

## Exercise and the AD/HD Brain

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I don't know if your children's school made the same change as my daughters,' but this year they have scheduled Phys. Ed. first thing in the morning. Initially I was very disappointed in this because my youngest daughter has been diagnosed with AD/HD, and I felt that if she could just get through the morning, then Phys. Ed. after lunch would be a great break for her. Then I started to read the research related to exercise and our mental health, and I began to understand the reasoning for what some schools are doing. A great book for getting all the details on this research is *Spark: The Revolutionary New Science of Exercise and the Brain* by John J. Ratey, MD.

It was long believed that we had narrow windows in our development in which our brain was able to grow and produce new neural pathways, and once those windows were closed, we were stuck with what we had. More and more research is pointing to the 'neuroplasticity' of our brains. In other words, the human brain can change as a result of one's experience; the brain is 'plastic' and 'malleable.' Ratey writes, "In fact, the brain responds like muscles do, growing with use, withering with inactivity. The neurons in the brain connect to one another through 'leaves' on treelike branches, and exercise causes those branches to grow and bloom with new buds, thus enhancing brain function at a fundamental level" (p. 5).

The symptoms of AD/HD stem from an inconsistent function of the brain's attention system. This system involves a connection of neurons dispersed throughout the brain, that together control arousal, motivation, reward, executive function, and movement. The circuits in this attention system are jointly regulated by the neurotransmitters norepinephrine and dopamine. These are the chemicals targeted by the medications that some people take to control the symptoms of AD/HD.

The attention system ties in with movement (and thus exercise) at the level of the cerebellum: this area controls both physical movement and also coordinates the flow of information in our brains on overlapping pathways (ensuring it moves seamlessly by managing and updating). The cerebellum takes up just 10 percent of the brain's volume, but it contains half of our neurons, and in people with AD/HD, it has been shown that parts of the cerebellum are smaller in volume and do not function properly, thus causing disjointed attention.

Knowing all this 'brain stuff,' how does exercise benefit people with AD/HD and why do it first thing in the morning? The broad explanation is that exercise tones down the symptoms of AD/HD by increasing dopamine and norepinephrine, and it does so immediately. Ratey describes that "an overactive cerebellum also contributes to fidgetiness in AD/HD kids, and recent studies have shown that AD/HD drugs that elevate dopamine and norepinephrine bring this area back in balance. Exercise also increases norepinephrine. And the more complex the exercise the better" (p. 159). Martial arts, ballet, figure skating, gymnastics, rock climbing, mountain biking, whitewater paddling, and even skateboarding all require complex movement in the midst of heavy exertion. This combination of challenging the brain and the body has been found to have a greater positive impact on attention and focus than aerobic exercise alone (e.g., running).

Researchers have yet to quantify how long the spike in dopamine and norepinephrine lasts after exercise, but evidence to date suggests sixty to ninety minutes of calm and

clarity. As a teacher, imagine a classroom full of calm children first thing in the morning! And just as this is about to wear off, it's recess!! Therefore, Dr. Ratey suggests that we exercise first thing in the morning and then, if we are taking medication, take it about one hour later when the immediate focusing effects of exercise begin to wear off. As a parent, I realize that this is not always a realistic option unless we can incorporate this exercise as a way to get to school. But wouldn't it be great to see our children benefit from exercise AFTER school, when the effects of their medication are wearing off or they are just tired after a full day of trying to focus at school? Dr. Ratey suggests that people establish a daily regimen of exercise – or at least during the five weekdays when focus is required at school or work. He further suggests that once daily exercise becomes a habit, some people may be able to use a lower dose of stimulant.

Ratey, John J. (2008). *Spark: the Revolutionary New Science of Exercise and the Brain*. New York, NY: Little Brown and Company.