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## Brain Power and Exercise: How to Improve Memory and Learning

Physical activity not only encourages new brain cells to be born, it also produces smart chemicals that helps them learn.

by John Ratey, M.D.

Filed Under: [Exercise and ADHD](#), [Brain Training for ADHD](#)

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The body was designed to be pushed, and when we push our bodies, we push our brains, too. Learning and memory evolved in concert with the motor functions that allowed our ancestors to track down food. As far as our brains are concerned, if we're not moving, there's no real need to learn anything.

Exercise improves learning on three levels: It optimizes your mindset, by improving alertness, attention, and motivation. It prepares and encourages nerve cells to bind to one another, which is the cellular basis for learning new information. And it spurs the development of new nerve cells from stem cells in the hippocampus, an area of the brain related to memory and learning.

Several progressive schools have experimented with exercise to find out if working out before class boosts a child's reading ability and her performance in other subjects. Guess what? It does.

We know now that the brain is flexible, or plastic, in the parlance of neuroscientists -- more Play-Doh than porcelain. It is an adaptable organ that can be molded by input in much the same way as a muscle can be sculpted by lifting barbells. The more you use it, the stronger and more flexible it becomes.

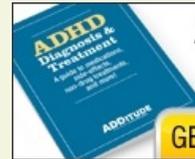
Far from being hardwired, as scientists once envisioned it, the brain is constantly being rewired. I'm here to teach you how to be your own electrician.

### Exercise: A Drug for Your Brain?

It's all about communication. The brain is made up of one hundred billion neurons of various types that chat with one another by way of hundreds of different chemicals, to govern our thoughts and actions. Each brain cell might receive input from a hundred thousand others before firing off its own signal. The junction between cell branches is

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the synapse, and this is where the rubber meets the road. The way it works is that an electrical signal shoots down the axon, the outgoing branch, until it reaches the synapse, where a neurotransmitter carries the message across the synaptic gap in chemical form. On the other side, at the dendrite, or the receiving branch, the neurotransmitter plugs into a receptor -- like a key into a lock -- and this opens ion channels in the cell membrane to turn the signal back into electricity.

About 80 percent of the signaling in the brain is carried out by two neurotransmitters that balance each other's effect: Glutamate stirs up activity to begin the signaling cascade, and gamma aminobutyric acid (GABA) clamps down on activity. When glutamate delivers a signal between two neurons that haven't spoken before, the activity primes the pump. The more often the connection is activated, the stronger the attraction becomes. As the saying goes, neurons that fire together wire together. Which makes glutamate a crucial ingredient in learning.

Psychiatry focuses more on a group of neurotransmitters that act as regulators -- of the signaling process and of everything else the brain does. These are serotonin, norepinephrine, and dopamine. And although the neurons that produce them account for only one percent of the brain's hundred billion cells, these neurotransmitters wield powerful influence. They might instruct a neuron to make more glutamate, or they might make the neuron more efficient or alter the sensitivity of its receptors. They can lower the "noise" in the brain, or, conversely, amplify those signals.

I tell people that going for a run is like taking a little bit of Prozac and a little bit of [Ritalin](#) because, like the [drugs](#), exercise elevates these neurotransmitters. It's a handy metaphor to get the point across, but the deeper explanation is that [exercise](#) balances neurotransmitters -- along with the rest of the neurochemicals in the brain.

**Next:** [How the Brain Learns and Creates Memories](#)



This article comes from the Fall 2010 issue of *ADDitude*. To read this issue of *ADDitude* in full, [buy the back issue](#).



To share strategies for managing ADD symptoms with exercise, visit the [ADHD Alternative Treatments](#) support group on ADDConnect.

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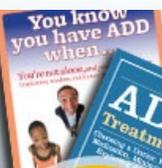
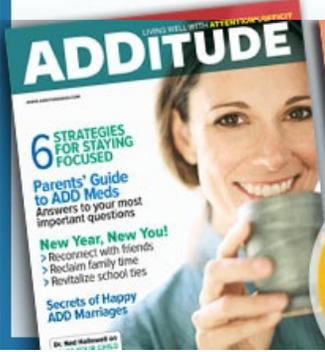


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