There is new research that suggests humans and animals can create new neurons in the hippocampus, according to “Psychology Today,” which was previously not thought possible.

SHUTTERSTOCK

This article, along with others that explore mind, body and soul, is excerpted from a Newsweek Special Edition.

The quest for ways to improve our brain would be a whole lot easier if scientists understood the mechanisms of intelligence even half as well as they do the mechanisms of, say, muscular strength. If we had the neuronal version of how lifting weights increases strength (chemical and electrical signals increase the number of filament bundles inside muscle cells), we’d be good to go.
The quest for effective ways to boost cognitive capacity is not hopeless, however. One of the strongest findings in neuropsychology, the science of how the brain changes its structure and functions in response to input, is that attention is almost magical in its ability to physically alter the brain and enlarge functional circuits. That might explain why skills we’re already good at don’t make us much smarter: We don’t pay much attention to them. In contrast, taking up a new, cognitively demanding activity—ballroom dancing, a foreign language—is more likely to boost processing speed, strengthen synapses and expand or create functional networks.

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By nailing down the underpinnings of cognition, neuroscientists can separate plausible brain boosters from dubious ones. With apologies to the political-correctness police, nicotine enhances attention—that key driver of neuroplasticity—and cognitive performance in both smokers and nonsmokers, scientists at the National Institute on Drug Abuse reported in a 2010 analysis of 41 double-blind, placebo-controlled studies. Nicotine, they found, has “significant positive effects” on fine motor skills, the accuracy of short-term memory, some forms of attention and working memory, among other basic cognitive skills. The improvements “likely represent true performance enhancement” and “beneficial cognitive effects.”

The reason is that nicotine binds to the brain receptors for the neurotransmitter acetylcholine that are central players in cortical circuits. (Caveat: Smoking also increases your risk of dementia, so while cigarettes may boost your memory and attention now, you could pay for it later. To be determined: whether a nicotine patch delivers the benefits without the risks.)

Neuroscience supports the cognitive benefits of stimulants like Adderall and Ritalin, too, at least in some people for some tasks. Both drugs (as well as caffeine) raise the brain levels of dopamine, the juice that produces motivation and the feeling of reward. They do not improve verbal fluency, reasoning or abstract thought, however, nor do they provide much benefit to people with a gene variant that keeps dopamine activity high, says a recent study.

But there’s a difference between reaching your natural potential by removing impediments and actually raising that potential. The latter requires tapping into one of the best-established phenomena in neuroscience—namely, that the more you use a circuit, the stronger it gets. As a result, a skill you focus on improves and even commandeers more neuronal real estate with corresponding improvements in performance. London cabdrivers who memorize that city’s insanely confusing streets (25,000 of them) have a larger posterior hippocampus, the region that files spatial memories, than the average Londoner, neuroscientist Eleanor Maguire of University College London discovered in 2003. Conversely, if we offload our navigational ability onto GPS, we’ll lose it.

The rule that “neurons that fire together, wire together” suggests that cognitive training should boost mental prowess. Studies are finding just that, but with a crucial caveat. Training your memory, reasoning or speed of processing improves that skill, found a large government-sponsored study called Active. Unfortunately, there is no transfer: Improving processing speed does not improve memory, and improving memory does not improve reasoning. Similarly, doing crossword puzzles will only improve your ability to do crosswords. “The research so far suggests that cognitive training benefits only the task used in training and does not generalize to other tasks,” says neuroscientist Yaakov Stern of Columbia University.

The holy grail of brain training is something that does transfer, and here there are three good candidates. The first is physical exercise. Simple aerobic exercise, such as walking 45 minutes a day three times a week, improves episodic memory and executive-control functions by about 20 percent, finds Art Kramer of the University of Illinois at Urbana-Champaign. His studies have mostly been done in older adults, so it’s possible the results apply only to people whose brain physiology has begun to deteriorate—except that it happens starting in our 20s.

Exercise stimulates the creation of new neurons in the region of the hippocampus that files away experiences and new knowledge. Exercise stimulates the production of new synapses, the connections that constitute functional circuits and whose capacity and efficiency underlie superior intelligence. Kramer finds that a year of exercise can give a 70-year-old the connectivity of a 30-year-old, improving memory, planning, dealing with ambiguity and multitasking. “You can think of fitness training as changing the molecular and cellular building blocks that underlie many cognitive skills,” Kramer says. “It thus provides more generalizable benefits than specifically training memory or decision making.”
The second form of overall mental training is meditation, which can increase the thickness of regions that control attention and process sensory signals from the outside world. In a program that neuroscientist Amishi Jha of the University of Miami calls mindfulness-based mind-fitness training, participants build concentration by focusing on one object, such as a particular body sensation. The training, she says, has shown success in enhancing mental agility and attention “by changing brain structure and function so that brain processes are more efficient,” a quality associated with higher intelligence.

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Finally, some video games might improve general mental agility. Stern has trained older adults to play a complex computer-based action game called Space Fortress, which requires players to shoot missiles and destroy the fortress while protecting their spaceship against missiles and mines. “It requires motor control, visual search, working memory, long-term memory and decision making,” he says. It also requires that elixir of neuroplasticity: attention, specifically the ability to control and switch attention among different tasks. “People get better on tests of memory, motor speed, visual-spatial skills and tasks requiring cognitive flexibility,” Stern says.

Kramer, too, finds that the strategy-heavy video game Rise of Nations improves executive-control functions such as task switching, working memory, visual short-term memory and reasoning in older adults. Few games or training programs have been tested to this extent, and many of those that have been come up short. Those with increasing levels of difficulty and intense demands on attentional capacity—focus as well as switching—probably do the most good...as does taking a brisk walk in between levels.

By Sharon Begley

This was excerpted from Newsweek’s Special Edition, Your Amazing Body: Leading Experts Reveal the Science and Secrets Behind Living Longer and Better, by Issue Editor James Ellis.