

The Exercise Prescription

by Michael Lara, MD

AS MANY PARENTS AND ADULTS WITH ADHD KNOW, making treatment decisions can be difficult. On one hand, prescription medications may help improve symptoms like hyperactivity, inattentiveness, and impulsivity. Unlike antibiotics taken for an infection, however, these medications will not suddenly fix all of your or your child's issues.

Even when the medicine is working, your child might still struggle with forgetfulness, emotional problems, and social awkwardness, or you might find yourself dealing with disorganization, distractibility, and relationship difficulties. It is important to know, though, that ADHD medications are not the only treatment option. There is now a consensus among experts that regular exercise is one of best things you can do to treat ADHD.

ADHD starts in the brain

ADHD stems from a glitch in the brain's attention system, which is made up of an interconnected web of neurons that are spread throughout various areas of the brain, from areas that control arousal, motivation, and reward, to those involved in executive function and movement. These attention circuits are regulated by neurotransmitters such as norepinephrine and dopamine, which help usher messages from one part of the system to another.

Broadly speaking, the problem for people with ADHD is that communication within their attention system is often patchy and disconnected (Mazaheri, 2010, and Pliska, 1996). Therefore, the goal of ADHD treatment is to fill these gaps in order to decrease distractibility and any other symptoms that might be present. And this is just what exercise does.

A recent study published in the *Journal of Attention Disorders* (Verret, 2012) showed that doing moderate to vigorous intensity exercise forty-five minutes a day, three times a week, for ten weeks improved cognitive func-

tion and behavior in children with ADHD. Specifically, it seemed that the children who followed the exercise program were more efficient at processing information, as demonstrated by faster speeds of visual research and better sustained auditory attention.

Exercise has similar effects as medications

Although most of us equate exercise to changes in our waistline, physical activity also has a profound effect on the brain. Early brain and exercise research has indicated that exercise results in the growth of new nerve cells (neurogenesis), increases in the levels of several different neurotransmitters, and vascular (new blood vessel) adaptations (van Praag, 2009). In fact, scientists have found that moderate to intense exercise actually provokes changes in many of the same neurochemicals and brain structures as popular prescription ADHD medications.

As mentioned previously, the neurotransmitters norepinephrine and dopamine play a major role in regulating the attention system. As a result, they are the most common chemicals targeted by ADHD medications. However, increasing norepinephrine and dopamine is also the broad scientific explanation for exercise's profound effect on the ADHD brain.

Whenever you walk, run, bike or swim, your brain releases lots of these neurotransmitters, which increases the attention system's ability to be regular and consistent by spurring the growth of new receptors in certain areas of the brain. This has many good effects like reducing the need for new stimuli and increasing alertness. John J. Ratey says in his book *Spark: The Revolutionary New Science of Exercise and the Brain* that exercise increases dopamine levels in the rat equivalent of the basal ganglia (which is responsible for the smooth shifting of the attention system and the key



Michael Lara, MD, is a board-certified psychiatrist who practices in Belmont, California. He combines his interests in nutrition and exercise therapy with traditional therapies to treat a spectrum of mood, anxiety, and cognitive disorders.

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for ADHD



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binding site for methylphenidate) by creating new dopamine receptors.

That's all well and good for the rats, but what sort of effect can this have in humans? Ratey described the results of one study that examined the effects of exercise in kids with ADHD by using motor-function tests, which provide indirect measures of dopamine activity. In boys, rigorous exercise improved their ability to stare straight ahead and stick out their tongue, indicating better motor reflex inhibition. Girls, on the other hand, didn't show any improvement, which may be because of a lower incidence of hyperactivity in girls. However, both the boys and the girls improved according to another measure related to the sensitivity of dopamine synapses, although boys fared better after vigorous exercise and girls after moderate exercise.

Another common symptom in children with ADHD, fidgetiness, has been linked to an overactive cerebellum. While recent studies have shown that ADHD drugs that elevate dopamine and norepinephrine bring this area back into balance, exercise has also been shown to be effective, and the more complex the exercise, the better.

Obviously researchers can't teach lab rats to do martial arts or ballet, but they did look at the neurochemical changes in their brains after periods of acrobatic exercise, the closest parallel to these sorts of activities that you can replicate in a lab. Compared to rats running on a treadmill, the rats that practiced complex motor skills had more dramatic improvements in levels of brain-derived neurotrophic factor (BDNF), which suggests that growth is happening in the cerebellum.

But what about adults with ADHD? Unfortunately, less research has been done in this group of patients. However, research into cognitive decline has shown that exercise continues to positively affect the brain well into old age.

What type of exercise is best?

While most clinical studies researching the effects of exercise on ADHD have utilized running on treadmills, you don't have to be a marathoner, or even a jogger, to benefit from exercise. In fact, challenging the body as well as the brain with complex activities like martial arts, ballet, ice skating, gymnastics, rock climbing, and mountain biking seems to have a greater positive impact on children with ADHD than aerobic exercise alone.

One small, unpublished study by a graduate student at Hofstra University (Morand) found that boys with ADHD who participated in martial arts twice a week had greater improvements in behavior and performance on a number of different measures than those who participated in a typical aerobic exercise program (although exercise in general led to dramatic improvements compared to nonactive controls). The kids involved in martial arts finished more of their homework, were better prepared for class, showed greater improvement in their grades, broke fewer rules, and jumped out of their seats less often.

Why is this? Experts don't know for sure, but it is probably due to a number of different factors. According to Ratey, "The technical movements inherent in any of these activities activate a vast array of brain areas that control balance, timing, sequencing, evaluation consequences, switching, error correction, fine motor adjustments, inhibition and of course intense focus and concentration." And, of course, these activities also generally take place the aerobic range, which would boost cognitive abilities and attention in a similar manner to running.



THINKSTOCK

The most important thing to consider when starting an exercise program is to find something you enjoy doing or that your child enjoys doing. That way you or your child will stick with it. Team activities or exercise with a social component can be especially beneficial.

Developing a successful prescriptive exercise program

The general guidelines for using exercise to treating ADHD are to do moderate-intensity cardiovascular activity (65-75 percent of maximal oxygen consumption—VO2 max) for thirty to forty minutes day at least four to five times a week. However, there are a few gaping holes in these guidelines, as few recommendations include resistance training or translate how adults can use exercise for ADHD. However, the general consensus is that exercising for ADHD must be done frequently, with occasional bursts of intensity.

In my practice I frequently recommend exercise therapy for my patients that incorporates cardiovascular training and strength training within a structured program. The program also includes a variety of functional movements that require coordination, balance, and flexibility to boost behavior and performance even more.

However, like medication, exercise only works if you take it. As a result, it is important to work with the ADHD brain (rather than against it) when designing an exercise routine.

Features of the ADHD Brain	Features Incorporated into an ADHD Exercise Program
Need for structure	Structured workouts that are planned and part of a daily routine; done with a personal trainer or in a group setting.
Need for variety	Allow for variety within the structured exercise program: <ul style="list-style-type: none"> • Variety of functional movements, including squats, lunges, upper body push/pulls, twists, dead lifts • Incorporate resistance-training, cardiovascular training and acquisition of new functional movements.
Need to incorporate new skills	Incorporate new functional movements
Need for a system to measure outcomes	Define a specific, measurable goal to keep in mind; for example, to complete a 10K run.

The program I recommend to my patients is modeled after Cross-fit (crossfit.com) and includes circuit training, strength training, and endurance training on a three-day cycle, followed by one day of rest. See the sidebar on page 25, “A Successful Exercise Program for ADHD.”

It is important, however, to build an aerobic-based program before starting a structured exercise program like the one I describe here. One of the most common reasons why patients quit an exercise prescription is that they get injured because they try to do too much too soon. Therefore, I recommend that patients walk for thirty minutes a day four times a week for a

minimum of one month before they begin to add variety.

All of these exercises should be done outdoors whenever possible. At least two studies have suggested that physical activity done in nature reduces ADHD symptoms significantly more than activities done in other settings (Kuo, 2004, and Taylor, 2009).

What about medication?

For a very small handful of people with ADHD, exercise may serve as a viable replacement for prescription medications. For most, however, it is complementary to their treatment—something you or your child should absolutely do, along with taking meds, to help increase attention and improve mood.

I typically tell my patients to exercise in the morning, before they have taken their medication, to benefit from the increased amounts of neurotransmitters that are produced in response to exercise. If one of my patients needs a quick energy boost before their workout, I will sometimes recommend they take one to two grams of the amino acid L-Tyrosine before they start exercising. I also advise my patients to take their stimulant medication about two hours after they finish their workout to take advantage of the cognitive boost provided by exercise.

Some patients find that they can eventually lower their dose of stimulant medication as long as they stick to their exercise program. However, this is definitely something you need to discuss with your doctor. 🗨️

Resources

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