

## **Overtraining Syndrome: Something Every Coach, Parent, and Athlete Should Be Aware Of**

**By Dr. Angela Hanlon, B.Sc (nutrition), ND**

Alex was a high performing pre-teen with a strong competitive spirit. She found winning races to be encouraging and empowering. It gave her focus and, frankly, it kept her out of trouble.

Through her pre-teen years and into her teens she flourished into a grounded young lady with a refreshing mix of confidence and clear-headedness. She performed well in school and on the race track.

Alex had developed a secret weapon to manage the stress of growing up: she did a rigorous combination of aerobic and anaerobic exercise every day. In addition, she competed almost year-round.

As she got older she did more travelling for her competitions. This was great! Her team would take off on whirlwind adventures that connected her to friends in other regions. This helped Alex to keep the drama of high school life in perspective, but it was also taxing on her body.

Alex got a scholarship for a local university and continued to train through her freshman year for the Canada Games. However, her performance began to decline. Alex gained some weight and started to show early signs of anxiety. Fortunately her coach had trained her to check her resting heart rate every morning, and she'd been doing so for almost 2 years. Alex's resting heart rate, which had previously been nice and low, had increased this season. She was also experiencing some mild dizziness during training.

She became winded more easily, developed dark circles under her eyes, and continued to gain weight. Finally she admitted that she'd been having strong food cravings. She also admitted to having dizziness when carrying laundry up the stairs, particularly when she'd spent extra time sitting around folding it.

As winter came around and peak competition season approached, Alex continued training for the Canada Games, under the close watch of her concerned coach. However declining race times became a growing issue. She just didn't have the speed, strength, and endurance she used to have. She began noticing her heart suddenly beating hard and fast during practices. Sometimes she even noticed transient spots in her visual field, usually when she was climbing the big hills. In addition, her heart would sometimes flutter while she was at rest. She also noticed that her menstrual periods were getting lighter.

Alex's performance in school was following a similar pattern. She began to struggle, despite doing everything she could think of to keep her mind focussed during study time.

She was having a progressively harder time dragging herself out of bed in the morning. Strangely, she was also having trouble settling down to sleep at night. She seemed to get a second wind around 8pm. Anxiety and food cravings continued to increase and Alex's eating habits became irregular.

Despite Alex's best efforts to downplay what was happening, her coach warned her of the consequences of pushing herself any further.

Alex continued pushing herself until she'd done her Canada Games competition. She then stopped competing and focussed on her schooling.

Over the next 2 years, as she slowly learned to take better care of her body, her system recovered and she became resilient again.

#### How to Check Resting Heart Rate:

Before getting out of bed in the morning, use your index and middle finger (not your thumb) to find a pulse at your wrist or throat. Count your heart beats for 60 seconds. If you're short on time, count for 30 seconds and multiply by two. Try to avoid doing the 10-second check, it's not quite accurate enough. Remember to keep a log so that heart rates can be tracked. It's normal for resting heart rate to fluctuate day-to-day. You're looking for week-to-week or month-to-month changes.

*\*Stay tuned for more on overtraining syndrome. Part 2 will discuss the different stages of overtraining and the role of the nervous, cardiovascular, and endocrine systems.*

## **Overtraining Syndrome Part 2: The Nervous, Cardiovascular, and Endocrine Systems**

### Overreaching

Overtraining syndrome has also been called maladaptive syndrome. Overreaching may also be a term you come across, which is described as a milder or earlier version of overtraining. Overreaching is often used as part of a structured training program to encourage resilience during recovery times. If it's done properly, recovery requires just a few days (1). Overreaching is described as a short term decrease in performance without signs of maladaptation as a consequence of intensive training.

Nonfunctional overreaching is a term used to describe overreaching that occurs unintentionally. This has also been called under-recovery. Daily life demands or unexpected circumstances can contribute to this (1).

### Overtraining Syndrome (General Adaptation Syndrome)

Overtraining syndrome (O.S.) requires weeks to months of rest combined with restorative dietary and movement-based activities (1). For the purpose of this article O.S will be described as a state of general adaptation syndrome, which is a dysfunction that has been thoroughly researched and documented. Specifically, O.S. will be described in the context of the resistance phase of general adaptation syndrome (2).

In O.S., the nervous system is in a state of sympathetic dominance, meaning that pain sensitization is likely to be heightened and everyday problems may seem more overwhelming than usual. Our neuroendocrine hormones become depleted (1, 2).

The cardiovascular system is affected by the state of the nervous system. Blood pressure and resting heart rate increase, and palpitations can occur (1, 2). Postural decline in blood pressure is a measure that health care providers use to assess for a dysfunction called orthostatic hypotension.

The endocrine system is a combination of glandular systems that includes the adrenal, thyroid, male/female, and pancreatic systems. Cortisol, which is a catabolic substance, elevates. This contributes to the stress response in the nervous system. Testosterone, which is an anabolic substance, declines (this is relevant for females as well). This inhibits muscle recovery, performance, and libido. Insulin increases, which makes us more susceptible to low blood sugar episodes. Female hormones decline, which affects menstrual periods, libido, and fertility. Thyroid hormones are thought to decline, though lab values of TSH, T3, and T4 often stay within range (1, 2).

In addition to the immune system being less able to fend off viruses and bacteria, it is thought to be more susceptible to autoimmunity (2).

The 24 Hour Cortisol Curve: Cortisol should be at its highest in the morning. It should not be elevated in the evening, but tends to be with overtraining syndrome (2). There are techniques and natural health products that can be used to correct dysfunctions in the cortisol curve.

### Parasympathetic Overtraining (Burnout):

Not enough is known about parasympathetic overtraining just yet. However, based on what is written about it, it seems to parallel the exhaustion phase of general adaptation syndrome (2).

In this state all endocrine hormones are depleted including cortisol. Immunity is weak. Simply, this is a state of exhaustion. Resting heart rate declines in this state. It also declines (normalizes) in the recovery state (1). Don't let this fool you.

### Recovery

Recovery is not a static state, it requires mild-moderate exercise (2). Examples of restorative movement techniques include yoga, tai chi, and qi

gong. Walking is also a restorative technique and, depending on the individual, light jogging may also be restorative. Stretching is very restorative, and should be the focus during recovery.

Dietary techniques to encourage restoration should not be prescriptive, but should instead be individualized. Restoration of the cortisol curve should also be addressed on an individual basis.

*\*Stay tuned for more on overtraining syndrome. Part 3 will discuss some realities of overtraining, and the role it can play in anxiety and depression*

### References

1) Kellmann M, Bertollo M, Bosquet L, et al. Recovery and Performance in Sport: Consensus Statement. *International Journal of Sports Physiology and Performance*. November 2017:1-6. doi:10.1123/ijsp.2017-0759.

2) Friedman MCAB. Fundamentals of naturopathic endocrinology: complementary and alternative medicine guide. Toronto, ON: CCNM Press; 2005.

## **Overtraining Syndrome Part 3: The Realities of Overtraining and The Role it Can Play in Anxiety and Depression**

For some of us, exercise is a highly effective stress management technique. That's great...right? The neuroendocrine hormones produced during rigorous exercise have a powerful influence on us. A body that regularly produces high levels of these substances will regulate its body systems accordingly. If the body stops producing regular doses of these neuroendocrine hormones, balance within the body systems is thrown off. This may be why many athletes experience anxiety or depression when an injury puts them out of commission for a long period of time.

Knowledge about overtraining syndrome is still lacking, but it appears that between 20% and 30% of North American amateur athletes experience it. Incidence rates are thought to be higher in individual sport athletes and females (1). Overtraining syndrome produces a variety of imbalances in the immune, endocrine, and nervous systems. This means that its effects on the body are far reaching (2,4). The endocrine system regulates our male and female hormones, blood sugar, stress hormones, circadian rhythm, and thyroid hormones. The nervous system is in charge of pain perception, moods, and

response to stressful situations. The autonomic part of the nervous system is in charge of heart rate, blood pressure, and respiration rate. It also determines where blood flow is directed in the body.

### Why Do We Overtrain?

In theory, the late stages of overtraining syndrome should never be reached. There are plenty of warning signs in the early stages, and they aren't exactly subtle. However despite all signs and symptoms, we push ourselves into injury and burnout even though we know better. Some say it's for the glory of overcoming obstacles to achieve success. In my experience it's usually more complicated than that. Many of us push ourselves into burnout because we don't know how to thrive without our regular workouts.

In addition to physical wellbeing, overtraining syndrome affects mental and emotional wellbeing including self esteem. It can affect resilience in many aspects of life, such as professional growth and the ability to handle disappointment or failure. An article published in a 2011 issue of Medical Sport Science stated this phenomenon best; "Of particular relevance to the issue of overtraining in the elite young athlete are the development of a unidimensional identity, the lack of autonomy, disempowerment, perfectionist traits, conditional love, and unrealistic expectations" (1).

However in my opinion, overtraining syndrome is not the cause; it is the consequence. Proper recovery from an overtraining state may require guidance and mentorship to develop alternative stress management techniques, adaptability, and psychological resilience.

### A Reminder Of What Overtraining Syndrome Looks Like:

For a detailed illustration of overtraining syndrome refer to Parts 1 and 2 of this blog series. The main signs you should be looking for are increased effort during familiar workouts, frequent respiratory infections, muscle soreness, sleep disturbances, loss of appetite, mood disturbances, shortness of temper, decreased interest in training and competition, decreased self-confidence, and inability to concentrate (1). Resting heart rate should be monitored by tracking beats per minute every morning upon waking.

Early detection of overtraining syndrome can significantly decrease the risk of overuse injuries (3, 5). This is particularly true in young athletes (3).

*\*Stay tuned for Part 4 which discusses how to stay resilient during heavy training times.*

### References

1) Winsley R, Matos N. Overtraining and Elite Young Athletes. *The Elite Young Athlete Medicine and Sport Science*. December 2010:97-105. doi: 10.1159/000320636.

2) Lehmann MJ1, Lormes W, Opitz-Gress A, Steinacker JM, Netzer N, Foster C, Gastmann U. Training and overtraining: an overview and experimental results in endurance sports. *Journal of Sports Medicine and Physical Fitness*. March 1997: 7-17

<https://www.ncbi.nlm.nih.gov.ccnm.idm.oclc.org/pubmed/9190120>

3) Walters BK1, Read CR2, Estes AR3. Effects of resistance training, overtraining, and early specialization on youth athletes. *Journal of Sports Medicine and Physical Fitness*. June 2017 Jun 8. doi: 10.23736/S0022-4707.17.07409-6

4) Cadejani FA1, Kater CE2 Hypothalamic-Pituitary-Adrenal (HPA) Axis Functioning in Overtraining Syndrome: Findings from Endocrine and Metabolic Responses on Overtraining Syndrome (EROS)-EROS-HPA Axis. *Sports Med Open*. Dec 8 2017 doi: 10.1186/s40798-017-0113-0

5) Vetter RE, Symonds ML. Correlations Between Injury, Training Intensity, and Physical and Mental Exhaustion Among College Athletes. *Journal of Strength and Conditioning Research*. 2010;24(3):587-596. doi:10.1519/jsc.0b013e3181c7c2eb.

#### **Overtraining Syndrome Part 4: Staying Resilient During Heavy Training Times**

Much of the research on the fundamentals of overtraining syndrome was done in the 1990s. Despite this, OS is still a foreign concept to many of us.

##### Honour the circadian rhythm (cortisol curve)

Cortisol is commonly called a stress hormone. Though it is produced during times of stress, it's also produced during times of performance. This includes competitions, workouts, public speaking engagements, and completing assignments. Excessive performance leads to excessive cortisol production, leading to a stress response in the body and eventual burnout. However, some cortisol production is good.

According to the natural circadian rhythm, cortisol should be highest at 8am and taper as the day goes on. By bedtime, cortisol levels should be low and melatonin levels should be increasing. If cortisol remains elevated through the day or rises in the evening, we'll have a hard time falling or staying asleep. In addition, the quality of our sleep will not be optimal. We'll wake up groggy and unrested. Throughout the day, hunger cues will be thrown out of balance which can lead to blood sugar fluctuations.

### Keep Blood Sugar Levels Steady

Blood sugar fluctuations can inhibit both performance and recovery. Think of elevated blood sugar as something that affects the performance of your vehicle (your body). The more concentrated the sugar, the more performance and recovery is affected. Soft drinks and slush drinks are at the top of this list. Other primary offenders include candy, energy drinks, and chocolate bars. There is, of course, a place for concentrated sources of carbohydrates. Use them strategically and intelligently. Do some extra reading about a body process called *reactive hypoglycemia*.

Blood sugar fluctuations can also affect the circadian rhythm. If you've ever had a big meal in the evening, you'll know that the next morning you don't wake refreshed. Your stomach may feel a little off and you may not be in a good mood. People who break the habit of eating a lot in the evening usually notice their sleep more restful and their mornings much more pleasant.

There are a number of ways to avoid blood sugar fluctuations, and the approach does not have to be complicated.

### Take Rest Days, But Have Fun With Them

Our workout is part of our day. It's the time we use to regain perspective, sort of like a re-set button. Rest Day needs differ from person to person, and each of us should use our own discretion to do what feels right. You may want to walk. You may want to sink into the couch in front of the TV. You may prefer a 10-15 minute jog (not run, not sprint. Jog). You may prefer yoga.

### Restorative Yoga: Very Efficient

Autonomic and neuroendocrine imbalances are thought to be the underlying cause of overtraining syndrome (2). Restorative yoga is a form of yoga that is thought to act on these body systems (4).

In my opinion, the sequential flexion and extension of muscle groups during yoga helps to prevent injuries and promote recovery. In addition, I think that the effect of yoga on our neuroendocrine hormones (including cortisol) has a lot to do with the movement and positioning of the spine while we're resting in

a yoga pose. The positions used in yoga cause the breath to create different body movements that wouldn't likely happen during other activities. This creates subtle changes in spinal cord movement that would, by logic, benefit nerve function within the spinal cord. The spinal cord has a big influence on the state of our nervous system, helping to dictate how wound up or wound down we are.

The more effectively we can get ourselves into wound down mode, the more efficient our recovery. The enhanced blood and lymphatic circulation that occurs in muscles during a prolonged body stretch provides added benefit.

### Training Basics

Sudden increases in training load should be avoided. Aim for a steady increase of 5% per week. Monotonous training should be avoided. Intensive exercise with short rests coupled with frequent competition increases the risk of developing overtraining syndrome (3). Training should be reduced during times of stress or overwork, such as exam time for students or tax time for accountants. Be self-aware during times of unexpected stressors such as family conflict, starting a new job, or times of grieving.

### Recovery time

A 1990 article published in the British Journal of Sports Medicine said it best: "Cases need to be assessed individually, and it is often difficult to persuade athletes that they need to rest. However, this seems to be the basis of treatment since an improvement in performance has been shown after 3-5 weeks rest, despite the fact that these athletes must become detrained in this time. The buildup to full training may take up to three further months. It is thought important to avoid competition, although individuals may produce personal best performances 'out of the blue' before apparent complete recovery. Our own anecdotal observation suggests that recovery takes three to eight weeks. However, there is a danger of relapse at around 3 months. We advise reduced training and competition stress for up to 4 months." (1)

-Dr. Angela ND

### References

1) Budgett R. Overtraining syndrome. *British Journal of Sports Medicine*. 1990;24(4):231-236. doi:10.1136/bjism.24.4.231.

- 2) Lehmann M, Foster C, Dickhuth H-H, Gastmann U. Autonomic imbalance hypothesis and overtraining syndrome. *Medicine & Science in Sports & Exercise*. 1998;30(7):1140-1145. doi:10.1097/00005768-199807000-00019.
- 3) Kenttä G, Hassmén P. Overtraining and Recovery. *Sports Medicine*. 1998;26(1):1-16. doi:10.2165/00007256-199826010-00001.
- 4) Corey SM, Epel E, Schembri M, et al. Effect of restorative yoga vs. stretching on diurnal cortisol dynamics and psychosocial outcomes in individuals with the metabolic syndrome: The PRYSMS randomized controlled trial. *Psychoneuroendocrinology*. 2014;49:260-271. doi:10.1016/j.psyneuen.2014.07.012.
- 5) Sullivan MB, Erb M, Schmalzl L, Moonaz S, Taylor JN, Porges SW. Yoga Therapy and Polyvagal Theory: The Convergence of Traditional Wisdom and Contemporary Neuroscience for Self-Regulation and Resilience. *Frontiers in Human Neuroscience*. 2018;12. doi:10.3389/fnhum.2018.00067.