MULTIPLE SCLEROSIS AND CROSSFIT—ONE MAN'S JOURNEY

Mary Boudreau Conover

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Times are changing for people with multiple sclerosis (MS)! In the past, treatment was "rest to conserve strength" for necessary tasks. Now, a great deal of knowledge is being gathered showing the benefits of exercise in MS, not only for physical strength, but also for maintaining and improving cognitive functions. In fact, anything about the benefits of exercise and the risk of a sedentary life style that can be said of the normal, healthy human being can also be said of those with MS. In robust health, young, old, in-between, on chemotherapy, on crutches, missing limbs, curling up with degenerative arthritis, rheumatoid arthritis,[1-5] or struggling with a neuro-degenerative disease like multiple sclerosis, *none are excluded from the benefits of exercise.* No one. We are all eligible to partake and reap those benefits.

MULTIPLE SCLEROSIS

Multiple sclerosis is the dysregulation of immune function resulting in varied patterns of inflammation, destruction of the protective covering of the nerve cell (myelin), and nerve cell loss,[6] causing nerve impulses to slow down or stop. Inflammation occurs along any area of the brain and spinal cord. Locations vary, as does the severity of each attack. It is not certain what triggers the inflammation, but the role of viruses has been implicated[7] as has genetics or a combination of both. The disease most commonly begins between ages 20 and 40, but it can occur at any age.[6]

Symptoms

Common early symptoms of multiple sclerosis such as tingling, numbness, loss of balance, weakness in one or more limbs, and blurred or double vision generally appear between the ages of 20 and 40. The onset may be dramatic or so mild that a person doesn't even notice any symptoms until far later in the course of the disease. As the disease progresses, symptoms may include muscle spasms, sensitivity to heat, fatigue, changes in thinking or perception, and sexual disturbances.[8] Episodes can last for days, weeks, or months and alternate with remissions. Hyperthermia and heated environments such as hot baths, and sun exposure can trigger or worsen attacks, as can stress. This results in a lower daily activity level than that of healthy people, along with the associated health problems of inactivity, such as osteoporosis (reduced bone mineral density), depression, and fatigue in addition to cardiovascular problems, reduced muscle strength, especially in the lower extremities, and loss of muscle mass.[9]

The Question of Exercise

In both health and disease, young and old, exercise benefits immune function mediated by a complex interaction of hormones and neural factors, eliciting an alteration in proteins that are secreted by cells of the immune system to carry signals between cells. [6, 9]

Many sources have presented evidence supporting the potential effects of exercise as not only a protector of nerves in MS through its affect on immune factors and stress hormones, but also a way to create new nerve connections. One of the most encouraging studies of individuals with multiple sclerosis demonstrated neuroplasticity in which different brain areas were recruited to perform tasks usually performed by another brain area. It has in fact been demonstrated that people with MS with higher fitness levels had faster behavioral performance and greater recruitment of additional areas in the brain than those with lower fitness levels. [10]

MEET TONY

"I limped into CrossFit East County November 14, 2007 and met Paul Flores (my CrossFit coach and owner of CFEC) about 9 months post-op from a cervical laminectomy of C4, C5, C6, and C7 with no fusion. That surgery was done at the Mayo Clinic in Rochester, MN, after 18 months of trying to find the source of my symptoms at two different university medical centers. I was fortunate enough to score a comprehensive, week-long review at Mayo (the most incredible healthcare provider in the world, by the way). I was and still am convinced surgery was the right thing to do in order to: 1) eliminate cord compression as a possible cause of my symptoms; and 2) prevent further deterioration of cord due to the hernition and resulting compression.

I exhibited symptoms in my left-side upper- and lower-extremities including transient numbness, weakness and spasmodic episodes. I also had a toe drop on my left foot (I often felt like I was walking down a concrete sidewalk, the left side of which had just been poured and was sticking to my left shoe every time I put my foot down). I would experience about 2 to 3 heavy 'fatigue' days per month, and it was easy to look at me and see all was not well. Paul has described my state as totally de-conditioned and perhaps even negatively conditioned given the post-surgical issues I was experiencing. I was on a pharmaceutical regimen that included two different muscle relaxants (I'm still on one of them) and a few other drugs to counteract the effects of those. We were trying IV steroid treatments and even though I was not yet diagnosed, demyelization disorders were still very much in play. This past April, new MRIs of my brain indicated that the plaque is no longer stable and is progressive, and I will now get full brain and spinal cord scans every six months instead of annually. My next scans will happen in November.

Things started very slowly for me at CrossFit, and I found working out to be miserable and my recovery time between 2x weekly sessions about 3 days. Progress was non-existent to my eye, and during my days of extreme soreness and fatigue between sessions I really wanted to quit and say screw all of this. My now close friend, Coach Paul, kept me in the game. He assured me he DID see results even though they were subtle, and I just needed to keep at it and things would change for me. About nine or ten months into CrossFit we added a third day a week. Finally I

could see some progress, but still pretty puny stuff in comparison to the amazing athletes around which I was sweating my ass off.

In January, 2009, I kicked it up to 5 days a week and things really started to change for me. My progress continues to accelerate. When I started, my first pull-up was a PVC pipe being pulled down to my chin while standing still. Today, I have 15 unbroken kipping pull-ups Rx. When I started, I had trouble doing a pushup from my knees. Today, I have a strong push up and have done as many as 200 in one WOD (Murph). When I started, I could not easily clean a 45# bar. Now, I can clean 160#. When I started, I actually failed at a deadlift of 135#. I have dead-lifted 340#, back squatted 225#, shoulder pressed 110#, and front squatted 200#. I have a 7:59 2000 meter row and a 9:15 mile. This list goes on and on and on.

In late August, I went on vacation to Maui, and when I arrived back home, I noticed that my legs were a little sore. I decided to look back what I'd been doing and was amazed (this list excludes all of the upper body stuff that also happened).

Monday: 3,200 meters of running, 750 meters of rowing, 40 Squats, 80 Walking Lunges, 24 Burpees.
Tuesday: 49 SDLHPs (75#), 49 K2Es, 49 Snatch Balance Squats (45#).
Wednesday: 1,200 meters of running, 1,500 meters of rowing, 70 KB Swings (53#), 80 Walking Lunges, 70 Goblet Squats (35#), 18 Vertical Jumps, 18 Oly Style Deadlifts (final weight 225#), 18 Squat Lunges in rack position.
Thursday: 3,520 meters of running, 45 Burpees.

In summary, I found myself in some form of a squat position, with and without a load, 592 times in four days, in addition to 10,150 meters of running and rowing over the same four days. Yes, my legs were indeed a little sore.

That I, at age 53 with MS and permanent spinal cord damage can even remotely do that is amazing to me. And it's CrossFit that got me there. I still have the same symptoms, but I am so much stronger in my core I can now use pure power to get me through most of my episodes and spasms with few outsiders even able to tell I am having one. I still have episodic fatigue, but I can rally and force myself through it in an hour or two instead of succumbing to it for a whole day. I am a different person today significantly due to the positive influences of CrossFit in my life. I achieved a level one training certification in June, and will attend the Olympic cert with Burgener in December, all for my own knowledge and betterment.

CrossFit really does work like no other self-improvement program I have ever pursued in my life. CrossFit is about great people and good science, and although I have no empirical data I would absolutely tell you that for me, CrossFit style exercise to the point of breakdown is making me more healthy – and is NOT consuming valuable energy that might be better used fighting off symptoms (if that even makes sense to say).

CrossFit is to me a bit like nuclear fission (i.e. so much more energy is created from the 'mass' CrossFitting consumes that it actually makes me feel stronger, despite the immense amount of energy expended to perform). In nuclear fission making a chain reaction happen consumes much

more energy than it creates - until that reaction is harnessed. Then, we all know what happens. My hypothesis is that initially, especially for an MS patient, the level of energy (exercise) required to pursue CrossFit is very, very difficult for most people to sustain and will likely be abandoned long before the great result of actually feeling better and stronger (the chain reaction) is realized. If not for Paul I would have never made it past the pain and fatigue. He was mission-critical in my sticking with it.

I get sore like everyone else, and I do have quite a few spasms and a tendency toward muscle cramps (sometimes severe). Those can be somewhat mitigated by electrolytes pre-WOD (I use Cyto-Max) and I do have a tear in my calf today from running through a cramp last week instead of giving into it, but I'm okay with that. My diet is pretty good – rather 'Zone-ish' but I do not measure, I eat dairy, and I drink wine several times a week. I am 5'11" and weigh about 185, down from 207 at my post-op peak. My waist size has gone from 36 to 32, and I really am pretty toned, although one can see that my left side extremities are not quite as developed as my right. I do not have anywhere near symmetrical balance and strength as all things left side are more difficult for me (most of my overhead lifts are pretty pathetic and end up going up crooked, I jump rope pretty much on one leg, etc.). I am generally much stronger in my lower body. I remember little of what I could do, but much of what I could not do during this period. I could not jump rope, or do a push-up, or get to parallel in an air squat, or do a pull-up, or do a box jump, or run the agility ladder without stumbling. My frustration level was significant, and my commitment was soft. Paul kept me in the game.

I think Paul is a rare coach with rare skills and I am a sample size of one, but it would be very cool to design and conduct a study to determine if using "over-the-top" world-class coaching and support to help MS patients push past the desire to quit and collapse during a vigorous exercise regimen would over time allow them to get to the point of net gain from the effort expended. Who knows?"

--Tony

COACH PAUL FLORES' REPORT ON TONY'S PROGRESS

"I have observed that while Tony's cardiovascular endurance has improved dramatically, and his stamina, flexibility, and speed have also improved, his balance significantly lags. Tony's left side extremeties fatigue far faster and more dramatically than do his right side extremities, which causes a variety of performance issues during certain workouts. Beginning in December, 2008, I believe that Tony made up his mind that he was going to do whatever it took to be a performer. I observed serious mental gains after that time, and I believe his mental state was as much of a performance issue for him as were his physical issues."

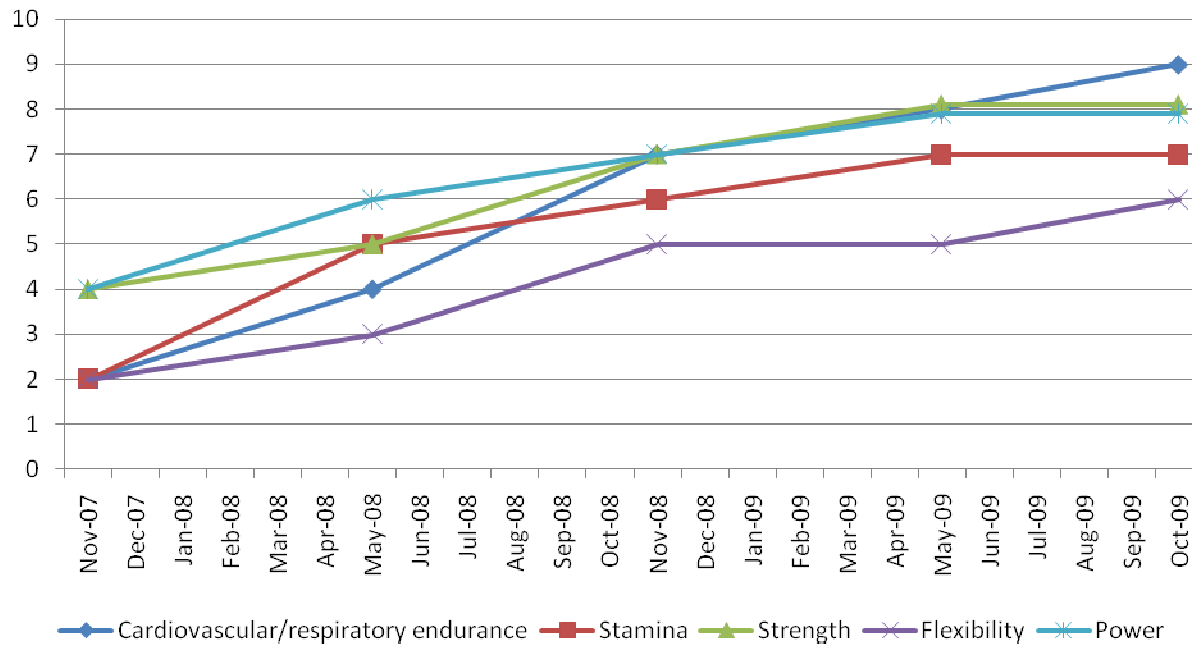
Paul Flores, Owner and L2 CrossFit Instructor, CrossFit East County

Jim Crawley and Bruce Evans are former track and field coaches and together they founded Dynamax, a manufacturer of soft medicine balls. Crawley and Evans have identified ten general physical skills that should be condered whenever defining fitness:

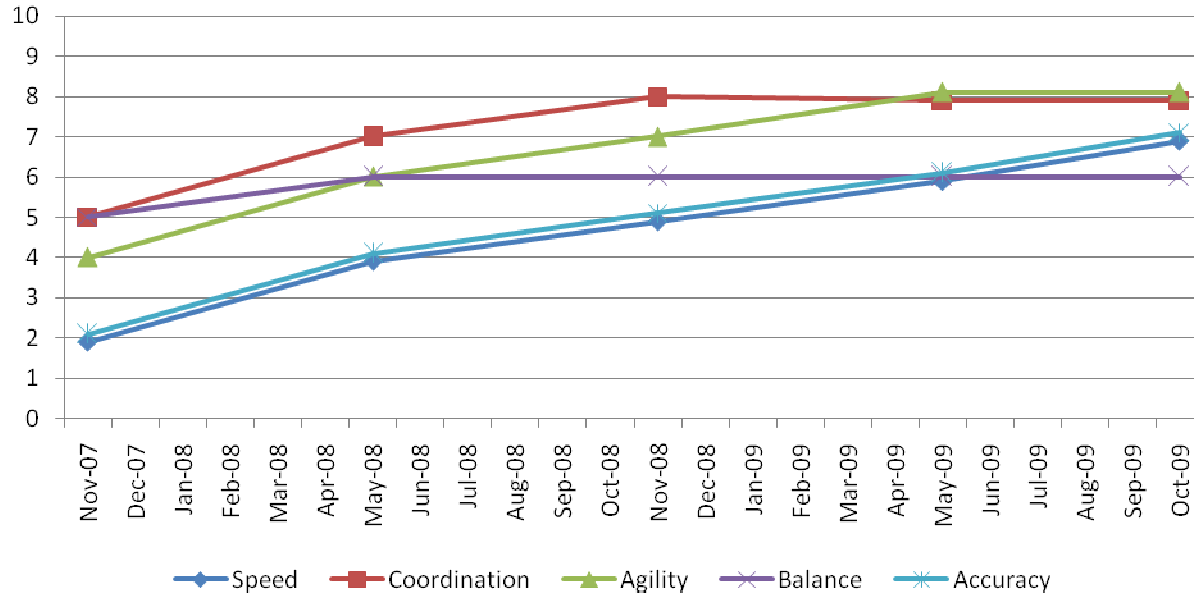
- Cardiovascular/Respiritory Endurance- The ability of body systems to gather , process and deliver oxygen.
- Stamina - The ability of body systems to process, deliver, store, and utilize energy.
- Strength - The ability of a muscular unit, or combination of muscular units, to apply force.
- Flexibility - The ability to maximize the range of motion at a given joint.
- Power - The ability of a muscular unit, or combination of muscular units, to deliver maximum force in minimum time.
- Speed - The ability to minimize the time cycle of a repeated movement .
- Coordination - The ability to combine several distinct movement patterns into a singular distinct movement.
- Agility - The ability to minimize transition time from one movement pattern to another.
- Balance - The ability to control the placement of the body's center of gravity in relation to its support base.
- Accuracy - The ability to control movement at a given direction or at a given intensity.

Coach Flores has evaluated Tony in each of these areas, and has charted his progress over the past two years.

Cardiovascular/respiritory endurance, Stamina, Strength, Flexibility, Power



Speed, Coordination, Agility, Balance, Accuracy



Deadlift 340# PR

Back Squat 225# PR

CrossFit Central Maui

Snatch

OHS in progress (note left side weakness)

Box jump in progress (note left leg drag)

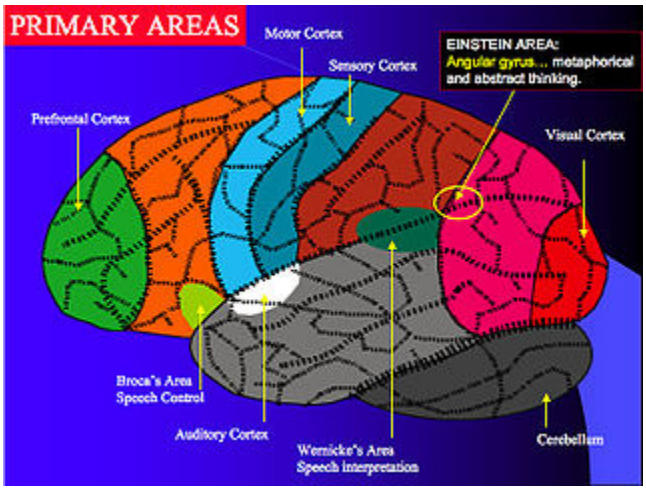
Paul and Tony

MIND YOUR BRAIN

When someone tells you to "exercise your brain", what exactly does that mean? It is about to mean more to us than solve a mathematical problem, write a brilliant essay or figure out how to get your 8 year old to do homework. It also means start moving—your brain will be activated and is obviously involved in your decision to walk, run, do pull-ups, dips, deadlifts, bench press, lunges, cleans. With exercise we marshal up our cerebral neurons to change focus, enhance stress resistance, and precondition our nerves to adapt under great physical and mental stress---even the stress of multiple sclerosis. Social and behavioral interventions such as regular physical activity and social support reduce the chronic stress burden and benefit brain, body health, and resilience. [12]

The literature tells us and Tony has shown us that people with MS can improve their cardiorespiratory endurance, stamina, strength, flexibility, power, speed, coordination, agility and accuracy through exercise training as shown below in Coach Paul Flores' graph of Tony's progress. Additionally, exercise may also lower disease risk related to inactivity. These facts are obvious to those who exercise, but less obvious perhaps is the fact that to do all of these things embodied in "exercise" we must marshal up our BRAIN POWER to impact *neuronal plasticity*. White et al[11] have shown that before fatiguing exercise, a person with MS uses more brain activation than those without MS. It is interesting to reflect on our own self-efficacy (motivational power) as we approach a workout and realize that a person with MS has to have such power in spades.

NEUROPLASTICITY



The term "neuroplasticity" implies change and the theory challenges the idea that brain functions are fixed in certain locations. The discovery that the adult mammalian brain creates new neurons from pools of stemlike cells was a breakthrough in neuroscience.[13]

The concept of neuroplasticity has come a long way since the early 1960's when Joseph Altman's work with adult rats with brain lesions suggested the possibility of proliferation of neurons.[14]

Multiple scleroses can cause nerves in any part of the brain or spinal cord to lose their protective myelin sheath (demyelination), causing symptoms in many parts of the body. But wait! Our brains aren't hard wired; they can change their "wiring" by forming new neural connections to compensate for injury and disease. The brain possesses the property of plasticity in that it can reorganize itself-- "one of the most extraordinary discoveries of the twentieth century." [14]

Coach Glassman urged us to *establish* neuromuscular connections for lifts and for cardiopulmonary endurance--"establish" being the operative word. CrossFit has encouraged us to learn a variety of new moves, rather than being stuck in one or two old moves. It turns out that this may be the most effective way to establish new neural pathways. A life of leisure, rest, and taking it easy pretty much guarantees degeneration and loss of function in unchallenged areas such as flexibility, strength and power, stamina, coordination, agility, balance, and cardiopulmonary efficiency. The fact that the adult brain is not hard-wired is a comfortable concept for those who incorporate intense exercise into their daily lives. What we didn't know is that the neuromuscular connection could also be new and recruited from a different area in the brain! This fact is especially encouraging for people with MS who have lost and damaged nerves—go after it! You have every hope of success.

Way back in the early 50's, in Nurses Training I was taught that each point on the body is directly wired to a specific point on the 'brain map,' essentially hard-wired with no hope for rehabilitation after brain injury. Over time we have come to understand that there is much greater potential for modification than we thought all those years ago. Hopefully, there will always be--as there have been, a few great and brilliant men and women who will step out of the proverbial road rut, take a courageous professional risk, and seek to find out more when that inner voice is prompting them that "there must be another answer."

BENEFITS OF EXERCISE

What are these incredible benefits of exercise that we strive to possess? They are all of CrossFit's stated goals, but they are more too. You are not excluded if you have MS, in fact because cognitive and movement faculties are threatened by MS, the benefits of exercise will be more profound for you. Here they are:

- Improved general health
- Improved endurance, fitness, strength, power, stamina, flexibility, coordination, agility, balance, and accuracy
- Possible protection, regeneration, and adaptation for damaged CNS nerves through the insulin-like growth factor-I associated with exercise[1]
- Improved neural activation and *neuroplasticity*
- Lessening of depression
- Less decline in learning and memory
- Promotion of anti-oxidant defenses
- Reduction of long-term disability[6]
- Better cerebro-vascular function and cognition[10]
- Possible disease modifying anti-inflammatory effect
- Potential to slow down the disease process[15]

In CrossFit endurance and resistance training are combined in every high intensity workout, providing profound adaptations in both cardiorespiratory and neuromuscular systems. When I started this story on 10/15/09, Tony was our only CrossFitter that I was aware of with multiple sclerosis; now there is another, but I will let her daughter tell that story. Tony's progress across

the entire physiological profile has been extremely rewarding to him and to his coach, Paul Flores.

MOTIVATION

Having considered the benefits of exercise for a person with MS, it may be a stretch for one to believe that such a person avoids any introduction to an exercise program. However, awareness of such benefits *will not bring commitment to a program*.[16] On the other hand, perceived *exercise self-efficacy* will do the trick; not a small thing--this sense of self-efficacy. It affects how we think, what motivates and influences us, and our selection processes in life.[17]

We see the motivation of self-efficacy every day in the people who train next to us, setting challenging goals, sustaining their efforts after failure or setbacks, and attributing failure to too little effort or not enough practice rather than their own insufficiency. They are powered by a firm belief in what they are doing.

Knowing this about the benefits of self-efficacy gives us an understanding of those who do not possess it and an understanding of their approach to their exercise training. Without this gift, one shies away from tough tasks that are personal threats and dwells on personal deficiencies, slackening efforts and giving up quickly in the face of difficulties and failure or setbacks.[17] If, as a trainer, you are faced with this attitude, you are not a poor trainer incapable of motivating others. As convinced as you are of the benefits of exercise for a client, friend or relative with MS, remember that self-efficacy has deep roots. Having met Tony, you know that no one dragged this man into CrossFit. He limped in because he decided to and he did so under his own power.[18]

When you see pictures of a man without arms and legs doing the CrossFit WODs and read about those special men who came out of prisoner of war camps in WWII after so many years of deprivation, hunger, and torture--needing healing, yet alive with aspirations and commitment to goals, you will know self-efficacy at its most challenging.

ADDENDUM

Since this article was begun Tony had a check-up. There has been no progression in white matter in the brain since April, 2009 and his reflex responses are stable. All very good news. His neurologist was amazed at his physical fitness but “skeptical” that intense exercise is directly responsible for his progress in stamina and fatigue--nothing new about that.

UPDATE MAY 23, 2013

Four years later!!

Hi Mary, thanks for following up. I’m doing fine; slowing down a bit but getting by. I’ve had two surgeries since we last spoke, and I’ve recovered nicely from both. I’m still CrossFitting 5 days a week under Paul’s supervision, but we’ve obviously modified my regimen and I’m not

dead lifting 355# or putting much weight overhead anymore. My cardiovascular fitness level and muscle tone still remain high.

I actually just returned from a week-long evaluation at the Mayo Clinic in Rochester, MN last week, and while I am measurably degrading, it's at a pretty slow rate so all is good.

Tony

ACKNOWLEDGEMENTS

The fascinating connecting chains in life have resulted in this article: a cry for suggestions, a response from **Olivia Cheriton Ph.D** with a personal story; followed by **Jon Brininger,** who introduced us to the stars of this production--**Tony** and **Coach Paul Flores.** Paul is owner and L2 CrossFit Instructor at CrossFit East County in San Diego. Tony is his client and friend. Thank you, Tony, for sharing your story with the CrossFit world and beyond, and Paul for your excellent graphs tracking Tony's progress.

Stef Bradford, Ph.D provided suggestions for the development of "Neuroplasticity". Stef took time from her busy schedule to bring me up-to-date with advice and current references.

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