Little brain zap, big memory boost

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FINDING it difficult to revise for an exam? Help could be on its way in the form of the first non-invasive way of stimulating the brain that can boost visual memory.

The technique uses transcranial direct current stimulation (tDCS), in which weak electrical currents are applied to the scalp using electrodes. The method can temporarily increase or decrease activity in a specific brain region and has already been shown to boost verbal and motor skills in volunteers.

Richard Chi at Harvard Medical School in Boston and colleagues wanted to follow up on previous research showing that lesions in the left anterior temporal lobe (ATL), an area near the temple, can lead to improvements in visual memory and perceptual skills similar to the abilities exhibited by some people with autism. Chi's team wondered if inhibiting that area using tDCS might likewise improve memory.

To investigate, his team showed 36 volunteers a dozen "study" slides covered with shapes that varied in their number, arrangement, colour and size (see "Brain games", below). The volunteers were then shown five "test" slides – two with patterns that appeared in the study slides, two with completely new patterns and one whose pattern looked similar to that on a study slide. Participants were asked to identify which of the test slides they had already seen, first performing the task without any brain stimulation.

Subjects then repeated the experiment 12 times, with one group receiving so-called anodal tDCS (which boosts activity) on their right ATL and cathodal tDCS (which inhibits activity) on their left. A second group received the opposite stimulation and a third group received a placebo treatment, which did not stimulate either side of the brain.

Those in the first group more than doubled their scores after receiving tDCS, experiencing a 110 per cent improvement in visual memory. Participants in the second and third groups showed no overall improvement in performance (*Brain Research*, DOI: 10.1016/j.brainres.2010.07.062).

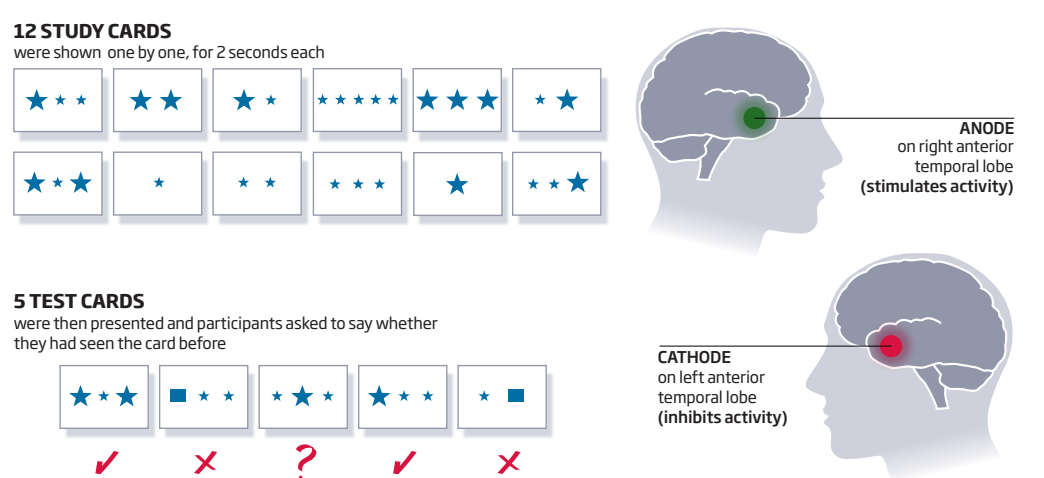
The left ATL is known to be crucial for context processing, among other things, while the right ATL is associated with visual memory. Chi's team suggests that inhibiting activity in the left ATL cuts errors in visual memory by reducing the potentially confusing influence that context can have on recognition. This effect, combined with an increase in activity in the right ATL, allows someone to be more aware of the literal details of each pattern. Further studies in which the temporal lobes are stimulated individually may help to distinguish the underlying mechanisms involved.

A previous experiment using the same visual task, but without tDCS, showed that people with autism outperformed non-autistic individuals by roughly the same margin as the improvement seen in this experiment, says Chi.

In future, Chi says, it might eventually be possible to use tDCS to "develop a 'thinking cap' that enhances learning". ■

Brain games

Simultaneously stimulating one side of the brain while inhibiting the other improves visual memory, allowing volunteers to better identify which cards had been shown to them before



What makes girls in the US hit puberty at 7?

TWICE as many white girls in the US reach puberty aged 7 as a decade ago. No one is sure why this should be the case, but obesity and exposure to chemicals that mimic the female hormone oestrogen are the prime suspects.

The figures come from a study of 1200 girls in three US cities. Of the girls studied, 10.4 per cent of white 7-year-olds had breast development consistent with the onset of puberty, compared to 5 per cent in a 1997

"To find that girls are starting breast development earlier is extremely concerning"

study (*Pediatrics*, DOI: 10.1542/peds.2009-3079). Earlier studies had identified early puberty mainly in black girls.

Marcia Herman-Giddens of the University of North Carolina at Chapel Hill, who led the 1997 study, expressed shock at the increases. "To find the girls are starting breast development earlier and earlier is extremely concerning," she says. "To have that much change in such a short time, it has to be the environment."

It appears that the proportion of black 8-year-olds entering puberty has dropped from 48 per cent in 1997 to 43 per cent today. Frank Biro of the Cincinnati Children's Hospital Medical Center in Ohio, head of the new study, suggests this might be a sign that the numbers of black girls experiencing early puberty may finally be levelling off, while the percentage of white girls affected is still rising.

"Part of it is the increase in overweight and obese girls," says Biro – hormones released by the extra fat cells could play a role. His team is also checking blood and urine samples for chemicals that mimic oestrogen, from plastics in the environment, for example, or soya in the diet. Andy Coghlan ■