<https://bigthink.com/ideafeed/which-brain-games-can-make-you-smarter>

**Which Brain Games Can Make You Smarter?**

Certain cognitive tests that improve attention and working memory have been shown to increase people's IQ scores, once considered a fixed measure of how smart someone is.

[**ORION JONES**](https://bigthink.com/u/orionjones)

22 April, 2012

**What's the Latest Development?**

A cognitive game known as the N-back test has been shown in some studies to increase people's IQ scores, a feat that was considered impossible just a few years ago. The game challenges players to remember something, such as the location of an object or a particular letter, which is presented "immediately before (1-back), the time before last (2-back), the time before that (3-back), and so on." By making the game gradually more difficult, the task overwhelms the usual task-specific strategies that people develop with games like chess and Scabble, working to affect a more comprehensive intelligence.

**What's the Big Idea?**

The N-back test is thought to improve fluid intelligence, which psychologists consider distinct from crystallized intelligence, defined as the accumulation of knowledge over one's lifetime. Fluid intelligence, by contrast, is "the ultimate cognitive ability underlying all mental skills, and supposedly immune from the usual benefits of practice." Working memory and attention skills are the gears of fluid intelligence and they are two metrics which brain games seek to measure and improve. If the effects of the N-back game are verified in future experiments, we may see businesses and government investment gather around making their employees and citizens smarter.

<https://www.brainturk.com/blog/improve-working-memory>

# How to improve working memory?

Nov 07, 2016

## **What exactly is the "working memory"?**

Memory refers to the encoding or learning, storing and recalling of information whenever needed. Working memory(WM) and short term memory(STM) are treated like synonyms, but technically STM refers to the maintenace of information whereas WM refers to the maintenance and controlled manipulation of a limited amount of information before recall. WM refers more to the whole theoretical framework of structures and processes used for the temporary storage and manipulation of information and STM is just one component of it.

Fluid intelligence is associated with WM and is related to the reasoning and solving problems, without prior knowledge, like thinking abstractly or identifying patterns or to distinguish relations or solving puzzles or to see connections and to get to the bottom of things. This ability is considered independent of learning, experience, and education. WM is so closely related fluid intelligence that at times they’re even considered identical. Fluid intelligence has long been known to peak in early adulthood, around college age, and then to decline gradually as they age. It is often affected by disease, or injury.

Weak WM skills can affect learning in many different subject areas including reading and math. The part of the brain responsible for WM is also responsible for maintaining focus and concentration. There are two types of working memory: auditory memory and visual-spatial memory, both of which are very essential for learning. Working memory difficulties often co-exist with other issues, such as dyslexia, dyspraxia and AD/HD but they can also be a stand-alone problem.

Now that we know the importance of working memory, the next question that arises is , **How to improve working memory?**

Sadly, there is no clear or most effective way, to improve WM, but one of the techniques that has shown promising success is ‘Brain training’ or ‘working memory training’ and we provide that at [Brainturk](http://brainturk.com/).

Brain training aims at improving cognitive abilities making use of WM techniques, in the form of simple games and tests which require us to understand, inhibit and manipulate information, shifting and controlling attention, the ability to maintain two tasks simultaneously, recalling a sequence either in the order it was or in the reverse order or recalling where an element specifically was in the sequence. You can see more about WM training [here](https://en.wikipedia.org/wiki/Working_memory_training).

In addition to working memory, there’s also the need to improve fluid intelligence by training other basic mental skills like perceptual speed which needs us to decide in a given time, whether a number is odd or even, visual tracking or quickly switching between a variety of tasks. In the brainturk website, there’s an entire section dedicated to games that help us improve fluid intelligence. Check out the fluid intelligence section at [Brainturk](https://www.brainturk.com/games).

**Improving working memory is beneficial to everybody**and not just those who are affected, so go ahead and try few of these games :

* [Math Asteroid](https://www.brainturk.com/mathe?tour=1)
* [Dual-N-Back](https://www.brainturk.com/dual-n-back)
* [Staircase](https://www.brainturk.com/staircase)
* [Picture Back](https://www.brainturk.com/pics)

# Lumosity to Pay $2 Million to Settle FTC Deceptive Advertising Charges for Its “Brain Training” Program

### Company Claimed Program Would Sharpen Performance in Everyday Life and Protect Against Cognitive Decline[Linked-In](http://www.linkedin.com/shareArticle?mini=true&url=https://www.ftc.gov/news-events/press-releases/2016/01/lumosity-pay-2-million-settle-ftc-deceptive-advertising-charges&title=%27Lumosity%20to%20Pay%20$2%20Million%20to%20Settle%20FTC%20Deceptive%20Advertising%20Charges%20for%20Its%20%E2%80%9CBrain%20Training%E2%80%9D%20Program%27&summary=%27The%20creators%20and%20marketers%20of%20the%20Lumosity%20%E2%80%9Cbrain%20training%E2%80%9D%20program%20have%20agreed%20to%20settle%20Federal%20Trade%20Commission%20charges%20alleging%20that%20they%20deceived%20consumers%20with%20unfounded%20claims%20that%20Lumosity%20games%20can%20help%20users%20perform%20better%20at%20work%20and%20in%20school,%20and%20reduce%20or%20delay%20cognitive%20impairment%20associated%20with%20age%20and%20other%20serious%20health%20conditions.As%20part%20of%20the%20settlement,%20Lumos%20Labs,%20the%20company%20behind%20Lumosity,%20will%20pay%20$2%20million%20in%20redress%20and%20will%20notify%20subscribers%20of%20the%20FTC%20action%20and%20provide%20them%20with%20an%20easy%20way%20to%20cancel%20their%20auto-renewal%20to%20avoid%20future%20billing.%E2%80%9CLumosity%20preyed%20on%20consumers%E2%80%99%20fears%20about%20age-related%20cognitive%20decline,%20suggesting%20their%20games%20could%20stave%20off%20memory%20loss,%20dementia,%20and%20even%20Alzheimer%E2%80%99s%20disease,%E2%80%9D%20said%20Jessica%20Rich,%20Director%20of%20the%20FTC%E2%80%99s%20Bureau%20of%20Consumer%20Protection.According%20to%20the%20FTC%E2%80%99s%20complaint,%20the%20Lumosity%20program%20consists%20of%2040%20games%20purportedly%20designed%20to%20target%20and%20train%20specific%20areas%20of%20the%20brain.Lumosity%20has%20been%20widely%20promoted%20though%20TV%20and%20radio%20advertisements%20on%20networks%20including%20CNN,%20Fox%20News,%20the%20History%20Channel,%20National%20Public%20Radio,%20Pandora,%20Sirius%20XM,%20and%20Spotify.The%20FTC%20alleges%20that%20the%20defendants%20claimed%20training%20with%20Lumosity%20would%201)%20improve%20performance%20on%20everyday%20tasks,%20in%20school,%20at%20work,%20and%20in)

FOR RELEASE

January 5, 2016

The creators and marketers of the Lumosity “brain training” program have agreed to settle Federal Trade Commission charges alleging that they deceived consumers with unfounded claims that Lumosity games can help users perform better at work and in school, and reduce or delay cognitive impairment associated with age and other serious health conditions.

As part of the [settlement, Lumos Labs, the company behind Lumosity, will pay $2 million in redress](https://www.ftc.gov/system/files/documents/cases/160105lumoslabsstip.pdf)and will notify subscribers of the FTC action and provide them with an easy way to cancel their auto-renewal to avoid future billing.

“Lumosity preyed on consumers’ fears about age-related cognitive decline, suggesting their games could stave off memory loss, dementia, and even Alzheimer’s disease,” said Jessica Rich, Director of the FTC’s Bureau of Consumer Protection. “But Lumosity simply did not have the science to back up its ads.”

According to the [FTC’s complaint](https://www.ftc.gov/system/files/documents/cases/160105lumoslabscmpt.pdf), the Lumosity program consists of 40 games purportedly designed to target and train specific areas of the brain. The company advertised that training on these games for 10 to 15 minutes three or four times a week could help users achieve their “full potential in every aspect of life.” The company sold both online and mobile app subscriptions, with options ranging from monthly ($14.95) to lifetime ($299.95) memberships.

Lumosity has been widely promoted though TV and radio advertisements on networks including CNN, Fox News, the History Channel, National Public Radio, Pandora, Sirius XM, and Spotify. The defendants also marketed through emails, blog posts, social media, and on their website, Lumosity.com, and used Google AdWords to drive traffic to their website, purchasing hundreds of keywords related to memory, cognition, dementia, and Alzheimer’s disease, according to the complaint.

The FTC alleges that the defendants claimed training with Lumosity would 1) improve performance on everyday tasks, in school, at work, and in athletics; 2) delay age-related cognitive decline and protect against mild cognitive impairment, dementia, and Alzheimer’s disease; and 3) reduce cognitive impairment associated with health conditions, including stroke, traumatic brain injury, PTSD, ADHD, the side effects of chemotherapy, and Turner syndrome, and that scientific studies proved these benefits.

The complaint also charges the defendants with failing to disclose that some consumer testimonials featured on the website had been solicited through contests that promised significant prizes, including a free iPad, a lifetime Lumosity subscription, and a round-trip to San Francisco.

The proposed stipulated federal court order requires the company and the individual defendants, co-founder and former CEO Kunal Sarkar and co-founder and former Chief Scientific Officer Michael Scanlon, to have competent and reliable scientific evidence before making future claims about any benefits for real-world performance, age-related decline, or other health conditions.

The order also imposes a $50 million judgment against Lumos Labs, which will be suspended due to its financial condition after the company pays $2 million to the Commission. The order requires the company to notify subscribers who signed up for an auto-renewal plan between January 1, 2009 and December 31, 2014 about the FTC action and to provide a means to cancel their subscription.

The Commission vote authorizing the filing of the complaint and proposed stipulated order was 4-0, with [Commissioner Julie Brill issuing a separate concurring statement](https://www.ftc.gov/public-statements/2016/01/concurring-statement-commissioner-julie-brill-matter-lumos-lab-inc). The FTC filed the complaint and proposed order in the U.S. District Court for the Northern District of California, San Francisco Division.

The FTC is a member of the National Prevention Council, which provides coordination and leadership at the federal level regarding prevention, wellness, and health promotion practices. This case advances the National Prevention Council’s goal of increasing the number of Americans who are healthy at every stage of life. This case is part of the FTC’s ongoing efforts to protect consumers from misleading health advertising.

**NOTE:**The Commission authorizes the filing of a complaint when it has “reason to believe” that the law has been or is being violated, and it appears to the Commission that a proceeding is in the public interest. A stipulated order has the force of law when signed by the district court judge.

The Federal Trade Commission works to [promote competition](https://www.ftc.gov/about-ftc/bureaus-offices/bureau-competition), and protect and educate consumers. You can learn more about [how competition benefits consumers](https://www.ftc.gov/sites/default/files/attachments/competition-counts/zgen01.pdf) or [file an antitrust complaint](https://www.ftc.gov/faq/competition/report-antitrust-violation). Like the FTC on [Facebook](https://www.facebook.com/federaltradecommission), follow us on [Twitter](https://twitter.com/FTC), read our [blogs](https://www.ftc.gov/news-events/blogs/competition-matters) and [subscribe to press releases](https://www.ftc.gov/stay-connected) for the latest FTC news and resources.

<https://www.ftc.gov/news-events/press-releases/2016/01/lumosity-pay-2-million-settle-ftc-deceptive-advertising-charges>

<http://longevity.stanford.edu/a-consensus-on-the-brain-training-industry-from-the-scientific-community-2/>

(Other links not shown, but available here:

<https://www.theatlantic.com/science/archive/2016/10/the-weak-evidence-behind-brain-training-games/502559/>

<https://www.scientificamerican.com/article/brain-training-doesn-t-make-you-smarter/>

<https://www.sciencedaily.com/releases/2017/04/170417095528.htm>

<https://www.technologyreview.com/s/602540/brain-training-apps-wont-make-you-smarter/>

<https://www.cnn.com/2016/10/20/health/brain-training-exercises/index.html>

<https://www.learningrx.com/brain-training-101>

<http://www.latimes.com/business/hiltzik/la-fi-mh-if-you-weren-t-smart-enough-20160106-column.html> )

A Consensus on the Brain Training Industry from the Scientific Community (Full Statement)

October 20, 2014

As the baby boomers enter their golden years with mounting concerns about the potential loss of cognitive abilities, markets are responding with products promising to allay anxieties about potential decline. Computer-based cognitive-training software –popularly known as brain games– claim a growing share of the marketplace. The promotion of these products reassures and entices a worried public.

Consumers are told that playing brain games will make them smarter, more alert, and able to learn faster and better. In other words, the promise is that if you adhere to a prescribed regimen of cognitive exercise, you will reduce cognitive slowing and forgetfulness, and will fundamentally improve your mind and brain.

It is customary for advertising to highlight the benefits and overstate potential advantages of their products. In the brain-game market, advertisements also reassure consumers that claims and promises are based on solid scientific evidence, as the games are “designed by neuroscientists” at top universities and research centers. Some companies present lists of credentialed scientific consultants and keep registries of scientific studies pertinent to cognitive training. Often, however, the cited research is only tangentially related to the scientific claims of the company, and to the games they sell. In addition, even published peer-reviewed studies merit critical evaluation. A prudent approach calls for integrating findings over a body of research rather than relying on single studies that often include only a small number of participants.

The Stanford Center on Longevity and the Berlin Max Planck Institute for Human Development gathered many of the world’s leading cognitive psychologists and neuroscientists –people who have dedicated their careers to studying the aging mind and brain– to share their views about brain games and offer a consensus report to the public. What do expert scientists think about these claims and promises? Do they have specific recommendations for effective ways to boost cognition in healthy, older adults? Are there merits to the claimed benefits of the brain games and if so, do older adults benefit from brain-game learning in the same ways younger people do? How large are the gains associated with computer-based cognitive exercises? Are the gains restricted to specific skills or does general cognitive aptitude improve? How does playing games compare with other proposed means of mitigating age-related declines, such as physical activity and exercise, meditation, or social engagement?

The search for effective means of mitigating or postponing age-related cognitive declines has taught most of us to recognize the enormous complexity of the subject matter. Like many challenging scientific topics, this is a devil of many details. The consensus of the group is that claims promoting brain games are frequently exaggerated and at times misleading. Cognitive training produces statistically significant improvement in practiced skills that sometimes extends to improvement on other cognitive tasks administered in the lab. In some studies, such gains endure, while other reports document dissipation over time. In commercial promotion, these small, narrow, and fleeting advances are often billed as general and lasting improvements of mind and brain. The aggressive advertising entices consumers to spend money on products and to take up new behaviors, such as gaming, based on these exaggerated claims. As frequently happens, initial findings, based on small samples, generate understandable excitement by suggesting that some brain games may enhance specific aspects of behavior and even alter related brain structures and functions. However, as the findings accumulate, compelling evidence of general and enduring positive effects on the way people’s minds and brains age has remained elusive.

These conclusions do not mean that the brain does not remain malleable, even in old age. Any mentally effortful new experience, such as learning a language, acquiring a motor skill, navigating in a new environment, and, yes, playing commercially available computer games, will produce changes in those neural systems that support acquisition of the new skill. For example, there may be an increase in the number of synapses, the number of neurons and supporting cells, or a strengthening of the connections among them. This type of brain plasticity is possible throughout the life span, though younger brains seem to have an advantage over the older ones. It would be appropriate to conclude from such work that the potential to learn new skills remains intact throughout the life span. However at this point it is not appropriate to conclude that training-induced changes go significantly beyond the learned skills, that they affect broad abilities with real-world relevance, or that they generally promote “brain health”.

As we take a closer look at the evidence on brain games, one issue needs to be kept in mind: It is not sufficient to test the hypothesis of training-induced benefits against the assumption that training brings no performance increases at all. Rather, we need to establish that observed benefits are not easily and more parsimoniously explained by factors that are long known to benefit performance, such as the acquisition of new strategies or changes in motivation. It is well established, for example, that improvements on a particular memory task often result from subtle changes in *strategy*thatreflect improvement in managing the demands of that particular task. Such improvement is rewarding for players (the fun factor) but does not imply a general improvement in memory. In fact, the notion that performance on a single task cannot stand in for an entire ability is a cornerstone of scientific psychology. Claims about brain games often ignore this tenet. In psychology, it is good scientific practice to combine information provided by many tasks to generate an overall index representing a given *ability*. According to the American Psychological Association, newly developed psychological tests must meet specific psychometric standards, including reliability and validity. The same standards should be extended into the brain game industry, but this is not the state of affairs today.

To date, there is little evidence that playing brain games improves underlying broad cognitive abilities, or that it enables one to better navigate a complex realm of everyday life. Some intriguing isolated reports do inspire additional research, however. For instance, some studies suggest that both non-computerized reasoning and computerized speed-of-processing training are associated with improved driving in older adults and a reduction in the number of accidents. Another study revealed, for a sample of younger adults, that 100 days of practicing 12 different computerized cognitive tasks resulted in small general improvements in the cognitive abilities of reasoning and episodic memory, some of which were maintained over a period of two years. In other studies, older adults have reported that they felt better about everyday functioning after cognitive training, but no objective measures supported that impression. Additional systematic research is needed to replicate, clarify, consolidate, and expand such results. To be fully credible, an empirical test of the usefulness of brain games needs to address the following questions. Does the improvement encompass a broad array of tasks that constitute a particular *ability*, or does it just reflect the acquisition of specific skills? Do the gains persist for a reasonable amount of time? Are the positive changes noticed in real life indices of cognitive health? What role do motivation and expectations play in bringing about improvements in cognition when they are observed?

In a balanced evaluation of brain games, we also need to keep in mind opportunity costs. Time spent playing the games is time not spent reading, socializing, gardening, exercising, or engaging in many other activities that may benefit cognitive and physical health of older adults. Given that the effects of playing the games tend to be task-specific, it may be advisable to train an activity that by itself comes with benefits for everyday life. Another drawback of publicizing computer games as a fix to deteriorating cognitive performance is that it diverts attention and resources from prevention efforts. The promise of a magic bullet detracts from the message that cognitive vigor in old age, to the extent that it can be influenced by the lives we live, reflects the long-term effects of a healthy and active lifestyle.

We also must keep in mind that studies reporting positive effects of brain games on cognition are more likely to be published than studies with null results –the so-called “file drawer effect”– such that even the available evidence is likely to draw an overly positive picture of the true state of affairs. Statistical methods such meta-analysis, which integrates the results of many studies in a given field of inquiry, allow estimation of effect magnitude as well as the likelihood of the file-drawer effect. While some meta-analyses report small positive effects of training on cognition, others note substantial disparities in methodological rigor among the studies that cast doubt on any firm conclusion. Further, the problems that haunt individual studies do not simply disappear when results from such studies are summarized in a meta-analysis. In particular, the practice of assessing specific tests rather than broader assays of ability is just as problematic on the level of meta-analytic integration as it is on the level of individual studies.

In summary, research on aging has shown that the human mind is malleable throughout life span. In developed countries around the world, later-born cohorts live longer and reach old age with higher levels of cognitive functioning than those who were born in earlier times. When researchers follow people across their adult lives, they find that those who live cognitively active, socially connected lives and maintain healthy lifestyles are less likely to suffer debilitating illness and early cognitive decline in their golden years than their sedentary, cognitively and socially disengaged counterparts. The goal of research on the effectiveness of computer-based cognitive exercise is to provide experimental evidence to support or qualify these observations. Some of the initial results are promising and make further research highly desirable. However, at present, these findings do not provide a sound basis for the claims made by commercial companies selling brain games. Many scientists cringe at exuberant advertisements claiming improvements in the speed and efficiency of cognitive processing and dramatic gains in “intelligence”, in particular when these appear in otherwise trusted news sources. In the judgment of the signatories below, exaggerated and misleading claims exploit the anxiety of adults facing old age for commercial purposes. Perhaps the most pernicious claim, devoid of any scientifically credible evidence, is that brain games prevent or reverse Alzheimer’s disease.

In closing, we offer five recommendations. Some of these recommendations reflect experimental findings in human populations, whereas others are based on a synthesis of correlational evidence in humans and mechanistic knowledge about risks and protective factors.

* Much more research needs to be done before we understand whether and what types of challenges and engagements benefit cognitive functioning in everyday life. In the absence of clear evidence, the recommendation of the group, based largely on correlational findings, is that individuals lead physically active, intellectually challenging, and socially engaged lives, in ways that work for them. Before investing time and money on brain games, consider what economists call opportunity costs: If an hour spent doing solo software drills is an hour not spent hiking, learning Italian, making a new recipe, or playing with your grandchildren, it may not be worth it. But if it replaces time spent in a sedentary state, like watching television, the choice may make more sense for you.
* Physical exercise is a moderately effective way to improve general health, including brain fitness. Scientists have found that regular aerobic exercise increases blood flow to the brain, and helps to support formation of new neural and vascular connections. Physical exercise has been shown to improve attention, reasoning, and components of memory. All said, one can expect small but noticeable gains in cognitive performance, or attenuation of loss, from taking up aerobic exercise training.
* A single study, conducted by researchers with financial interests in the product, or one quote from a scientist advocating the product, is not enough to assume that a game has been rigorously examined. Findings need to be replicated at multiple sites, based on studies conducted by independent researchers who are funded by independent sources. Moreover, participants of training programs should show evidence of significant advantage over a comparison group that does not receive the treatment but is otherwise treated exactly the same as the trained group.
* No studies have demonstrated that playing brain games cures or prevents Alzheimer’s disease or other forms of dementia.
* Do not expect that cognitively challenging activities will work like one-shot treatments or vaccines; there is little evidence that you can do something once (or even for a concentrated period) and be inoculated against the effects of aging in an enduring way. In all likelihood, gains won’t last long after you stop the challenge.

*In summary: We object to the claim that brain games offer consumers a scientifically grounded avenue to reduce or reverse cognitive decline when there is no compelling scientific evidence to date that they do. The promise of a magic bullet detracts from the best evidence to date, which is that cognitive health in old age reflects the long-term effects of healthy, engaged lifestyles. In the judgment of the signatories, exaggerated and misleading claims exploit the anxiety of older adults about impending cognitive decline. We encourage continued careful research and validation in this field.*

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(There is also a summary statement at <http://longevity.stanford.edu/a-consensus-on-the-brain-training-industry-from-the-scientific-community/>)

Signed: List of participants; \*indicates that the signer has a current conflict of interest, defined as having financial interests (research funding, stock options, or stocks) in the brain gaming or competing (e.g., pharmacological) industries.

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