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Training the Brain

Dr. John Ratey, author of *Spark: The Revolutionary New Science of Exercise and the Brain*, on movement, the mind and CrossFit.

By Chris Cooper

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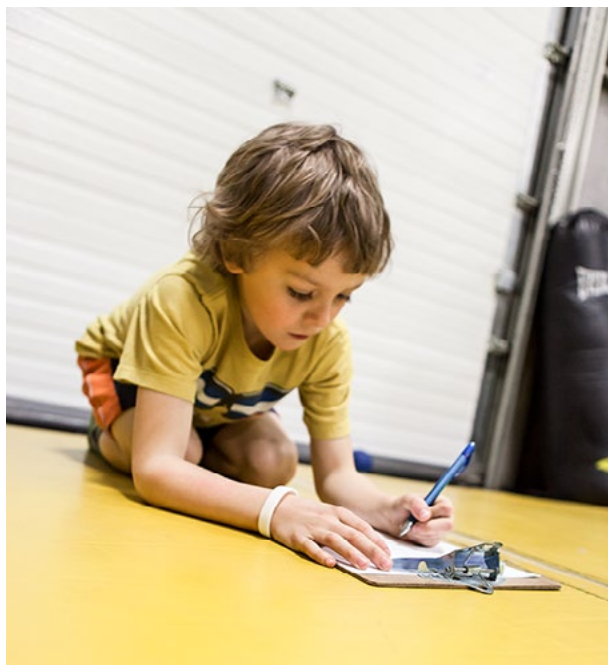
Can burpees help with math homework?

Dr. John Ratey thinks so.

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Andreane Fraser



Andreane Fraser

Dr. John Ratey is convinced that physical activity can improve brain function in young students.

In 2008, the associate clinical professor of psychiatry at Harvard Medical School wrote the book *Spark: The Revolutionary New Science of Exercise and the Brain* based on the outstanding example of the Naperville School Board. The book summarized the experience of physical-education teacher Phil Lawler, who had implemented a before-class fitness program at the Illinois school.

"He threw out the balls. No more sports. Just getting fit: running, strength training, CrossFit-type activities for the junior-high-school kids," Ratey explained. "He had this brilliant idea to use heart-rate monitors, which was a paradigm shift for phys. ed. Nineteen thousand kids in the district and only 3 percent were obese. Seventy-five hundred in the high schools and they couldn't find a single obese kid. Not one. So this was astounding."

Just as impressive: the school's test scores.

"Two years before I learned about it, they had participated in the International Science and Math Test, which is given to every country in the world every three years. The U.S. is always in the low teens. The school district lobbied to participate as a country and came No. 1 in science and No. 6 in math," Ratey said. "The low obesity rate piqued my interest. The test scores got me on a plane."

Ratey realized that lessons learned in Naperville could have a profound effect on education worldwide.

"This was like magic. Boom: here's my new mission in life. This was the glue that really led me to sit down and go through 1,000 articles and translate those into *Spark*," he said.

The book was an unqualified success and stirred the gelatinous bureaucracy of elementary-level academics. Many teachers, coaches and parents shared a collective epiphany: when kids run around more, they generally do better in school.

Now Ratey is back with more. The learning experience can be optimized, he said, and CrossFit might be the answer.

"Miracle-Gro for the Brain"

Spark brought no surprises for Jeff and Mikki Martin, who created the CrossFit Kids program in 2007.

"In our gym early on—2004 to 2005—we started realizing that kids who are more fit do better in school. Our GPA in the gym was above the average in the district, but no real light bulbs went off. In 2006, we started realizing that this body of research was out there that brain function was

influenced by exercise. In our gym, we had five valedictorians come out of the gym and two salutatorians,” Jeff said.

“When the CrossFit Kids course was first delivered, Ratey and (Dr. John J.) Medina were foundational to the ideas we taught. We brought their ideas into the course and talked about how we use study hall immediately following our teen classes. We’ve been running that program for four years. The evidence is clear: There’s a window of opportunity to learn right after exercise.”

Medina authored *Brain Rules: 12 Principles for Surviving and Thriving at Work, Home, and School* in 2008. He is the director of the Brain Center for Applied Learning Research at Seattle Pacific University. A developmental molecular biologist, Medina focuses his research on the genes involved in human brain development and the genetics of psychiatric disorders.

The core lesson taught in Ratey’s *Spark* was the neurochemical response to exercise. When we move, we secrete

a neurotrophin called brain-derived neurotrophic factor, or BDNF, which helps make neural connections stronger. Ratey famously dubbed BDNF “Miracle-Gro for the brain.”

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CrossFit Kids is now involved in the curriculum for 400 schools. And Ratey believes we’re just getting started.



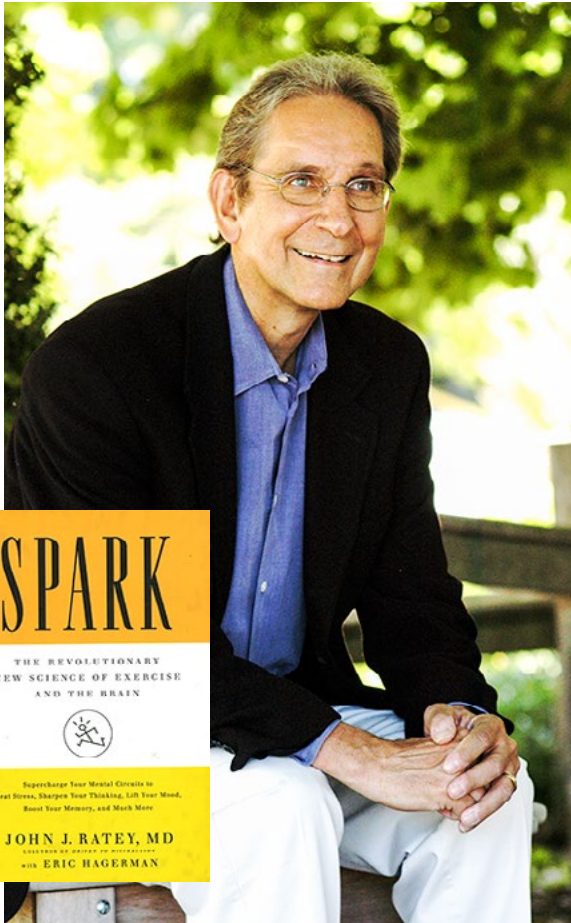
Andrae Fraser

Some CrossFit Kids workouts involve strategy, planning or even math, blurring the lines between classroom and gym.

The Play Aspect

Harvard University's campus isn't immune to trends. Students matriculating at one of the world's most prestigious schools still look and dress like kids anywhere else. But in the periphery, game-changing research is being driven by professors in mathematics, sciences, the arts and education. Much of this research will create trends for future study.

Ratey's office is the top floor of an old home converted into office space. A bookshelf sits below a small skylight, and comfortable couches and chairs round out the domain of a man who has been interviewed often in the last five years. His speeches on TED stages have been viewed millions of times, he's quoted weekly by news publications, and his research has spawned thousands of academic papers.



Courtesy of Dr. John Ratey

Dr. Ratey's book provided the science to explain the academic success many educators were seeing in active children.

"After *Spark* came out, I began to speak all over and make connections with other Ph.D.s who were interested. All of them read *Spark* and said, 'This is really something: we're lowering health-care costs, getting people more motivated and fit but also keeping brains working better, more focused, less depressed, less stressed ... all those things we know that exercise does,'" Ratey said. "I put together the science behind it to prove what we knew was happening on the ground. That's why it became so popular. It led to studies here (at Harvard), there and everywhere to look at how exercise really was impacting students and the elderly."

Although *Spark's* focus was on students, he added, "The elderly was the first area of interest in academic circles because that's where the money was, and preventing Boomers from developing Alzheimer's is still an important area. Sixteen hundred papers were published last year looking at exercise's effect on cognition. All were positive in the direction of preventing cognitive decline and Alzheimer's disease. That's pretty conclusive proof."

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—Dr. John Ratey

It's not just the exercise. With so much new research focusing on learning, Ratey is widening the aperture to consider elements beyond simply raising the heart rate. CrossFit, he said, is helping the brains of its athletes far beyond increasing BDNF.

Some of Dr. Ratey's theories are based on speculation about how our ancestors lived. Science has yet to reveal everything about early human history.

"We got our genes when we were hunter-gatherers over 100 million years ago. We were coded to move a lot, to

play, to have the right kind of diet. To sleep. To have an experience with nature because we weren't living inside in those days. To have a mindfulness: a centeredness of who you are and where your being is. You had to be attentive or you're cat food. We're wired for these things. We're genetically programmed to expect these things. Our brains perform at our optimum when we have these things involved. Then you have connection with another person or a small family group," Ratey said.

"CrossFit is great. It provides the play aspect, certainly the exercise aspect, the connections and the small groups. When it's possible, CrossFit classes go outside. They get an element of nature in there All of these things are critical to proper brain development."

Ratey will expand on each of these ideas in his forthcoming book, *Human 1.0*, expected in 2014.

"One of the things someone said to me recently is, 'We're really not born to run; the human person is like the Swiss Army knife.' We have lots of different possibilities that we need to explore and develop physically as well as

cognitively. CrossFit might be thought of as muscular, but it actually is so much more than that, and so I think that's really a big plus. I certainly have interviewed people for my new book about how CrossFit has helped them, and it's been remarkable for some people. The novelty of CrossFit WODs leads not just to greater interest but also challenges the brain to develop more fully," Ratey said.

The group ethos of CrossFit, he added, can help create better cognitive function.

"We're geared to be working in small tribes—everyone is supportive, moving together, pitching in, helping those lagging behind to catch up. In hunter-gatherer times, you didn't want to leave anyone behind, because they had to help out. You needed everybody's participation," Ratey explained. "We're genetically geared for that, and that's why I believe—what's happening in our schools that are successful—is they're using small tribes. They're using tables instead of desks, working together in units. We're genetically programmed to do that. We become suboptimal when we're on our own."



Chris Cooper

Ratey believes CrossFit's constantly varied workouts and group training can create an environment where kids can thrive mentally and physically.

The Group Ethos

CrossFit's SAT program, led by Laura Bradrick, is leveraging the power of the tribe.

"At this point, it's gone beyond just SAT prep," she said. "CrossFit gyms can help students—and adults—learn anything. Look at your members, find someone who loves teaching. They might be a history or math teacher who knows how to present material to kids. Look for a piano teacher. If we can show them that whatever their specialty is is worthwhile, it's good. Who's to say that being good at math is more important than being good at piano?"

By incorporating exercise and academic tasks into one session, students have the opportunity to shine among their peers—even if they're better with numbers than with thrusters.

The group dynamic is also useful as a behavioral transformer.

**"CrossFit gyms can help students
—and adults—learn anything."**

—Laura Bradrick

"It helps with modifying behavior because you want to be a member of the group, so you just can't throw tantrums all the time. You'll be sat upon; the group can't tolerate it. If you're feeling depressed, they'll want you not to be depressed because they're getting less of your activity, thoughts, participation, foraging, getting game—they can't have you that way. If you're spooked too much, too anxious, depressed, panicky, they want that to settle down. The group demands that just by the 'groupiness' of it," Ratey said.

Jeff Martin believes a CrossFit Kids group atmosphere can also provide children with an opportunity to be leaders.

"We have teens lead the 'focus' portion of the class for the younger kids. They learn valuable public speaking within the class," he said. "In the long run, the kids who do speak



Chris Cooper



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CrossFit's SAT-prep program provides "above-the-neck fitness" that can help children get into the rights colleges.



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The brain is part of the body and can be trained just like the hamstrings can be trained to move greater loads.



Chris Cooper

Perhaps most importantly, CrossFit Kids makes fitness and learning fun.

well publicly may get the better jobs because they can stand in front of a board and make a case for whatever they want."

The group collaboration effect is powerful. But competition, Ratey noted, is just as important.

"It's natural. It's in our genes. Look at being a good hunter-gatherer: you wanted the fastest one to finally get the damn antelope. You needed that person to be the one to finally make the kill, but you needed other people to chase the antelope and wear him out so the sprinters could go in there and make the kill," he said. "There's a need and natural tendency for that competitiveness, but it can also be seen as something that leads the group or has a specific group function. And so it's not just the best athlete or greatest Mudder or Spartan of the year. The smartest is as important as the fastest."

These specialties are best discovered through play, Ratey said, and play is on the decline in schools. His email tagline reads, "It's time to take play seriously."

"Play helps you learn the social rules and emotional regulation," he continued. "We're talking about interactive play. Sometimes you lose, but then you get up and do it again because there's an inherent feeling of it being fun."

You also cheat and you learn that you'll get exposed by the group, which is an important thing to learn. Physical interactive play teaches those lessons and also how to support one another, how to get the most out of your group. You want everybody to be at their best. You don't want people just thinking about what's straight ahead. You want people to think of new ideas and break the rules."

Unstructured play, then, is critical for brain development.

"Recess may be as important as gym class," Ratey said. "I think it's really vital. People need to recognize that."

Recess also frequently takes children outside, another important element of learning.

"Being in nature is very important," he said. "It's a whole chapter in the new book. Being outside helps to get the brain ready to learn."

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—Dr. John Ratey

In Denmark, "outside schools" have children engaged in outdoor education for the majority of their day. Kids come in for brief periods to use the washroom or change into dry clothes—an inverse of the traditional North American model. It begs the question: is more time outside better?

"There's no good study showing a minimum or maximum of any of these—aerobic activity, mindfulness, green time—but I think the more, the better," Ratey said. "You can have the weather to consider, and the capacity to shift inside is probably more ideal."

A Different Kind of Classroom

While Ratey doesn't believe it's possible to create a one-size-fits-all template for the perfect environment, he does see certain common elements.

"You can't come in with a package," he said. "You have to adapt it to every situation. There's a lot of different environments that are conducive to learning. The best is supportive, challenging, more 'you can do it,' more goal-oriented. It shouldn't come from just the teacher but the students you're participating with—more or less the group ethos."

Transferring from the CrossFit Kids class to study hall carries the group approach from the physical to the academic realm.

"I think all CrossFit gyms should have a classroom right in there," Martin said. "Other people have to argue with their kids to do their homework; ours do it because they know that's what needs to be done. They don't see hard work in the same framework that other kids their age do. To develop correctly, we have to have obstacles and hard work, and we have to overcome those obstacles."



"I think all CrossFit gyms should have a classroom right in there." —Jeff Martin

While most research has students exercising before school, Ratey thinks we can do even more.

"This morning, I visited a school in Lawrence, Mass. They're the worst school in the state, all these kids who speak English as their second language," he said. "They just started a new program where they have P.E. twice per day. Before lunch, they have a 30-minute recess break, so the kids get 'play' time. Then class, lunch, another class, another recess, and then go home. They also have 'brain breaks'—that's what I call them—where they do burpees or star jacks for two minutes in the middle of class. Two minutes makes a difference. They're motivated, awake and aroused."

Bradrick said she's heard of similar models in CrossFit gyms.

"Some are doing CrossFit or CrossFit Kids and putting math right into the workout," she added.

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This "intervention" idea is a popular one at CrossFit Catalyst in Sault Sainte Marie, Ont. There, coach Tyler Belanger's Ignite program shows teachers how to use "interventions"—short exercise breaks during class—to maintain a level of high engagement and arousal during class. Specialty programs like move-a-matics, drama, creative writing and money matters are popular with children and parents.

If a physical game involves a cognitive task, Ratey said, a child can get even greater benefit.

"Your brain is on fire because it's being used for the aerobic part, but some parts are being asked to 'search and switch,'" he said.

And then there's the burpee.

"It is really one of the best exercises you can do for your brain. There's plenty of evidence to show that aerobics is

the best exercise bang for your buck. But aerobics with some coordination component—that's probably the best exercise you can do," Ratey said. "If you want to construct the ideal exercise, it's this: something with someone else (a partner or small tribe) outside for up to 20 or 30 minutes. It's fun, people are competing with one another and helping one another. That is what we know from the evidence. Not just running, but running in open spaces or playing games or doing physical challenges outside."

The implications of training the brain and body together reach far beyond the classroom.

"The cerebellum—responsible for balance—is activated when you activate the 'core.' The cerebellum is also involved with memory, learning, social skills, emotion and very much with attention," Ratey said. "All the learning skills are very much involved with the cerebellum. We used to think it was just about physical coordination, but it's really coordinating all of our higher functions. If you are 'discoordinated' physically, some things are going to be out of whack intellectually and emotionally as well."

Ratey is using exercises—like burpees—that require inter-hemispheric coordination and recruitment of core musculature with a group of autistic students.

"I'm setting up training to teach them coordination, and this will have a payoff: being more focused, less aggressive, less self-destructive, more social. They are very uncoordinated—that's a big problem. Their cerebellums are off. But you can train the cerebellum, which is what you're doing all the time you're working on the core exercises," he said. "Even thinking of CrossFit, doing rowing—there's a core component to that and certainly most of the other exercises we do in a WOD. That's training the cerebellum—it's not just standing on one foot and doing the yoga pose, which is also great."

He added: "We don't know all those constituents or parts of the puzzle, but we know that exercise can help. Before you get into a retraining phase, using neurofeedback is essential."

"Exercise will promote your ability to learn, plain and simple."



About the Author

Chris Cooper is a writer for CrossFit. He owns CrossFit Catalyst in Sault Sainte Marie, Ontario.