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## Brain Games: Ten Years Away

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When I first became editor of *Cerebrum* two years ago, I pitched an article about the effectiveness of brain games to my advisory board. Too soon, they suggested, because there aren't enough good studies to support one.

That struck me as curious, since a look on Lumosity's website revealed nine peer-reviewed studies, 36 university collaborators, and testimonials galore. Lumosity is the largest company in a brain-game business that is estimated at \$1.3 billion a year.

Three months ago the board finally greenlighted the idea for an article, on the condition that I could find a recognized authority with a track record in cognition and aging to write it. I invited [Arthur F. Kramer](#), Ph.D., director of the Beckman Institute for Advanced Science & technology and the Swanlund Chair and professor of psychology and neuroscience at the University of Illinois. He accepted and suggested he collaborate with research colleague [Walter R. Boot](#), Ph.D., an associate professor at Florida State University. The result is this month's *Cerebrum* article, "[The Brain Games Conundrum: Does Cognitive Training Really Sharpen the Mind?](#)" (A Q&A with the authors will post on the Dana Foundation website on Monday).



The advisory board will be delighted to see 41 citations attached to the article; the names of our authors are attached to 11 studies. One study they collaborated on in 2008 is titled "The effects of video game playing on attention, memory, and executive control," published in *Acta Psychologica*.

Among the messages in the article are: Whenever money-making is involved, snake-oil salesmen ultimately abound—even when it comes to neuroscience. But the other, more hopeful message is: brain games are not a total sham; we just don't know whether they work yet or not.

"Maybe in 10 years we might know enough to make more definitive recommendations," says Boot, co-author of the article. "There are a number of exciting things going on right now in psychological science in terms of an increased focus on replication, pre-registration of studies, and better ways to measure and control for placebo effects and other important confounds in brain training studies. There is a movement for a return to methodological rigor and thinking about these issues. Because of this, we are already beginning to see studies with results that are easier to interpret, and I anticipate that this trend will continue."

The authors cite ACTIVE (Advanced Cognitive Training for Independent and Vital Elderly), a long-term study that showed some multi-year benefits for a subset of the training protocols in cognitive function. But the initial

training was only 10 hours, too short a period to measure long lasting effects and speak in absolutes, as does the Lumosity website. Interestingly, Nintendo's Brain Age, a popular alternative to Lumosity, lists no scientific research on its website. "The ACTIVE study also relied on a lot of positive effects that were subjective and self-reported and, and some positive effects that were objectively measured, but these were pretty limited," says Kramer.

The authors point to another troubling trend: health-insurance companies that make brain-training products available to their clients. Boot points out that the companies should know better, since findings are seldom replicated and peer reviewed journal articles often leave him skeptical. "Many consumers are not going to look hard enough, or have the background to evaluate whether the evidence they're seeing on those websites is high quality evidence, or whether the evidence supports benefits to important everyday tasks and not just abstract laboratory tasks," he says.

Kramer straddles the fence when asked about Project: Evo, a video game designed to tax several mental abilities at once. Developed by his friend and colleague [Adam Gazzaley](#), M.D., Ph.D., a neuroscientist at UCSF, *Nature* magazine's cover declared "Game changer" when findings were published last year. The Boston company that is developing Akili, which Gazzaley advises, is seeking Food and Drug Administration approval for the game that claims adults who are 60 to 85 years old will develop multi-tasking skills on par with 20 year olds.

Gazzaley came to the University of Illinois to present his findings, which Kramer found impressive. The findings incorporated the work of Kramer and other colleagues who have been studying cognitive function and neuroplasticity over the past 15 years. "The fact that older people can get better at some of these [multitasking] skills doesn't surprise me," says Kramer. "Whether we're ready for a product or not, I'll leave that up to Adam and his colleagues to decide."

For now, or until the science fully catches up with dubious such claims as brain games will help you remember your keys, drive more safely, and perform several tasks simultaneously, the authors recommend that, as you age, stay intellectually engaged with book reading and other mental activities. And never forget about physical activity, says Boot, who mentions more than once that "exercise is something people should be doing regardless of any mental benefit."

—Bill Glovin

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