

Mind Games: The Truth About Brain-Fitness Programs



Roughly 130 companies offer so-called brain-fitness programs that the companies claim will improve your daily life by sharpening your cognitive abilities. However, experts tell us that increasing your brain-fitness score doesn't do much beyond improving your game-playing ability.

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If you're one of the 76 million baby boomers in the United States, you might be considering ways to stay sharp cognitively. If you're one of the 37 million high-school and college students in the United States, you likely want to keep your mental processing clear to stay ahead in your courses.

Whatever your age, a brain-fitness product exists that supposedly is tailored to you.

Brain-fitness marketers sell programs that they claim will enhance users' quality of life by improving their concentration, memory, problem-solving and reaction time.

For \$8–\$15 per month, you can play an online brain-fitness game on a computer or a mobile device. For \$250–\$300, you can take a 6-week course and play brain-fitness games in person. About 130 companies now offer brain-fitness programs, compared with fewer than 50 in 2005. Alvaro Fernandez of SharpBrains, which is a market-research company, tells us that the worldwide brain-fitness market in 2013—the most recent data that are available—totaled about \$650 million, which is up 24 percent from 2012.

We found that almost all brain-fitness marketers have in-house research-and-development teams that employ neuroscientists (and sometimes cognitive psychologists) to develop and test their programs. The companies use these teams as a marketing tool on their website to promote the idea that their games are proven scientifically to improve your cognitive abilities.

Although brain-fitness marketers say their virtual games make you sharper mentally, the 10 cognitive psychologists and neuroscientists whom we interviewed are skeptical. Only one of the 10 experts believes that any cognitive abilities can be improved through mental training, and he doesn't believe that these improvements can be achieved through a brain-fitness program.

“There is no compelling evidence for generalizable benefits of brain-fitness programs,” says Zach Hambrick, who is a professor of psychology who studies memory function and intelligence at Michigan State University.

We played brain-fitness games from six companies. The games certainly were fun, and we earned better scores the more that we played, but we agree with the experts: We don’t believe that our improvement in the games translated into benefits in our everyday life.

SAME OLD TESTS. Ten experts tell us that most of the games that are in brain-fitness programs are digital versions of established and well-researched academic tests of cognitive functions. The tests have been used by cognitive psychologists since the 1950s. For example, one of Lumosity’s exercises is the Trail Making test, which is merely a version of connect-the-dots, in which the player must connect an alternating series of numbers and letters in sequential order—from one to A to two to B and so on. (For more examples of brain-fitness games, see “Flexing Your Brain? A Look at Typical Brain-Fitness Games.”)

We found that all of the companies have games that are tailored to a range of cognitive abilities. For example, a typical 30-minute brain-fitness training session provides six 2- to 5-minute games, and each game claims to target a different cognitive ability. We found that most companies target five cognitive abilities: brain speed, language, logic, memory and visuospatial orientation. CogniFit claims to target 24 cognitive abilities, which is the most that we found among brain-fitness marketers’ claims. Experts tell us that CogniFit’s list doesn’t mean that it tests a broader range of cognitive skills. Instead, it’s just a matter of marketing. For example, the company includes six memory subcategories: auditory short-term, contextual, nonverbal, short-term, visual short-term and working.

Most brain-fitness marketers track your progress and tell you how many times that you performed each game, the ones at which you’re best and the ones that require more practice. The companies also claim that they personalize your training based on the cognitive areas in which you require more practice. However, David Meyer, who is a cognitive scientist and psychologist at University of Michigan, tells us that the personalization is trivial. We found that the companies don’t personalize the games per se; they just change the level of difficulty as you improve.

Some brain-fitness programs are marketed toward specific age groups or other demographics. Daisy Brains, for example, is marketed to women. Hambrick tells us that “absolutely no credible evidence” supports the idea that any cognitive difference in brain function exists between men and women. However, Laura Howard of Daisy Brains tells us that the games aren’t tailored specifically toward women. Daisy Brains uses the same academic tests of cognitive functions as most brain-fitness companies do but presents them in an interface that has colors and a layout that the company believes might appeal more to women.

“It’s really about the look and the feel of the platform,” Howard says.

Another example of brain-fitness niche marketing is Dakim Brain Fitness Silver, which says it's designed for folks who are older than 75 who want to fend off age-related cognitive decline. However, no scientific consensus believes that improving in brain-fitness games staves off cognitive decline in old age. Furthermore, Hambrick and other experts are concerned that an older consumer who doesn't perceive any measurable improvement from playing brain-fitness games might have his/her psychological well-being suffer.

We found that almost all brain-fitness marketers claim that their programs enhance *neuroplasticity*, which refers to the capability of the brain to create neuron connections and adapt to age, a changing environment and injury. Brain-fitness marketers say that by playing their games, you'll build neuron connections and improve your cognitive ability and overall intelligence. However, scientists tell us that no one fully understands neuroplasticity or its supposed benefits. Most scientists believe that neuron connections are created when a person takes up a hobby or learns a language or task. Experts tell us that no independent evidence proves that a person's intelligence increases as a result of new neuron connections, however.

"Learning how to open a new kind of water bottle or using a new shower at a hotel is also neuroplasticity," says Zach Shipstead, who is a psychology professor at Arizona State University and an expert on working memory.

In other words, you can create neuron connections and derive whatever benefits that they might produce free, instead of paying a monthly subscription fee to a brain-fitness marketer. Any new information, such as learning a new way to tie your shoes, might create neuron connections.

SEEKING A BOOST. All 10 of the experts whom we interviewed say no convincing evidence shows that improving in a brain-fitness game will extend to broader cognitive skills, such as abstract reasoning or improving your IQ. In other words, improving your score on a memory game that challenges you to remember increasingly long strings of numbers likely won't help you to, say, remember a birthday or find your car keys more quickly.

"There are certainly studies that show training improves a particular skill, whether that is memory or visual attention," Meyer says, "but when you start to look carefully at whether the improvement will transfer from the original task to new and slightly different ones, and from the original task to real-world tasks, it becomes a lot more iffy."

In the past 6 years, a series of studies explored the connection between intelligence and working memory, which is the ability to keep your attention on a task and hold and process that information even in the face of distraction, such as noise or a sudden change in your environment. Cognitive scientists hypothesize that working memory might be correlated with problem-solving, attention control and the ability to determine what to do in a new situation. Still, according to experts in working memory, researchers don't understand the relationship between working memory and intelligence.

A 2008 study by University of California-Irvine psychologist Susanne Jaeggi and her colleagues trained 70 adults in a working-memory game that's called "dual n-back," which was introduced in 1958 and shows up in many brain-fitness games. Jaeggi found that the training increased the adults' intelligence and boosted IQ scores by one point per hour of training, up to a total of 10 points after 10 hours of training.

Many brain-fitness marketers cite Jaeggi's study as evidence that brain-fitness programs work. Most companies also cite their own studies. Experts tell us, however, that all of those studies, including Jaeggi's, have flaws or conflicts of interest that discredit the results.

Randall Engle, who is an expert in attention and working memory at Georgia Institute of Technology, was unable to duplicate Jaeggi's results in 2010 with a wider range of memory games and a larger number of test subjects. Engle found no evidence that those who trained in dual n-back or any other brain-fitness game showed any improvement in intelligence measures.

"We've now attempted numerous replications using different tasks, and we have never found a single data point supporting the argument that you are going to get improvements in attention and intelligence" from a brain-fitness game, Engle says.

Other studies also fail to show the positive results of the Jaeggi study. Researchers at University of Oslo and University College London pooled 23 studies, all of which tested whether working-memory training in adults and children improves general mental abilities. Their conclusion: It doesn't.

Experts tell us that Jaeggi's study was flawed, because the study used only one test of reasoning (dual n-back). Cognitive psychologists agree that intelligence is a reflection of many different tests of reasoning.

Monica Melby-Lervåg, who is a psychology professor at University of Oslo, tells us that no single test of reasoning—no matter how well-conceived that it is—can tell you definitively whether an individual's intelligence or cognitive performance increased. Every cognitive psychologist with whom we spoke agrees that many different tasks have to be used, and many well-executed studies have to be conducted to demonstrate that playing a brain-fitness game provides a real-world benefit.

"We found that this training has short-term effects on specific working-memory tasks but that the effects did not transfer to relevant daily tasks, like problem-solving, verbal ability, attention or reading," Melby-Lervåg says.

Jaeggi agrees that her 2008 study doesn't provide convincing evidence that brain-fitness training transfers to relevant daily tasks.

"When you look at the claims these companies are making, you need to take them with a grain of salt," she tells us. "Ninety-nine percent of the claims are completely overblown."

Still, Jaeggi and her colleagues continue their studies and remain optimistic that further research can bolster the results of their 2008 report. She tells us that the research team hopes to improve existing training tasks and figure out why studies show no positive effect of working-memory training.

Michael Scanlon, who is the co-founder and chief scientific officer of Lumosity, says the company's internal unpublished research, which includes a 2011 paper about 23 volunteers, points to an improvement in visual attention and working memory after online training. He acknowledges that the study of brain training is in its early stages.

“Some of the research trials being used are just the first ideas for methods of brain training,” he says.

However, the lack of convincing research doesn't prevent Lumosity and other brain-fitness marketers from claiming in its marketing that their games make you smarter.

HIT THE GYM. Most experts tell us that aerobic exercise is one activity that has transferrable benefits for the brain. Many balanced, independent studies demonstrate this, Engle says.

“There is evidence that aerobic exercise benefits the brain of people of all ages, including our brain as we age, preventing cognitive decline,” Engle says.

Even though exercise isn't related directly to cognitive function, the enhanced blood flow and oxygen to the brain after exercise has been shown to boost the health of blood vessels and increase nerve growth in the brain in both animals and humans.

“When people walk more or do aerobic exercise, they get better at all kinds of tasks—memory, decision-making tasks,” says Arthur Kramer, who is a neuroscientist at University of Illinois and a leading expert on the connection between brain function and exercise.

In other words, your brain will get a better workout from you exercising every day than it will from you playing a brain-fitness program.

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Flexing Your Brain? A Look at Typical Brain-Fitness Games

Ten cognitive psychologists and neuroscientists whom we interviewed say most of the games that are in brain-fitness programs are slightly different variations (different colors, graphics and wording) of established and well-researched academic tests of cognitive functions that cognitive psychologists have used since the 1950s. Brain-fitness marketers claim that their games will enhance users' quality of life by improving their cognitive abilities. However, none of the experts whom we interviewed believes that these improvements can be achieved through a brain-fitness product.

“There is no compelling evidence that these games have far-reaching effects on performance in the real world,” says Zach Hambrick, who is a professor of psychology who studies memory function and intelligence at Michigan State University.

Here's a look at four common games that you can expect to find in any brain-fitness program:

Cognitive ability—Memory

Game description—You're shown a series of images and then are presented with a new image and asked whether it's identical to a previous image.

Claim—BrainHQ says its “Card Shark” version improves your ability to retain and work with more than one piece of visual information at a time.

Cognitive ability—Mental speed

Description—You sort images as quickly as possible into a left bucket or a right bucket.

Claim—Fit Brains says its version, “Speed Sort,” improves mental processing speed and the ability to multitask.

Cognitive ability—Task switching/flexibility

Description—You're asked to indicate whether images are pointing or moving in a specific direction.

Claim—Lumosity says its version, “Ebb and Flow,” improves your ability to switch between tasks by adapting to changing scenarios.

Cognitive ability—Verbal fluency

Description—You're given seven letters. You then get 2 minutes to rearrange them into as many three- to seven-letter words as you can.

Claim—Daisy Brains says its game, “Lemonade Letters,” challenges your word-finding skills and verbal speed.

Thinking Caps? Tracking Brain Activity

Consumers spent \$585 million worldwide in 2013 on brain-fitness headbands that have one or more electroencephalogram (EEG) sensors, according to SharpBrains, which is a market-research company. The headbands are said to measure and record the electrical activity of your brain. We found eight companies that sell these headsets, which start at \$80. All eight companies have activities that they say will help you to calm your brain and increase your focus and cognitive function. For example, when you put on InteraXon’s Muse (\$299) headband, you might hear the sound of ocean waves or a voice asking you to count your breaths. The Muse’s seven sensors analyze your brain waves, and you earn points if your brain signals relax.

Like the seven other companies, InteraXon says a calmer brain allows you to sharpen your focus and improve your cognitive abilities. However, 10 cognitive psychologists and neuroscientists whom we interviewed tell us that no convincing scientific evidence exists that cognitive abilities can be improved through a brain-fitness product. In other words, brain-fitness headbands might help you to feel more relaxed, but no scientific evidence proves that they can help you to improve your concentration or any other cognitive ability.

Still, SharpBrains expects more EEG sensors in the next 2 years as more companies invest in wearable activity trackers.