

Accelerated Cure Project for MS

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Improve Your Thinking While Living With MS

Maintaining mobility is one of the top concerns for people with MS. However, a loss of cognitive function can be just as devastating. [Studies](#) suggest up to 65% of people with MS have problems with aspects of thinking, such as memory, concentration or problem solving, at some point in the course of their disease. These difficulties usually develop gradually over time. As we discussed in our [March 2019 newsletter](#), cognitive difficulties can have a big impact on daily life. Recognizing symptoms of MS-related cognitive decline is important for early intervention. Preventive strategies, such as being vigilant about medications and managing co-morbidities that may worsen cognitive symptoms (such as sleep disorders) are also key to keeping cognitive function as healthy as possible.



Assistive technology (AT) is any item that is used to improve an individual's function at home, work, school, or in the community. Cognitive AT helps with thought processes like focus, attention, memory, organization, management or planning events/activities. There are two categories of cognitive AT, internal and external. An internal aid is a way of thinking to enhance a particular cognitive process. External cognitive aids, as the name implies, are external items or devices that assist with thought processes. For example, [research](#) shows memory loss is common in people with MS. [Internal memory aids](#) help to focus attention and give meaning to what one may be trying to learn or remember. Some helpful thought patterns may be as simple as repetition, or mental imagery (creating a picture of something in one's mind) to help recall information. Some people also find creating rhymes or stories about what they are trying to remember, or linking things together to be helpful. Some useful [external memory aids](#) may include lists, sticky notes, white boards, diaries, or calendars. There is [evidence](#) that using a personal digital assistant (PDA) improves cognitive and daily function in people with MS. A box or bin can be placed in a central area for everyday items, such as keys or glasses, to prevent misplacing

these items. Pillboxes are a useful aid to organize daily medications. Some have built-in alarms that alert individuals when it's time to take their medicine. Cell phones are a useful external memory aid in many ways. Contact lists reduce the need to remember phone numbers. Individuals can take a picture of new people, places or things and email them to themselves with a note to help remember them later. GPS systems on cell phones (or in cars) can prevent one from getting lost. Phone apps can help people with MS stay organized, track disease activity and store medical information. As discussed in our [May 2018 newsletter](#), MSAA has developed a free mobile app, [My MS Manager™](#), which can collect and store the above information, and securely share it with an individual's healthcare team. The app enables those with MS and their physicians to closely track and manage disease activity.

[Research](#) suggests that people with MS who maintain mental activity, such as reading or puzzles, are able to withstand considerable disease burden (white matter lesions or brain atrophy) without cognitive impairment. There are a number of fun ways to stimulate the brain. Games like Sudoku, solitaire, and dominoes all require some form of sequencing (arranging items in a particular order), problem solving, reasoning and [mental flexibility](#), all of which may be affected by MS. These types of games utilize and strengthen these skills. Crossword puzzles and Scrabble provide equal benefit with an added language component that can reinforce word retrieval. Jigsaw puzzles, hidden pictures, word/number searches, and mazes are all types of search and find games that boost visual-perceptual skills, another area that those living with MS may struggle with.



[Brain-training](#) websites and apps have become increasingly popular over the last few years. Brain training is based on the premise that mental stimulation can improve neuroplasticity. As we discussed in our [April 2019 newsletter](#), neuroplasticity is the brain's ability to form and reorganize connections between brain cells in response to new tasks. The effectiveness of brain training in boosting mental function is well documented. A [2013 study](#) showed brain training games improve [executive functions](#), working memory, and processing speed in young adults. Another [study](#) found three months of cognitive training leads to significant improvements in attention and memory in older adults (aged 65 or older). These results suggest brain-training games may be a simple and convenient way to improve some cognitive functions for people of all ages.



[Brain HQ](#) is an online brain-training system that offers 29 different activities designed to “exercise” an individual’s attention, brain speed, memory, people skills, navigation, and intelligence. Each exercise adapts in difficulty, so users always train at an optimum level (where they are most likely to make cognitive improvements). A [recent study](#), using a version of Brain HQ specifically designed for research, suggests that this type of online training program, accessed from home, can improve brain functioning in people with MS. Researchers studied 135 subjects with MS, each experiencing cognitive difficulties. Participants were randomly assigned to either a brain-training program or to a control group using ordinary computer games (word puzzles and other games). Researchers found that the subjects in the brain-training group had significantly greater improvement in cognitive function, even though those in the control group spent more time playing computer games.

There are many other websites offering free brain-training games for individuals to keep their thinking and memory sharp. These activities can be accessed online or via apps on mobile devices (smartphones and tablets). [Lumosity](#) offers more than 50 mini games that are designed to train five cognitive functions: speed, memory, attention, flexibility, and problem solving. At sign-up, users complete a "fit test," which measures their initial speed, attention, and memory. This provides insight into the areas of cognition that require the most attention. Each day going forward, Lumosity sends a reminder to complete a brain "workout," which involves 3-5 mini games. The games on [CogniFit](#) are also designed to improve a wide variety of cognitive functions. This program offers [brain-training exercises](#) tailored to MS. Activities include puzzles and games, appropriate for all ages, focused on strengthening many cognitive processes (memory, concentration, planning, reasoning, mental agility and learning).



Some websites focus on education as a means to improve cognitive functioning. [Khan Academy](#) is a nonprofit organization whose mission is to provide a free, quality education to anyone, anywhere. Khan Academy offers practice exercises, instructional videos, and a personalized learning dashboard that allow users to study at their own pace. Their app allows individuals to download more than 4,000 videos on a wide variety of subjects.

These resources are available in more than 36 languages. A recent [study](#) suggests bilingualism has a positive effect on cognition later in life, not just for those living with MS but in general. Results indicate this benefit occurs in individuals who speak two or more languages, even those who acquire a second language in adulthood. [Duolingo](#) is a platform that includes a language-learning website and app, as well as a language proficiency assessment exam. As of January 2019, Duolingo offers 85 different language courses in 24 languages.

[Charge Your Brain](#) is another brain-training app that is available on the iTunes App Store.

It's described as a "colorful brain-teaser with lots of mini games." Each mini game is designed to train different parts of the brain and different types of memory. An interactive guide (Kate) helps users in the app. Users earn medals upon completion of each game based on how many problems they solve correctly. [Research](#) shows that exposure to art boosts intelligence and critical thinking skills. [DailyArt](#) is a free app that sends one piece of fine art every day to the user's mobile device via a push notification.



Users can explore and search a collection of more than 2,000 masterpieces, as well as read artist biographies and get information on a large number of museum collections. Users can also share the paintings with family and friends on social media or via email.



A [recent study](#) found video games targeting cognitive abilities may improve brain function in people with MS. [Big Brain Academy](#) is one such video game that offers activities targeting memory, attention, visual-perceptual skills, and processing speed. Tests are done throughout the game in order to hypothetically measure the player's "brain mass." (This

is not a literal measurement, but rather a parameter within the game.) According to the game, the heavier the brain, the smarter the brain is or the better its reaction time. At the beginning of the game, users take a test to determine the appropriate difficulty level of activities. One can then choose from a variety of puzzles from five categories: logic, reasoning, math, visual, or memory. [Brain Age](#) is a series of brain-training video games developed and published by Nintendo. Brain Age also features a variety of puzzles, such as [stroop tests](#), mathematical questions, and Sudoku puzzles, all designed to help keep certain parts of the brain active. Japanese [researchers](#) found that elderly participants who played Brain Age for four weeks experienced improvements in executive functions, such as sequencing, problem solving, reasoning, mental flexibility, and processing speed. Mini-games included with Brain Age also target other cognitive processes, such as memory, attention, and visual-perceptual skills.

A new technology called [transcranial direct current stimulation](#) (tDCS) has been recently shown to improve some of the symptoms of MS. During the tDCS procedure, a low-amplitude current travels through a set of electrodes, which are placed on a person's scalp. The electric current stimulates the brain, thus enabling neurons to signal to each other more easily. This, in turn, improves neural connectivity and hastens the learning process. Researchers from NYU conducted a [study](#) during which 45 subjects with MS participated in a brain-training program, playing computer games to improve cognitive skills, such as problem solving, attention, information processing, response time, and other working memory skills. 25 subjects used tDCS during these activities, and a control group of 20 participants underwent cognitive training without tDCS. Data showed the tDCS group had higher cognitive scores and significantly improved response times than the control group. These results suggest that tDCS, performed under a supervised treatment protocol, may provide an exciting new treatment option for people with MS struggling with cognitive symptoms. There are a number of [tDCS products](#) available for purchase. It's important to note that these devices are not standardized. There are many factors to consider that may vary widely between devices, including electrode size and positioning, intensity and duration of stimulation, number of sessions per day, and the interval between sessions. This technology should only be considered in consultation with one's physician.



There is mounting evidence that mental stimulation holds great benefit for people with MS. Cognitive exercise is similar to physical exercise in many ways. Challenging oneself is key to seeing benefits. Furthermore, it is important to workout consistently to maintain or increase any improvements made. There are many different ways to engage in cognitive exercise and many types of brain training games available online, via smartphone apps or as traditional board games. Before beginning a cognitive exercise program, it's important for individuals with MS to first have any difficulties they may be experiencing addressed by a healthcare professional, and seek their recommendation for appropriate activities or aids that may be of benefit.

