

## Brain sells

Cognitive training may be a moneyspinner despite scientists' doubts

"OUR primary goal is for our users to see us as a gym, where they can work out and keep mentally fit," says Michael Scanlon, the co-founder and chief scientist of Lumos Labs. For \$14.95 a month, subscribers to the firm's Lumosity website get to play a selection of online games designed to improve their cognitive performance. There are around 40 exercises available, including "speed match", in which players click if an image matches a previous one; "memory matrix", which requires remembering which squares on a matrix were shaded; and "raindrops", which involves solving arithmetic problems before the raindrops containing them hit the ground. The puzzles are varied, according to how well users perform, to ensure they are given a suitably challenging brain-training session each day.

The popularity of Lumosity since its launch in 2007 has been, well, mind-blowing. Its smartphone app has been the top education app in the iTunes store at some point in 38 countries. On August 1st it launched an iPad version, which it expects to boost its existing 45m registered users in 180-plus countries. Lumos Labs has already raised almost \$70m in venture capital, and is one of two firms vying to become the first public company serving the new "digital brain health" market, says Alvaro Fernandez of SharpBrains, a research firm. (The firm hoping to beat it to the punch is NeuroSky, which makes "brainwave sensors"—including some shaped like cats' ears that will apparently wiggle if you are enjoying yourself and droop if you are relaxed.)

The market had total revenues of more than \$1 billion for the first time in 2012, calculates SharpBrains, thanks in large part to the rapid growth of consumer firms such as Lumos Labs. In 2009, when revenues were around \$600m, health-care firms, schools and employers accounted for most of the buying. SharpBrains forecasts that the market will grow to \$6.2 billion in 2020, with retail spending accounting for over half of this. Ageing baby-boomers desperate to postpone their dotage are expected to be especially keen buyers.

## Another Brain Gym?

The metaphor of workouts for the mind will set alarm bells ringing for anyone familiar with Brain Gym, a series of physical exercises for children, adopted unquestioningly by many British schools, whose supposed cognitive benefits were debunked in "Bad Science", a 2008 book by Ben Goldacre. However, Mr Scanlon, who quit his neuroscience PhD at Stanford University to co-found Lumos Labs, says he was inspired to do so by the mounting academic evidence of the plasticity of the brain and of the ability to improve cognitive function through simple exercises.

Lumos Labs plays up the contribution it can make to testing theories of brain function by using its database of results from its subscribers. It has launched The Human Cognition Project, to encourage academic researchers to use its data. Mr Scanlon was one of several authors of a recent paper in *Frontiers in Human Neuroscience*, a journal, that used Lumosity data to show that seven hours of sleep a night is optimal for brain function, and that modest amounts of alcohol improve mental performance.

There is evidence that some brain exercises can help with particular problems. Cogmed, a company owned by Pearson (which also part-owns The Economist), has achieved robust results in children with a low working memory, including some with Down's syndrome. Lumosity points to several peer-reviewed studies that find its training to be beneficial. In May, for instance, a paper by Shelli Kesler of Stanford University found that 12 weeks of Lumosity training significantly improved executive brain functions in a group of women.

Not everyone is convinced. "It is tempting to think of the brain as a muscle, that as it gets stronger at one thing it is also stronger at everything, but it isn't," says Stephen Kosslyn,

until recently director of Stanford's Centre for Advanced Study in the Behavioural Sciences. "The shocking truth is that the opportunities to generalise are very limited. If you practise some cognitive task you are basically practising that thing. If something else is very similar in its underlying structure there may be some transferability, but rarely 100%." Mr Scanlon concedes there are lots of questions to be answered about when Lumosity's exercises work, and what are the limitations, but is optimistic about what the firm's data trove will eventually reveal.

Market research suggests that the bar for Lumos Labs and other brain-health firms should not be set too high, says Mr Fernandez of SharpBrains. His firm's research demonstrates that most consumers are far less fussy about the evidence than scientists. They are not looking for a guaranteed way to avoid Alzheimer's disease; they just want to enhance or maintain the performance of their brain "better than by doing the other kind of things they already do and that have far less evidence to support [them], such as crossword puzzles, taking vitamin supplements, watching educational TV shows, or simply doing nothing," he says. In that case, as long as Lumosity can manage to be more engaging than Sudoku, its future could be bright.

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