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In Memory of Sarah

Catalyst Fitness sees one of its members die from a brain tumor and re-dedicates itself to exercise for the benefit of the brain. Chris Cooper explains.

By Chris Cooper

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All images: Chris Cooper

Sarah Grand arrived at our gym in 2008, bald and pierced, with a chip on her shoulder. "Who is this punk?" I thought.

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She wore the baldness as if she was daring you to ask why. There was no victim in her swagger, no black cloud over her death-metal baseball cap.

Two weeks earlier, she'd been swinging her legs as she sat perched on a doctor's examining table. Her mother, father and boyfriend were with her. The doctor gave them the diagnosis: a large tumor in the brain. Situation: terminal.

**“Fuck you. You don't
know me.”**

—Sarah Grand

He offered Sarah a plastic bag—a Ziploc full of pills—to help with the anxiety and depression that were sure to come.

Sarah weighed the bag in her hand. Her family stood by in overwhelmed silence. They had an inkling something was wrong—the blackouts, the headaches, the family history. But this? To their little girl?



***Sarah Grand battled the effects of chemo with yoga
and CrossFit.***

Sarah looked up from the baggie and met the doctor's eyes.

“Fuck you,” she said. “You don't know me.”

Sarah became a vegetarian. She started doing more yoga. And she started CrossFit.

I got to spend a lot of time with Sarah while she went through rounds of chemotherapy. Aside from the extreme fatigue and time spent over a toilet—which Sarah joked was “Just like CrossFit! You'd love it!”—she also noticed a lot of “fogginess.”

Understanding Chemo Brain

Two years later, “chemo brain” is well documented if not perfectly understood.

A whole host of issues are happening in the brain during chemotherapy:

- Hormonal balance is distorted and imbalanced for weeks at a time.
- Cells die or lose connection to one another.
- Depression and anxiety issues cause enlargement of the amygdala, and size decreases in the frontal lobe.
- Massive medication changes the way the brain works as a unit (1).

During chemotherapy, of course, the patient has a more pressing issue: killing the cancer. The effects of chemo brain—short-term memory loss, lack of focus and difficulties multitasking—continue, though, for the long-term among survivors. While the chemicals might have killed the cancer, they've also destroyed a lot of the brain's function. Up to a third of breast-cancer survivors report a poorer quality of life due to chemo brain or chemo fog post-cancer (2). While they're grateful to have survived, they're frustrated. Many face cognitive impairment for the first time in their lives. Think it's aggravating to struggle with math as a 10-year-old? Try it as a 50-year-old engineer.

While the effect is widely reported, it's difficult to measure the precise loss of cognitive ability from chemotherapy (3). Models are being built to measure loss of brain tissue and perhaps even loss of electrical activity. However, because it's impossible to measure the brain's capacity in a normal, healthy person, the loss is incalculable.

What are the options, then, for survivors of cancer? How can they possibly regain the brain vitality they once enjoyed? The answer is neuroplasticity: the brain's ability to reform, rewire and rebuild itself. And I believe CrossFit can help.

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CrossFit for the Mind

For the last year, we've been working with folks suffering from acute brain injury, or ABI, whose cognitive issues are diverse and deep. We've done CrossFit-style workouts with those who have survived strokes, car accidents and head traumas, and now we're working with our local oncology unit to develop a center for brain rehabilitation after chemotherapy. To differentiate from the rest of our gym, we call our rehabilitation area the Ignite Academy.

Starting from about four months after conception, the human brain is flushed with chemicals to help it grow larger, regenerate cells and reinforce connections that make up memories (engrams). Chemicals tell our brains to grow or shrink; to remember information or to drop it, depending on priority; to run and hide, fight or love. The regulator of these chemicals, largely, is exercise.

Research has recently shown that exercise—aerobic and anaerobic—can help victims of ABI, stroke, chemotherapy and other impairments recover high-level cognitive function (6,7,8). Memory, processing speed, focus and attention all can be improved thanks to the plasticity of the brain.

Step by Step

Step No. 1: Encourage Movement

We've written at length about CrossFit's greatest bragging right: adherence. The stuff's potent and it's addictive. After the brain has experienced the pleasurable rush of a 15-minute AMRAP, it simply doesn't want to down-regulate itself to try to find joy on a pec-deck machine.

We don't measure ability in our initial consultations. Instead, we talk about bright spots: things the client is already doing right. We try to find at least three. From there, we forecast future bright spots: the way the client will know the program's working. Works like a charm; our adherence rate is at 93 percent.

Step No. 2: Elevate the Heart Rate—Over and Over

Any form of aerobic activity will trigger the release of IGF-1 (insulin-like growth factor) and BDNF (brain-derived neurotrophic factor)—the more, the better. A dose-specific response has been demonstrated among populations doing aerobic activity as part of school, work or rehabilitation and then being tested on cognitive tasks.



Aerobic activity improves brain function for people of all ages.

Step No. 3: Get Anaerobic

When your body is working hard, it's using glucose at a high rate in the muscles. A study published in the *FASEB Journal* (4) shows the brain switches to lactate as its primary energy source when the body is working hard. Another study from the journal *Cell* shows long-term memory formation can't happen without the presence of lactate (5).

Step No. 4: Add "Challenges" Specific to Cognitive Tasks to be Strengthened

Include academic skills such as memory, handwriting, eye tracking, speech, etc.

Memorization WODs are common around here. So are eye-tracking workouts, impromptu spelling bees in the middle of Angie, and box-jump/math ladders.

Adding a cognitive skill to a physical task helps the brain create relevance—a contextual backdrop—that will help recall the information quicker. If the brain perceives the information as more important, it will store the data in a place that's easier to access. Consider what your ancestors' brains would have perceived as more relevant: animal hiding here, easy hunting here, safe sleeping spot at the top of that hill.

Step No. 5: Encourage Frequent Practice, Just Like in Sport

Practice makes permanent.

Treat focus, attention, memory, processing and orientation as skills just as you would a snatch, front squat or kettlebell swing.

Step No. 6: Reinforce Lessons With Relevant Real-World Application

Change the context of the lesson often. Use examples that will apply personally to the client.

Step No. 7: Constantly Increase Difficulty

The ideal challenge—just like the ideal WOD—might appear to be slightly too challenging at first but is actually reachable through hard work. Good coaches intuitively know that tough but achievable milestones provide the greatest reward.

Step No. 8: Add Daily "Interventions" and Challenges

Add in regular challenges for handwriting, vision, speech, memory and auditory processing, along with daily mobility work and exercise.

Because the client is typically off work during treatment, exposure to daily challenges is limited. Combining therapies in one spot—for instance, our academy—is more appealing to insurance companies and less draining on the client.

"It's time to go to Ignite!" is much more attractive than "Three stops to make today before we can come home!"

Sarah's WOD

The science of neuropsychology and cognitive development is moving so quickly that new information and tiny advances seem to happen daily. Slowly but surely, we move closer to the resolution that exercise is better than most drugs.

Memorization WODs are common around here. So are eye-tracking workouts, impromptu spelling bees in the middle of Angie, and box-jump/math ladders.

While the pace of research into cancer is also hectic, it wasn't quick enough to save Sarah's life. She passed away in 2009 at the age of 25. Her memory lives on in our affiliate, supported in a small way by our own WOD, created by Sarah, called 100 Grand.

100 Grand

10 rounds for time of:

10 box jumps

10 knees-to-elbows

10 tuck jumps

10 squats

We dedicate much of our research to Sarah's memory, and we're reminded every day by our clients that anything is possible in the brain.



Imagine doing math problems in the middle of a punishing WOD.

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About the Author

Chris Cooper is president of Catalyst Fitness (CrossFit Catalyst) in Sault Ste. Marie, Ont., Canada. Catalyst is constantly engaged in research and has published three books on the incorporation of exercise into cognitive enhancement, brain rehabilitation and enrichment for students. Cooper also maintains [Don't buy ads](#), a business resource for CrossFit affiliates. Chris has two small CrossFit kids, a very patient CrossFit wife, and an incredible staff of coaches, trainers and therapists.