

**WHEN "MORE" IS NOT "more":**

**RECOGNIZING OVERTRAINING**

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**"Feeling Lousy"**

A 35 year old woman presents to her primary care doctor reporting that she has been "feeling lousy" for a few weeks. Upon further questioning, she describes that she has difficulty concentrating at work, is frequently irritable and anxious, and has had changes in her appetite. She hasn't been sleeping well, feels generally sluggish, and has no interest in sex – or anything else, for that matter.

So what's the deal? Viral infection? Major depression? Anemia? Vitamin D deficiency?  
Maybe not.

"You exercise?" asks the woman's doctor.

Suddenly, her eyes lit up. "Oh yeah. I totally LOVE my Spinning classes! They kick my ass."

Hmmm. Relevant? Maybe.

Turns out, excessive high-intensity training with inadequate recovery can result in nervous system, hormonal, and immunological changes<sup>1</sup>. This manifests itself as not only compromised athletic performance but also as disturbances in cardiac function, sleep and energy, cognitive performance, mood, sweating, and immunity. Sub-ideal, right? Right.

**WHAT IS OVERTRAINING?**

The phenomenon of overtraining is incompletely understood but we know that many of the consequences we observe come from systemic inflammatory processes that result from intense exercise, without being balanced by appropriate recovery time. What does inflammation have to do with exercise, you ask? Think back to your basic exercise physiology: to train muscle, we have to overload it enough to cause little microtears in the muscle fibers, which we later re-build. But what we may not appreciate is how we go from "tear" to "re-build." It's actually an inflammatory process. When we tear that muscle fiber, inflammatory cells send out chemical signals (cytokines) that recruit other inflammatory cells that rush in, clean up the "mess" of injury, and shift into repair mode<sup>2</sup>. So with high volume/high intensity training, we are doing THAT much more muscular injury – resulting in THAT much more inflammatory signaling. When we take time for sufficient recovery before causing more "injury" – but when we don't, we never get to that re-building phase. Instead, we just keep breaking stuff down and making an inflammatory mess of cytokines (i.e., IL-1, IL-6, TNF-alpha)

that circulate systemically and coordinate a “whole body” response. These cytokines communicate with the central nervous system (which affects, well, EVERYTHING) and make us literally “feel” sick<sup>3</sup>.

While a specific Overtraining Syndrome has been largely studied and described in elite athletes, “mere mortals” frequently experience aspects of this phenomenon. And since we’re talking about important adverse physiological, cognitive, and emotional consequences that impact people’s lives beyond exercise, it is important that we know how to recognize when this may be taking place. **If physicians and coaches can think to keep overtraining on their “radar,” early recognition of when training patterns are undermining health can help get people make necessary changes to their training plans (or lack thereof).**

### **WARNING SIGNS OF OVERTRAINING**

Research tells us that overtraining impairs physical performance<sup>4</sup>. Rather than belabor all the ways we can measure physical performance in competitive athletes associated with overtraining<sup>5</sup>, I will describe useful warning signs that affect everyday people who are simply doing too much high-intensity training.

#### **\* Mismatch between Perceived Exertion and Heart Rate**

Training with a heart rate monitor provides objective, precise measurement of one important aspect of the body’s physiological response to challenge (i.e., intensity), which is why sophisticated athletes bother to employ them. The trick, though, is that perceived exertion ought to approximate heart rate. When it doesn’t, we know that something else is going on – whether that be illness, sleep deprivation, dehydration, overhydration, certain drugs (caffeine, beta blockers, antihistamines) or, as we now learn, overtraining<sup>6</sup>.

Cardiac responses to overtraining have been described in two “flavors,” if you will: one is primarily driven by the sympathetic nervous system (i.e., “fight or flight”: heart rate is higher – resting heart rate higher, heart rate higher during exercise even when recovering); the other, primarily parasympathetic (i.e., “rest and digest”: heart rate is lower – can’t get it up even when working hard)<sup>7</sup>. I will describe both.

#### **\* “Can’t Get It Up”**

Overtraining is associated with decreased beta-adrenergic receptors and responses (see: my previous article on beta-blockers). Under certain conditions, overtraining is effectively like being on a beta blocker. Despite intense challenge, the heart rate simply is not rising in response to attempted sympathetic firing.

Same result, different mechanism: one adaptation to training is increased parasympathetic nervous system activity (which lowers the heart rate). This is why conditioned athletes have lower resting heart rates. This is a good thing! But under conditions of overtraining, this goes too far. Excessive parasympathetic firing can result in an inability to increase the heart rate in response to challenge<sup>8</sup>.

Bottom line: You feel like you're working really hard, and your heart rate monitor is telling you otherwise.

\* **"Can't Get it Down" – Elevating Resting Heart Rate or Difficulty Recovering**

Overtraining is also associated with increased resting plasma norepinephrine levels, which is a catecholamine whose presence increases the heart rate. This is why we may see elevated resting heart rates, or difficulty recovering quickly after a surge of intense effort<sup>9</sup>. Overtrained athletes may also experience rare palpitations or fibrillations<sup>10</sup>.

This is not to say that reaching high heart rates indicate overtraining. The significant finding is when one does NOT recover quickly from said high heart rates. For example, my appropriately rare anaerobic interval training to 106% of lactate threshold requires me to push to 197 bpm. Reaching 197 bpm does not mean that I am overtrained; I drop 30 beats in < 1 minute. When I am not able to do that, however, I suspect overtraining and build additional recovery time into my training plan.

\* **Chronic Fatigue & Muscular Pain** – unexplained sore, stiff, "heavy" muscles. Not responsive to conventional treatment (because of consistent exposure to additional pro-inflammatory cytokines – any progress made is thus "undone," and pain persists)<sup>11</sup>

\* **Mood Problems**<sup>12</sup>

Depression

Loss of drive/purpose

Loss of libido

Increased irritability/anxiety

\* **Sleep Disturbances**<sup>13</sup>

Difficulty getting to sleep/staying asleep

Waking unrefreshed

Nightmares

\* **Change in appetite**<sup>14</sup>

Either increased or decreased. "CHANGE" is the key.

\* **Frequent Infections, particularly of the upper respiratory tract**<sup>15</sup>

\* **Medical Laboratory Abnormalities**

Overtraining syndrome has been associated with high serum creatine kinase levels and low ratio of serum testosterone to cortisol concentrations, though is not required for diagnosis. Research is under way to develop means for using serum catecholamines, glutamine<sup>16</sup>, and oxidative stress<sup>17</sup> biomarkers for diagnosis. Overtraining syndrome is a diagnosis of exclusion, when all other medical explanations for the presenting signs and symptoms have been exhausted.

**WHO'S AT RISK?**

- \* **Sudden increases in training volume and/or intensity** – watch for changes in season, returning from illness/injury/inactivity without gradual increase
- \* **Frequent anaerobic interval training**
- \* **Insufficient recovery**
- \* **Large volumes of monotonous training (i.e., same intensity all the time without periodization)**
- \* **Physical stresses** – glycogen depletion (i.e., insufficiently fueling before/during/after exercise), dehydration, preexisting illness or injury<sup>18</sup>

### **NOW THAT WE'VE RECOGNIZED OVERTRAINING – HOW DO WE FIX IT?**

The fastest, most effective way to counteract the effects of insufficient recovery from high intensity training is to COMPLETELY RECOVER. Taking a week off from exercise will largely reverse the processes I've described.

But here's the deal: overtrained athletes are the LAST people who want to hear this. Try telling someone used to daily high-intensity efforts and uber-huge endorphin releases to \*gasp\* sit still for a week. Not going to happen.

Immediate interventions are not the time for conversations about epic training restructuring or major lifestyle changes. But most people are receptive to the idea of trying a brief "experiment" based on scientific principles, particularly if said experiment is oriented toward making them not feel lousy. First step: arrive at a consensus that feeling lousy is sub-ideal, and that your athlete's training practices may be responsible for their discomfort. Next: suggest a trial of three days of passive recovery (avoid elevating the heart rate any higher than "very light" exertion).

Take the initiative to discuss your athlete's concerns about coping with these three days: whether he or she has alternative ways of stress management and relaxation, perhaps through mindfulness practice or investment in a non-exercise hobby. Some athletes will be able to anticipate the challenge of scaling back their exercise; some will not. Support them by prompting them to anticipate their discomfort and rehearsing strategies to cope when it arises.

If your athlete is not open to three days off, try two – or even one day. Then, encourage them to continue the next 1-2 weeks with active recovery (i.e., engaging in light exercise)<sup>19</sup>. Support the athlete through the psychological and emotional challenges of taking time off from exercise, as this truly may be a significant personal stress. Help them to find alternative ways of stress management and relaxation, through mindfulness training or investment in an alternative non-exercise hobby.

Once the present signs and symptoms of overtraining are resolved and your athlete feels better, he or she will be more likely to be receptive to a conversation about how to restructure his or her training plan to accommodate sufficient recovery time to support the training load and intensity. It may even be appropriate to re-evaluate whether said load/intensity is truly an effective strategy to help the athlete meet his or her specific personal goals.

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*Next up: Management of common overuse injuries in cyclists*

*Have a medical-related question that you want ICI to cover? E-mail [melissa.marotta@uvm.edu](mailto:melissa.marotta@uvm.edu).*

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