Supercharge your zen

The benefits of yoga and meditation are plentiful, but they take years of dedicated practice to achieve. Could a zap to the brain offer a shortcut, asks Helen Thomson

FIRST came yoga, then hot yoga, beer yoga, even goat yoga. Now we have e-yoga, the combination of brain stimulation with meditation, mindfulness and downward dog.

Paradoxical though it may seem to add modern technology to a spiritual practice, there are hints that passing a small electrical current through your brain enhances the hard-won effects of yoga and meditation, leading to greater feelings of well-being, more quickly.

The first results of trials of the technology will be available next month, but that isn’t quick enough for some. Behind closed doors, the world’s first e-meditation classes have already started. The US defence agency is even investigating the concept as a way to enhance soldiers’ abilities. But don’t unroll your mat just yet: fast-tracking your zen could have a dark side.

The yoga and meditation industry is booming, with more than 30 million people practising in the US alone and the global market worth £74 billion. It is no wonder: while practitioners have spoken about the transformative potential of meditation for centuries, science has only recently caught up.

Mindfulness meditation – paying more attention to the present moment, to your thoughts, feelings and the world around you – can protect against depression, accelerate learning and alleviate pain and anxiety. It may even slow the ageing process. Yoga has also been found to offer numerous health benefits, such as helping with depression, anxiety and emotional eating. Both can switch off genes implicated in inflammation, which is linked to a number of diseases.

Even so, it takes time and dedication to see results from yoga and meditation. Bashar Badran, a neuroscientist at the Medical University of South Carolina, and his colleagues think they can speed things along.

Their secret is a simple, non-invasive brain stimulation technique called transcranial direct current stimulation (tDCS). This involves sticking two electrodes to the head, one above the eye and one on the temple, and then steering a small electrical current across the brain. The method has already been shown to improve the symptoms of depression, help with addiction and cravings, and possibly speed up recovery from stroke. Badran thought it might also help people achieve a state of mindfulness more quickly and easily. “It’s an idea I’ve been thinking about for a long time, that you could somehow mimic the brain changes you see in long-term meditators in novices,” he says.

To test the idea, his team led 15 volunteers with no prior meditation experience through a 20-minute session of mindfulness meditation. As they meditated, the volunteers received tDCS at 1 or 2 milliamps or a placebo that mimics the sensation of the real thing on the skin. The volunteers took part in three sessions over three weeks, receiving each of the treatments. Before and after every session, they answered questionnaires that quantified aspects of their mood, such as scoring different emotions on a scale of 1 to 100.

Feelings of calmness significantly increased, from around 5 per cent after receiving the placebo to almost 15 per cent after brain
stimulation. Restlessness, one of the main hurdles to achieving a mindful state, decreased twice as much after the 2-milliamp stimulation compared with meditation alone. These are changes you would normally expect to take many weeks, says Badran.

Meanwhile, Marlon Danilewitz at the University of British Columbia in Canada and his colleagues had a similar idea for yoga. “We know that yoga and meditation can have a positive impact on depression, anxiety and stress,” he says. “There’s such a great need for improved treatments for these conditions, so we were curious to see whether we could harness tDCS and yoga together. They both lend themselves to interventions that you can do in your own home.”

Their study involved 22 healthy men and women who regularly practise yoga. During one yoga session, the participants received tDCS or a sham procedure. A week later, they were given the opposite. At the beginning and end of each session, they were assessed, including by having their brain activity measured and performing memory tests while their brains were scanned. These evaluations should give clues about what type of brain activity and what brain regions are affected by tDCS, which may hint at the physiological mechanisms behind any perceived benefits.

Preliminary results suggest that brain stimulation had a positive impact on participants’ ability to “decentre” their thoughts, an aspect of mindfulness in which you are taught to acknowledge thoughts as objective events in the mind rather than identifying with them. It also appeared to give memory a boost. Further details of both trials will be presented next month.

These early results appear promising, but why would a brain jolt make us more mindful? Humans spend a lot of time thinking about stuff that isn’t going on around us, especially planning for the future or pondering the past. This mind-wandering seems to be our brain’s default state when we aren’t concentrating on a task. It is an evolutionary accomplishment, allowing us to plan, learn and reason. But it comes at a cost: too much rumination is associated with unhappiness.

In 2010, work by Matthew Killingsworth...
and Daniel Gilbert, both then at Harvard University, showed that our mind not only wanders during as much as half of our waking hours, but we are also less happy when mind-wandering than when we are focused on a task. The pair’s conclusions concurred with what religions have emphasised for centuries: a wandering mind is an unhappy mind.

This mind-wandering state is associated with a set of brain regions collectively known as the default mode network. This switches off when we target our attention towards a specific goal, but comes back on when we allow our minds to drift. Studies show that people with more than 10 years of meditation experience are skilled at deactivating their default mode network, consistent with decreased mind-wandering.

Brain stimulation seems to fast-track that process. It was the default mode network that both Badran and Danilewitz targeted with tDCS to reduce its activity and decrease mental chatter during meditation and yoga.

Although early days, the idea has caught the attention of the US Army. It was already investigating the use of yoga and mindfulness to help increase soldiers’ performance, for instance by improving attention, memory and learning, and the ability to think clearly under pressure. Badran is now working with the US Army Research Laboratory to investigate whether tDCS might augment these efforts.

“The army is interested in tools that can increase attention or cognition,” he says. “The idea that you can use meditation to enhance performance when you’re fatigued is really important to them. Rather than chugging caffeine or taking a drug, perhaps we can improve a soldier’s ability to cope in stressful environments with mindfulness and electronic stimulation.”

**Do try this at home**

News of this electronic enlightenment has spread. Several people from one group of meditation enthusiasts in Charleston, South Carolina, who had read about Badran’s research, contacted him to ask if they could have a go. He let them borrow his device and taught them where to place the electrodes and how long to switch them on for. Once they were comfortable using it correctly, the meditators were allowed to try it at home. Some were so impressed with the results that they bought their own tDCS devices.

Reflecting on their experiences, several of them said that it made them feel more calm, alert and sociable than they felt after normal meditation. “Meditating for me is hard,” says Pete Sniderman, who has been practising for 10 years. “It usually takes 30 minutes or so for my mind to get quiet and it doesn’t happen at all half the time. With brain stimulation, my mind goes still within the first 5 to 10 minutes. Time passes quickly: 20 minutes feels like 5.”

Once the meditation is over, he says he can focus his attention on anything he wants to accomplish for the next 4 to 6 hours. He calls it his “anti-procrastinator tool”.

But not everyone is convinced that brain stimulation is the answer. Clifford Saron, a neuroscientist at the University of California, Davis, says we don’t have a good enough understanding or definition of what mindfulness is to start tweaking the neural mechanisms that might underlie it. “There’s no question that many people benefit from an opportunity to learn mindfulness,” he says, “but we still don’t understand how those benefits come about.” What’s more, studies on the positive effects of meditation or mindfulness often show rather small impacts, he says, and even where studies show structural brain changes, we can’t be sure these practices are the cause. “It might be that the positive effects are associated with the social support from taking a class, being motivated toward self-care or as a result of being given sanctioned time to do nothing,” says Saron.

To truly test whether tDCS makes a difference, we would need more precise measures than questionnaires about mood states, says Saron. And to be objective, you would also need to compare whether tDCS changes how people feel after doing a mundane task like checking email.

Some even question whether it is wise to turbocharge meditation, given that meditation itself can have negative consequences. People have reported effects ranging from emotional distress to hallucinations and even psychosis.

“If larger stimulation studies do indeed show increases in mindfulness in some people, we’d also expect an increase in negative effects,” says cognitive psychologist Miguel Farias at Coventry University, UK. “Meditation and mindfulness is not for everyone – that’s the important message.”

For those who enjoy the technique, Badran holds private e-meditation sessions in New York, and he has begun developing a medical-grade device in a headband for people to use when meditating at home. “We believe that brain stimulation has the potential to help people improve their general well-being, control their anxiety, limit their depression and pain,” he says. “There are so many domains in which this might be useful that it is worth expanding these trials and seeing if it works.”

And contrary to your instincts, his ambitions might actually gain the approval of the religious communities whose traditional practices he is reshaping. Buddhist monk Bhikkhu Bodhi has written that as long as investigators are respectful of its roots, non-traditional applications of mindfulness are acceptable on the grounds that they help alleviate human suffering.

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