

Transcript of 2021 3MT® presentation by Alex Coates, PhD Human Health & Nutritional Sciences candidate at the University of Guelph

So, let me paint the scene. You are in a middle school track meet and you are running the 800 or two laps of the track. The gun goes up and you shoot ahead. Your legs are flying, your arms are pumping, your crush is watching you from the bleachers. And then you're halfway the first lap, and you think "uh-oh", because you're 12 years old and no one has taught you anything about pacing. Three minutes of excruciating pain later, you collapse across the finish line, and your legs feel like jelly set on fire.

Well, whether you had this experience or not, you can likely relate to that feeling of muscular fatigue, and you know the only way to let your legs recover is to let them rest. But have you ever thought about the heart is a muscle as well, and yet it never gets to rest. Can your heart even get tired? That's the concept behind my thesis, which is exploring these issues of the heart.

So, exercise induced cardiac fatigue was first noticed in 1964 when two famous scientists realized that athletes who exercised for over two and a half hours had a reduction in blood being pumped out of their heart per beat. And this implied that the heart wasn't contracting quite as hard as it previously could.

Fast forward to today, and we now have many studies that have demonstrated a reduction in cardiac function, following very prolonged or very intense exercise. But we don't really know what causes this cardiac fatigue.

So, my thesis set out to answer one main question. What drives exercise induced cardiac fatigue? In my first study, we wanted to get this question of is it intensity or duration? We had a very unique opportunity to go to an ultra-marathon race and test the athletes before and after they completed in either 25, 50, 80, or 160 kilometres of running. And what we found was super unexpected, and that was that those athletes who raced any distance be it 2 hours long or 25 hours long had the same amount of cardiac fatigue. But we did find that those athletes that worked harder in the race had a bit more cardiac fatigue, so maybe it's how hard you go rather than for how long.

In my second study, we thought okay, we know that inflammation increases with very hard exercises, so maybe that's what driving this cardiac fatigue. And we thought the best way to study this would be to test athletes after a moderate cycling bouts, but with or without an injection to cause an increase of systemic inflammation. And this time what did we find? This time, we saw the same amount of cardiac fatigue, following bouts of exercise with or without the extra inflammation. So, this tells us that cardiac fatigue is current independent of inflammation.

So, what does this all mean? Well, just like your legs feel like jelly set on fire after a track race, it is likely that your heart is tired as well, and it happens if you are healthy or sick. There is also a chance the harder you go, the more fatigue you have regardless of duration. But does this mean we should be afraid of exercise? Probably not. Because just as your legs get stronger overtime, it's likely that your does as well.

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