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Brain Training Programs Do Not Increase Cognitive Function

Fran Lowry

Authors and Disclosures

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April 21, 2010 — Commercial brain training programs that are widely claimed to increase cognitive function have received a failing grade.

In a large study of more than 11,000 healthy adults between the ages of 18 and 60 years, those who did computerized brain training exercises 3 times a week for 6 weeks actually showed less improvement in cognitive function than control participants who did not train their brains, but merely surfed the Internet instead, according to new research reported online April 20 in *Nature*.

"A couple of years ago, I reviewed the literature on brain training and was surprised to find that, despite the fact that many millions of people are now involved in these types of activities, there is very little solid peer-reviewed scientific evidence out there to show that it actually works," lead author Adrian M. Owen, MD, from the Medical Research Council, Cognition and Brain Sciences Unit, Cambridge, United Kingdom, told reporters at a telephone press briefing. "This is a multi-million-pound industry, and given that so many people are involved, it is interesting that the scientific evidence was lacking."

Dr. Owen and his colleagues conducted an online study to investigate whether regular brain training leads to any improvement in cognitive function. In conjunction with the BBC Lab UK, the researchers invited viewers of the BBC science program "Bang Goes the Theory" to participate.

Of 55,617 individuals who initially applied, 11,430 completed benchmark assessments of reasoning, verbal short-term memory, spatial working memory, and paired-associates learning.

The participants were then randomly assigned to 1 of 3 groups. The first group trained in tasks that emphasized reasoning, planning, and problem-solving. The second group trained in a broader range of cognitive functions, which included tests of short-term memory, attention, visuospatial processing, and mathematics. To continuously challenge the participants' cognitive performance and maximize any benefits of training, the difficulty of the training increased as the participants improved.

The control group surfed the Internet to find answers to general knowledge questions.

All participants were well matched for age and sex.

At the end of 6 weeks, the participants were reassessed to see whether their cognitive functioning had improved.

The researchers found that none of the brain training tasks transferred to other mental or cognitive abilities beyond what had been specifically practiced by each group.

Numerically, they report, group 1 improved on 4 benchmarking tests, and group 2 improved on 3 benchmarking tests. Standardized effect sizes varied from small (eg, 0.35; 99% confidence interval [CI], -0.29 to 0.41) to very small (eg, 0.01; 99% CI, -0.05 to 0.07). However, the control group also improved numerically on all 4 benchmarking tests with similar effect sizes.

A direct comparison of the 3 groups showed that effect sizes across all 4 benchmarking tests were very small (eg, from 0.01 [99% CI, -0.05 to 0.07] to 0.22 [99% CI, 0.15 - 0.28]). "In fact," said Dr. Owen, "for [verbal short-term memory] and [paired-associates learning], the difference between benchmarking sessions was numerically greatest for the control group."

The control group also improved in their ability to answer obscure knowledge questions, although the effect size was small.

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The study found that the training groups did get much better on the test that they actually practiced. In addition, participants got better the more they trained. However, even people who trained much more than average showed no generalization of training to untrained tasks — even those that were cognitively closely related.

Dr. Owen told *Medscape Neurology* that doing brain training for fun "is absolutely fine. But if you are doing it because you are expecting to improve your IQ, our data suggests that that isn't the case. It doesn't make you smarter overall. If you are expecting to improve your mental abilities over and above what would happen to you if you just use Internet every day for the same period of time, that's not going to happen."

Starkly Negative Result

"This was a fascinating and creative investigation," said David Knopman, MD, a neurologist with the Mayo Clinic, Rochester, Minnesota, and a spokesperson for the American Academy of Neurology.

"While there are a number of issues with the design of the study that make it different than a typical randomized controlled trial, the starkly negative result is powerful evidence that short-term usage of so-called brain training programs has no beneficial effect on mental functioning," Dr. Knopman said.

Dr. Owen has disclosed that his research is supported by the Medical Research Council.

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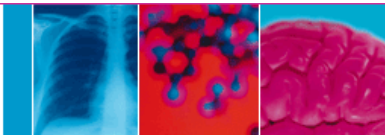
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