

NEW LEARNING BY BRAIN REGION LIST

The parts of your brain that you use will grow, and the parts of your brain that you do not use atrophy, or shrink. This provides guidance on how to exercise the brain. Just doing crossword puzzles or Sudoku is not going to give you the full benefit you want. That's like going to the gym, doing right bicep curls and then leaving. Here are some ideas for doing "whole brain combination workouts."

Prefrontal Cortex (PFC) Exercises:

- Language games – such as Scrabble (if you memorize the Scrabble dictionary, you will crush your friends at the game), Boggle, Words with Friends
- Crossword puzzles
- Speech and debate classes in college
- Strategy games – such as chess
- Tetris (also works parietal and occipital lobes) – after just three minutes, it can help decrease cravings for drugs (alcohol, nicotine, caffeine), food and drink and activities (sex, exercise, gaming)
- Prayer and meditation – may be the most powerful prefrontal cortex booster of all. I have published several studies on meditation, and it reliably activates the prefrontal cortex. It helps you have better focus and executive function, judgment and impulse control, so you can make more thoughtful and moral decisions. In a study of meditative prayer, my friend and colleague Andrew Newberg, M.D., a neuroscientist at Thomas Jefferson University, found increased blood flow to the PFC. The Franciscan nuns performed a practice called "centering prayer," which requires that an individual focus attention on a phrase from the Bible or a prayer over a period of time with the goal of "opening themselves to being in the presence of God."
- Weight training and aerobic activity (fast walking) – when combined, these activities increased executive function—which encompasses complex thought processes, including reasoning, planning, problem-solving and multitasking—in dementia patients!

Temporal Lobe Exercises:

- Super Mario 3D World – but not 2D Angry Birds, for enhanced hippocampal function
- Intensive learning – such as medical or law school, increased hippocampal size after just 14 weeks
- Memorization of poetry and prose – increased hippocampal size
- Memory and mnemonic training diagram
- Learning to play new musical instruments – involves PFC, parietal lobes and cerebellum
- Physical exercise – increases the hippocampus, so learn a new sport while you exercise



Parietal Lobe Exercises:

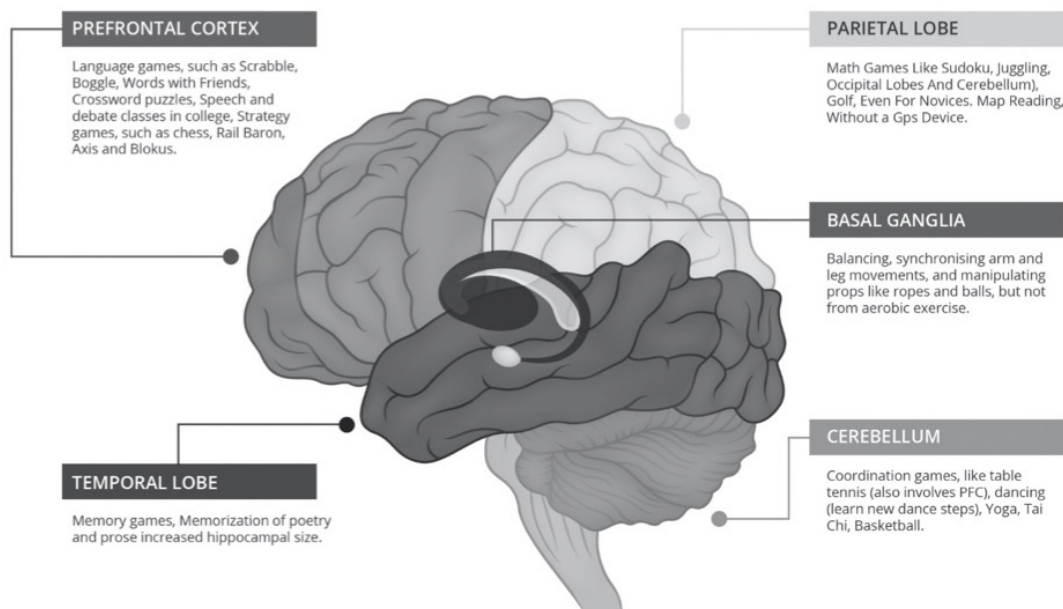
- Math games – like Sudoku
- Juggling – involves PFC, temporal lobes (hippocampus), occipital lobes and cerebellum
- Golf, even for novices – forty hours of training increases gray matter in the parietal and occipital lobes
- Dance – including the tango, even for those with Parkinson’s disease
- Learning to read and play music
- Map reading – without a GPS device

Basal Ganglia Exercises

- Balancing
- Synchronizing arm and leg movements
- Manipulating props – like ropes and balls, but not from aerobic exercise

Cerebellum Exercises

- Coordination games – like table tennis (also involves PFC), dancing (learn new dance steps), yoga, tai chi
- Basketball



The list of ways to stimulate your brain with new learning is likely to be endless. When you choose, follow these guidelines: Each one should be challenging, new and something you love.

THE END OF MENTAL ILLNESS: BRAIN HEALTH REVOLUTION

- Hardy JL et al. Enhancing Cognitive Abilities with Comprehensive Training: A Large, Online, Randomized, Active Controlled Trial. *PLoS One*. 2015 Sep 2;10(9):e0134467.
- Nouchi R et al. Brain training game boosts executive functions, working memory and processing speed in the young adults: a randomized controlled trial. *PLoS One*. 2013;8(2):e55518.
- Skorka-Brown J et al. Playing Tetris decreases drug and other cravings in real world settings. *Addict Behav*. 2015 Dec;51:165-70.
- van Dillen LF, Andrade J. Derailing the streetcar named desire. Cognitive distractions reduce individual differences in cravings and unhealthy snacking in response to palatable food. *Appetite*. 2016 Jan 1;96:102-10.
- Khalsa DS et al. Cerebral blood flow changes during chanting meditation. *Nucl Med Commun*. 2009 Dec;30(12):956-61
- Newberg A et al. Cerebral blood flow during meditative prayer: preliminary findings and methodological issues. *Percept Mot Skills*. 2003 Oct;97(2):625-30.
- Bossers WJ et al. A 9-Week Aerobic and Strength Training Program Improves Cognitive and Motor Function in Patients with Dementia: A Randomized, Controlled Trial. *Am J Geriatr Psychiatry*. 2015 Nov;23(11):1106-16.
- Liu-Ambrose T et al. Resistance training and executive functions: a 12-month randomized controlled trial. *Arch Intern Med*. 2010 Jan 25;170(2):170-8.
- Clemenson GD, Stark CE. Virtual Environmental Enrichment through Video Games Improves Hippocampal-Associated Memory. *J Neurosci*. 2015 Dec 9;35(49):16116-25.
- Koch K et al. Extensive learning is associated with gray matter changes in the right hippocampus. *Neuroimage*. 2016 Jan 15;125:627-32.
- Roche RA et al. Prolonged rote learning produces delayed memory facilitation and metabolic changes in the hippocampus of the ageing human brain. *BMC Neurosci*. 2009 Nov 20;10:136.
- Dresler M et al. Mnemonic Training Reshapes Brain Networks to Support Superior Memory. *Neuron*. 2017 Mar 8;93(5):1227-1235.e6.
- Herdener M et al. Musical training induces functional plasticity in human hippocampus. *J Neurosci*. 2010 Jan 27;30(4):1377-84.
- Kirk I et al. Exercise training increases size of hippocampus and improves memory. *Proc Natl Acad Sci U S A*. 2011 Feb 15; 108(7): 3017–3022.
- Gerber P et al. Juggling revisited - a voxel-based morphometry study with expert jugglers. *Neuroimage*. 2014 Jul 15;95:320-5.
- Boyke J et al. Training-induced brain structure changes in the elderly. *J Neurosci*. 2008 Jul 9;28(28):7031-5.
- Bezzola L et al. Training-induced neural plasticity in golf novices. *J Neurosci*. 2011 Aug 31;31(35):12444-8.
- Brown S et al. The neural basis of human dance. *Cereb Cortex*. 2006 Aug;16(8):1157-67.
- Sacco K et al. Motor imagery of walking following training in locomotor attention. The effect of “the tango lesson”. *Neuroimage*. 2006 Sep;32(3):1441-9. Epub 2006 Jul 24.
- Hackney ME, Earhart GM. Effects of dance on movement control in Parkinson’s disease: a comparison of Argentine tango and American ballroom. *J Rehabil Med*. 2009 May;41(6):475-81.
- Stewart L et al. Brain changes after learning to read and play music. *Neuroimage*. 2003 Sep;20(1):71-83.
- Niemann C et al. Exercise-induced changes in basal ganglia volume and cognition in older adults. *Neuroscience*. 2014 Dec 5;281:147-63.
- Park IS et al. Experience-dependent plasticity of cerebellar vermis in basketball players. *Cerebellum*. 2009 Sep;8(3):334-9

