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Rewiring the Body

Chris Cooper talks about multiple sclerosis and how trainers can try to help athletes with the disease.

By Chris Cooper

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Jim Corelli

Pam Didonato is 45 years old. She just set a Murph PR, breaking 40 minutes for the first time. She rows 500 meters in under two minutes. She can finish Fran in under 5 minutes.

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Pam also has multiple sclerosis. She needs a cane to walk. Her right knee is 30 degrees hyperextended, and she has a drop foot.

Diagnosed at 18, Pam's been fighting MS her entire adult life. Six years ago, she let me be her "fitness caddy." Last year, she started CrossFit.

Pam competes: she's done Fight on Friday, Baseline Week, FranFest and now Murph with her Catalyst Fitness family in Sault Ste. Marie, Ont. She usually drags a few friends with her to watch. This year, we invited her physiotherapists and chiropractors. She talks about CrossFit at her Globo Gym, where she does spin class to mobilize her knee and visit with friends.

Every year, Pam meets with a specialist in London, Ont., to measure the progress of the disease against her nervous system. There isn't much. Pam's simply not regressing.

"Oh," they say, a bit surprised. "See you next year."

She takes no drugs, does physiotherapy only intermittently and sees a massage therapist every two months.

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Pam Didonato training hard: It was once thought that exercise and MS were a bad combination, but current medical opinion holds that the rewards of exercise outweigh the risks.

Fighting Against MS

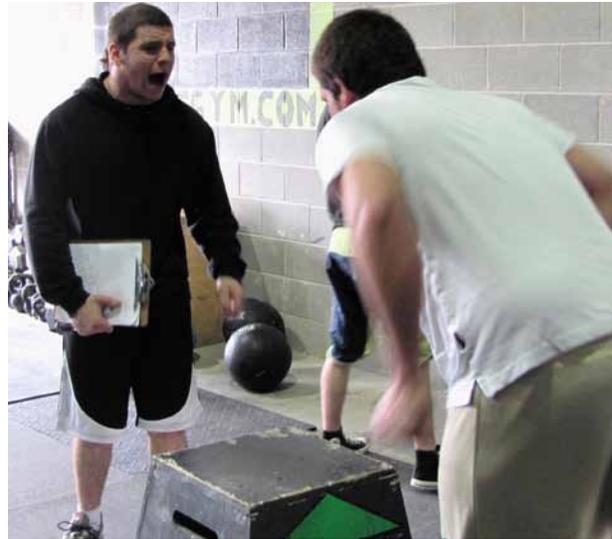
There are four different types of MS:

1. **Relapsing/remitting**—Symptoms appear and disappear. It's common for new symptoms to crop up over time, combining with the old ones to challenge management.
2. **Secondary progressive**—Eventually, some people with MS will pass into this phase, in which the periods between flare-ups become shorter and degradation becomes a consistent downward spiral. This is the phase we're trying to prevent with exercise.
3. **Progressive relapsing**—Symptoms appear and disappear, but complete recovery isn't possible between relapses, and so the situation worsens in fits and starts.
4. **Primary progressive**—The condition of the patient deteriorates rapidly and consistently, with no remissions at all. Proper exercise programs can help to shift this type into a relapsing/remitting model, where quicker recovery between periods of symptomatic flare-up helps prolong quality of life.

From the Physiotherapy Association of British Columbia: "Until the early 1990s, exercise was thought to magnify MS-related symptoms. Today, evidence is ample that positive outcomes of exercise intervention in MS outweigh potential adverse effects."

Can you imagine being told that exercise will make your disease worse? This was the logic when Pam was diagnosed, but she persisted.

In a nutshell, multiple sclerosis attacks the nerve fibres that are responsible for transmitting communication signals within the central nervous system (CNS), and also between the CNS and the nerves controlling the rest of the body. Lesions appear at seemingly random places in the white matter (nerve bundles), and these lesions destroy the myelin sheaths which insulate the nerve bundles from damage. Because different nerve bundles control different things—movement, speech, thought, sight, sensation—every MS patient experiences the disease differently.



Carolle Robinson

Greg Glassman linked fitness to health when creating the CrossFit program, and more and more athletes now understand this critical link.

MS is still not fully understood. In the last few years, though, new research has thrown light on its causes and effects. When experiencing an MS flare-up, white blood cells (leukocytes) are drawn to the lesions, which causes inflammation. The inflammation strips the myelin (protective sheath) in the same way you'd strip a rubber cover off copper wire, and to the same end, transmission along the nerve bundle is halted or slowed. Nervous impulses can also jump to other nearby demyelinated nerve bundles, which causes motor-control misfires. Could your body produce new myelin sheaths to protect the nerve bundles? Absolutely, except that, in a cruel twist, the inflammation also appears to kill the oligodendrocytes—the cells responsible for myelin regeneration.

Because we teach many complex motor patterns in CrossFit, logic would dictate that the development of new motor pathways by practicing and refining skills is a good way around the issue. And empirical evidence suggests this to be true: if one pathway is blocked, blaze a new trail.

It also seems obvious—to those familiar with the Zone ideology of eating—that reduction of inflammation could lessen the impact of individual flare-ups, at least in the early stages of the disease. During the secondary stages of the disease, axons die without the presence of inflammation. That's where we rejoin Pam.

Because MS goes into periodic remission, during which time inflammation dies back, the motor neurons can resume their normal function, even if the myelin sheath has been compromised. This is only true, though, if the client still has a relapsing/remitting form of MS, which typically degrades into a more progressive downward spiral. Our long-term goals during training would be to keep the sufferer in the relapsing/remitting phase as long as possible so there's a chance to make progress during periods of remission.

We'd also like to prolong those remission periods, of course, but because we can't yet predict flare-ups, our best bet is to make the most of each opportunity. That means:

1. Attempting to "re-wire" new motor pathways.
2. Reducing inflammation as quickly as possible.
3. Strengthening nerve bundles against further attack.
4. Promoting the generation and activity of the oligodendrocytes.

The simplest task, in terms of programming, is to attempt to rewire—or make more efficient—the motor-control pathways of the central and peripheral nervous systems. This means rapid movement, heavy weights, reflexive movement (for example, plyometrics or "rebounding") and careful motor-control drills. While Pam would vastly prefer to simply concentrate on lifting heavy weights, we spend time every week doing step drills and knee lifts to the bar to maintain control between hip and knee joints.

It's tempting (because I love seeing her succeed) to make the lifts as easy as possible. For instance, she'd love to lift 200 lb. on a Smith machine, but controlling the movement on two planes won't do much for her. So she pulls from pins in a cage. Her ability to plantarflex her right foot is nonexistent, so double-unders are replaced by step-overs—a lateral stride over her cane and back again, accomplished with hip flexion.

The secondary phases of MS, where the nerve bundles degenerate without the trigger of inflammation (called Wallerian degeneration), may be partially caused by a lack of brain-derived neurotrophic factor (BDNF). Low levels of BDNF have also been linked to Parkinson's disease and other motor-neuron disease. Interestingly, BDNF is naturally released by the body during vigorous exercise, which gives us hope that even if a patient has progressed beyond first-stage MS, we can still help slow its degenerative process (1).

Other components of fitness are also important to maintain. While strength, coordination and flexibility loss can be primarily attributed to a loss of motor control through damage to the nerve bundles, they can also be regained during periods of remission.

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Our treatment plan for Pam (open for debate and suggestion):

1. Warm up on the rower. Focus on technical details like the slide, catch and reaching full extension.
2. Practice complex motor skills using PVC or light dumbbells.
3. Introduce the day's challenge, reinforcing the motor skills. What matters is not "how fast." How well is more important, and the challenge should be set up accordingly.
4. Talk about upcoming events and other CrossFit challenges, and stretch while reviewing homework.
5. Row again, attempting to achieve the same rowing time as during the warm-up.



Carolle Robinson

Didonato wasn't able to compete in a recent Fight Gone Bad event but was on hand to cheer on her fellow athletes.

The Joy of Competition

A final note on the use of athletic competition and events: many doctors discourage athletic pursuits by MS sufferers, fearing the possible stress of performing in front of a crowd or embarrassment by physical failure. This is a huge mistake. Because depression is so rampant among long-term victims, I believe it's absolutely critical to keep excitement and novelty as parts of any exercise program. We demonstrated that fact in our 2008 study on exercise adherence ([The Secrets of Sticking With It](#)), and we believe it to be doubly true among those with compromised physical function.

Earlier this year, Pam was training for her second Fight Gone Bad challenge, which ran on April 2. She was recently fitted with a new knee brace that keeps her out of knee hyperextension, and so she wasn't able to participate in FGB, but she was there cheering over 70 athletes on. On Facebook, her face—jaw set, brow creased, determined—is a favorite in many photo albums. She tentatively plans on doing Baseline Week—Angie, Michael, Grace, Kelly and Fran, followed by a party—but remembers its toll from last year. She's happy to accept praise from other CrossFitters but leans away from the limelight. In a disease typically measured by the rate of regression by its victims, forward momentum is victory.

References

1. Gold SM et al. Basal serum levels and reactivity of nerve growth factor and brain-derived neurotrophic factor to standardized acute exercise in multiple sclerosis and controls. *Journal of Neuroimmunology* 138(1-2): 99-105, 2003.



About the Author

Chris Cooper is president of Catalyst Fitness in Sault Ste. Marie, Ont., Canada. Split between two facilities—a private personal-training centre and a CrossFit box—Catalyst Fitness is engaged in research, athletic development and the pursuit of all things fitness. Chris has two small kids, a 14-hour workday, a 2:51 Diane and a 520-pound deadlift PR. He also has an incredible staff of trainers, therapists and coaches, as well as a probable case of mild ADD and a very patient wife. Reach him at catalystfitness@yahoo.ca or visit catalystgym.com.



Courtesy of Chris Cooper/Catalyst Fitness