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Do Brain Workouts Work? Science Isn't Sure

By TARA PARKER-POPE

For a \$14.95 monthly membership, the website Lumosity promises to “train” your brain with games designed to stave off mental decline. Users view a quick succession of bird images and numbers to test attention span, for instance, or match increasingly complex tile patterns to challenge memory.

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Personal technology for health and fitness.

While Lumosity is perhaps the best known of the brain-game websites, with 50 million subscribers in 180 countries, the cognitive training business is booming. Happy Neuron of Mountain View, Calif., promises “brain fitness for life.” Cogmed, owned by the British education company Pearson, says its training program will give students “improved attention and capacity for learning.” The Israeli firm Neuronix is developing a brain stimulation and cognitive training program that the company calls a “new hope for Alzheimer’s disease.”

And last month, in a move that could significantly improve the financial prospects for brain-game developers, the Centers for Medicare and Medicaid Services began seeking comments on a proposal that would, in some cases, reimburse the cost of “memory fitness activities.”

Much of the focus of the brain fitness business has been on helping children with attention-deficit problems, and on improving cognitive function and academic performance in healthy children and adults. An effective way to stave off memory loss or prevent Alzheimer’s — particularly if it were a simple website or video game — is the “holy grail” of neuroscience, said Dr. Murali Doraiswamy, director of the neurocognitive disorders program at Duke Institute for Brain

Sciences.

The problem, Dr. Doraiswamy added, is that the science of cognitive training has not kept up with the hype.

“Almost all the marketing claims made by all the companies go beyond the data,” he said. “We need large national studies before you can conclude that it’s ready for prime time.”

For centuries, scientists believed that most brain development occurred in the first few years of life — that by adulthood the brain was largely immutable. But over the past two decades, studies on animals and humans have found that the brain continues to form new neural connections throughout life.

But questions remain whether an intervention that challenges the brain — a puzzle, studying a new language or improving skill on a video game — can really raise intelligence or stave off normal memory loss.

A series of studies in recent years has suggested that certain types of game training can improve a person’s cognitive performance. In February 2013, however, an analysis of 23 of the best studies on brain training, led by the University of Oslo researcher Monica Melby-Lervag, concluded that while players do get better, the increase in skill hasn’t been shown to transfer to other tasks. In other words, playing Sudoku or an online matching game makes you better at the game, but it doesn’t make you better at math or help you remember names or where you left your car keys.

But other studies have been more encouraging. Last September, the journal *Nature* published a study by researchers at the University of California, San Francisco, that showed a driving game did improve short-term memory and long-term focus in older adults. The findings are significant because the research found that improvements in performance weren’t limited to the game, but also appeared to be linked to a strengthening of older brains over all, helping them to perform better at other memory and attention tasks.

In addition, brain monitoring during the study showed that in older participants, game training led to bursts in brain waves associated with attention; the patterns were similar to those seen in much younger brains.

In January, the largest randomized controlled trial of cognitive training in healthy older adults found that gains in reasoning and speed through brain training lasted as long as 10 years. Financed by the National Institutes of Health, the Active study (Advanced Cognitive Training for Independent and Vital Elderly) recruited 2,832 volunteers with an average age of 74.

The participants were divided into three training groups for memory, reasoning and speed of processing, as well as one control group. The groups took part in 10 sessions of 60 to 75 minutes over five to six weeks, and researchers measured the effect of training five times over the next 10 years. Five years after training, all three groups still demonstrated improvements in the skills in which they had trained. Notably, the gains did not carry over into other areas. After 10 years, only the reasoning and speed-of-processing groups continued to show improvement.

The researchers also found that people in the reasoning and speed-of-mental-processing groups had 50 percent fewer car accidents than those in the control group. The claims about commercial brain games are “a mixed bag,” said Sherry L. Willis, a University of Washington research professor involved in the Active study. “There is a tendency for companies to say a certain measure represents X ability, but there may be insufficient, if any, research to support the assertion,” added Dr. Willis, who said a version of the training used in the Active study was available through Posit Science and AARP Brain Fitness.

Earlier this year, the National Institutes of Health invited applications to more rigorously test brain fitness training to stave off cognitive decline. Researchers say they hope the effort will help establish a consistent standard for determining whether a brain-training intervention works.

But while the science remains unclear, entrepreneurs have seized on what is likely to be a sizable marketing opportunity. In May, hundreds of researchers and businesses will gather in San Francisco for the NeuroGaming Conference and Expo to explore the latest research and the newest technology.

While there is no real risk to participating in the many unproven brain-training games available online and through smartphones, experts say, consumers should know that the scientific jury is still out on whether they are

really boosting brain health or just paying hundreds of dollars to get better at a game.

“I’m not convinced there is a huge difference between buying a \$300 subscription to a gaming company versus you yourself doing challenging things on your own, like attending a lecture or learning an instrument,” Dr. Doraiswamy said. “Each person has to personalize for themselves what they find fun and challenging and what they can stick with.”

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