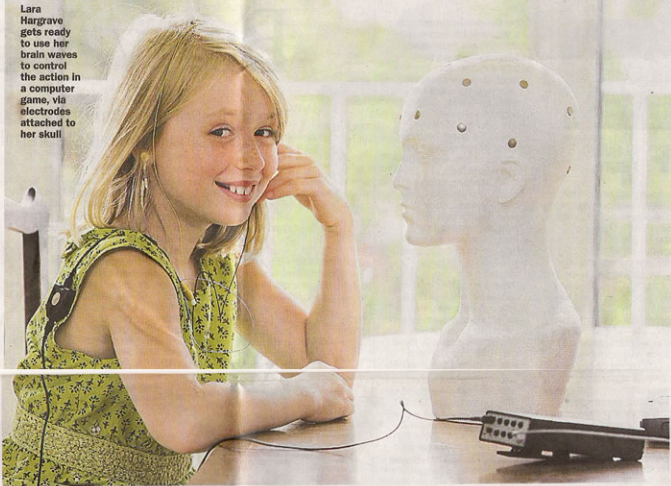
The treatment has long been established in the US, but does the answer to mental wellbeing really lie with our brain waves? And will neurofeedback take off here?

Juliet Hargrave believes that her daughter is proof of the treatment's potential. "Lara's teachers were constantly telling us 'She's a bright girl, if only she could concentrate'. When her school suggested ADHD in 2003, I was determined to avoid Ritalin." Online research led Hargrave to the Learning with Neurofeedback clinic in Wandsworth, South London, run by Melissa Foks, a member of the British Psychological Society. "Neurons in the brain communicate via electrical signals," says Foks. "We can control this electrical activity, it's commonly called brain waves. If you're restfully gazing at the clouds, there will be a certain brain-wave pattern; a lot of alpha brain-wave activity. If you're deep in a maths problem, there will be a lot of beta. Any mental state, is simply the production of certain brain electrical activity."

Put simply, the ADHD child typically has too much theta brain-wave activity — the kind associated with daydreaming — and not enough beta. Neurofeedback aims to alleviate the condition by raising beta activity and lessening theta, so a more normal brainwave profile is achieved.

During each 30-minute session, Lara's brain waves are read by an electrode on her scalp, and fed to a desktop computer. Meanwhile, the game on the screen of that computer is set up to reward Lara whenever she produces a certain kind of brain waves. Lara will know she's get-

Lara Hargrave gets ready to use her brain waves to control the action in a computer game, via electrodes attached to her skull



ting it right when she sees another bird appear in the sky, and the more often a new bird appears, the better she is doing. Over many hours of therapy — so runs the theory — her brain will respond to this visible system of a reward and learn how to produce "concentration" brain waves when she wants it to. And, crucially, she will take that ability away with her.

According to Dr Soren Andersen, a psychologist and neurofeedback researcher at the University of Swansea: "Neurofeedback is a tool that allows the brain to learn how to change at a fundamental level. Learning is slow: it typically takes 20 to 40 sessions to see a satisfactory result. On the upside, this is a non-invasive, non-pharmacological treatment."

There is good evidence for efficacy on ADHD. "Some have argued that neurofeedback is all placebo effect; patients become calmer just because they're sitting quietly for half an hour," says Dr Andersen. "On ADHD, we can now say that is not true. On anxiety and depression, we still need proper trials. This is potentially a great tool, but there is a way to go."

Still, patients with mood disorders already talk of success with neurofeedback. In 2004 Jayne Forbes, 44, a mother of two from Hertfordshire, visited the EEG Neurofeedback Clinic in St Albans, run by Dr Surinder Kaur. Dr Kaur has offered the treatment for 11 years and takes about five NHS referrals from GPs every year. Forbes's complaint was depression.

"I felt constantly low and didn't want to get out of bed. I had been feeling like this for months." At the clinic Forbes played a variety of neurofeedback games, including one where she had to keep a Pacman-type character moving through a maze. "At first it seemed that I had no control over the game. Then, gradually, I learnt that it was about clearing my mind completely and focusing on the screen. As I became better at keeping focused, it was a strange feeling. It made my brain feel huge, just this very expansive, calm, pleasant feeling."

After 40 sessions, Forbes showed a significant change in brain-wave profile. "If I felt myself becoming stressed, I could summon that calm feeling. I think that neurofeedback saved me having to take antidepressants."

Now proponents say that neurofeedback has benefits for healthy subjects. In 2003, Professor John Grueter led an Imperial College study in which 97 students at the Royal College of Music were found to have significantly improved instrumental technique after a course of neurofeedback. So is the treatment set for wider acceptance? "The mental health charity Mind encourages caution: 'Disorders such as depression and anxiety are extremely complex,' says Sophie Corlett, the policy director. "If a person has underlying emotional reasons for such a problem, this treatment isn't going to deal with that. It could be a valuable tool. But the proven value of talking therapies, which treat the whole person, shouldn't be neglected."

For now, UK therapists, including Melissa Foks, have established the Society of Applied Neuroscience, which aims to bring neurofeedback into the UK scientific mainstream. As for

the Hargraves, they need no convincing. Lara says she is able to concentrate better and an attention assessment last February showed normal results. "Now Lara is a calmer child, with dramatically improved concentration," says Juliet. "Maths used to be her worst subject; she just scored 95 per cent in a test. I'm convinced that neurofeedback made the difference."

WHAT'S THE EVIDENCE? DR TOBY MURCOTT

Is neurofeedback effective for ADHD?

A small number of trials has been conducted, providing some evidence to support its effectiveness. One 2003 study compared neurofeedback with methylphenidate (Ritalin) in 34 children and concluded that they both improved behaviour. However, all the studies are relatively small and more research is required to confirm their findings.

How does it work?

That's not fully understood but a 2005 review, in the *Journal of Clinical Psychology*, suggested that it may affect brainwave activity. Studies have found that people with ADHD have increased slow brainwave activity and reduced fast wave. Neurofeedback appears to change this to a more normal pattern.

Is it safe?

There have been no reports of any adverse effects.

Dr Toby Murcott is a former BBC science correspondent

What's it all about?

What is it? Neurofeedback is a non-invasive technique, which, it is claimed, can alter the brain-wave patterns in a person to improve attention, concentration, and to control hyperactive behaviours.

Does it work? It is claimed that it can treat attention disorders, depression and anxiety, epilepsy, and even incontinence.

Cost? From £50 for an initial consultation, and between £30 and £50 for 30-minute sessions thereafter. Some GPs may refer patients for NHS treatment.

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