

# The Overtraining Syndrome

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Overtraining has been traditionally described as diminished performance that results from an increase in training volume and/or intensity. I have defined the *overtraining syndrome* as an imbalance in a simple equation:

$$\text{Training} = \text{Workout} + \text{Recovery}.$$

Overtraining may result from an excess number and/or intensity of workouts, lack of recovery or a combination.

The overtraining syndrome may be comprised of a variety of problems resulting in many different signs and symptoms. These may be hormonal, nutritional, mental/emotional, muscular and others.

Prevention and correction of the overtraining syndrome begins with self-assessment. Observing the subtle clues in their earliest stages are crucial to the prevention of further regression. The MAF Test may be the most powerful tool for assessing overtraining in the earliest stage, and may provide the first objective sign, even before symptoms. In order for this assessment to be effective, you must conduct the MAF Test about every four weeks.

It's always best to discuss the full spectrum of overtraining, not just the more obvious middle and late-stage conditions. The overtraining syndrome can be described as having three stages:

Stage 1: Also called *functional overtraining*.

The onset and earliest stage where very subtle signs and symptoms can indicate you're starting to overtrain.

Stage 2: Also called *sympathetic overtraining*.

A more obvious stage associated with specific nervous, hormonal and mechanical imbalances causing a variety of signs and symptoms.

Stage 3: Also called *parasympathetic overtraining*. A serious end-stage of overtraining associated with the exhaustion of nervous and hormonal factors.

The overtraining syndrome typically results in poor athletic performance, structural injury secondary to muscle dysfunction, metabolic problems such as fatigue, infection, bone loss, sexual dysfunction, altered mood states and others. These signs and symptoms not only affect training and competition, but all aspects of a person, sometimes well into later life.

While we think of overtraining as being sports related, other lifestyle factors may contribute to the cause. Increased work, family or job stress, social obligations, poor sleep habits and other non-sports factors can significantly and indirectly contribute to overtraining.

## Stage 1: Functional Overtraining

The first stage of overtraining is not usually accompanied by classical problems but by very subtle or subclinical ones. This may include a seemingly minor plateau or slight regression in *training* performance most easily observed when measuring heart rate vs. pace (the MAF Test).

Interestingly, this stage is sometimes accompanied by a sudden or dramatic improvement in *competitive* performance that may convince you that training is progressing well. This temporary improvement may be due to an abnormal overactive sympathetic nervous system. This may be followed by a physical injury which may mark the start of the second stage of overtraining.

A common problem in Stage 1 overtraining is a developing imbalance between aerobic and anaerobic capacity. While this may be determined by various tests, it is not difficult to generally compare maximum aerobic function vs. maximum anaerobic function. Aerobic capacity can be measured with the MAF Test, while anaerobic function by competitive performance. An imbalance is evident, for example, if you can perform the MAF Test at 7 minutes per mile but run a 5 or 10K race under 5 minutes per mile. It is not uncommon for talented athletes in Stage 1 (or the start of Stage 2) to compete at high levels but

have poor aerobic function. (Decreased performance levels may not be evident until middle and later stages of overtraining.)

Stage 1 overtraining may be synonymous with *overreaching*, which has been shown in studies to boost performance but often turns into overtraining – it's a fine line between optimal preparedness and the beginning of overtraining.

Adrenal gland dysfunction, very common in overtraining, starts in Stage 1. In addition, it typically parallels aerobic deficiency. As Stage 1 progresses, athletes may begin to develop fatigue, sleeping irregularities and abnormal hunger or cravings. They may be unable to lose that extra body fat, get sleepy after meals, and have an uncanny craving for caffeine.

Nutritional problems may include excess consumption of refined carbohydrates at the expense of healthy fats and protein.

Other complaints common in the first stage of overtraining include:

- Increasing vulnerability to back, knee, ankle, and foot injuries.
- Adrenal gland hormone imbalance – slight elevations in cortisol (and secondary lowering of testosterone and DHEA levels).
- Premenstrual syndrome and menopausal symptoms may be secondary complaints for women, but amenorrhea is the most common hormonal problem.
- Sexual dysfunction may be a problem for both sexes, typically producing reduced sexual desire and sometimes infertility.
- Mental and emotional stress, including mild or clinical depression and anxiety is not uncommon.

When overtraining is not halted, all these signs and symptoms merge into the second stage of the overtraining syndrome.

### **Stage 2: Sympathetic Overtraining**

As overtraining progresses, imbalance worsens. Specifically, the sympathetic part of the nervous system becomes overactive. This results in the classic sign of an increased resting heart rate. Many athletes become aware of this if they

regularly measure their morning heart rate, or train with a heart monitor. Often associated with this is restlessness and over-excitability.

The increased training heart rate also influences the MAF Test results – i.e., training at the same pace results in a higher heart rate, or, training at a given heart rate slows your pace.

Stage 2 overtraining is more common in athletes who train with speed and power excess, those who train too often, those with contributing lifestyle stress, and most often those athletes who have a combination of these factors.

Adrenal gland dysfunction also progresses during sympathetic overtraining. Early detection and treatment of adrenal dysfunction is vital to the prevention of overtraining (and is easily done with regular salivary testing). Specific adrenal problems include various hormonal imbalances: cortisol output may rise to abnormal levels. The keen awareness and fine hand-to-eye coordination required in some sports are adversely affected by these hormone problems. High cortisol levels have a catabolic effect on the system – this is comparable to that produced by exhaustive, prolonged training.

High cortisol may also increase insulin levels. Aerobic training usually suppresses insulin production during exercise, whereas studies show that maximal training intensities can increase the insulin response. This further raises the sympathetic nervous system activity and adds to the overtraining condition. In addition, elevated cortisol lowers testosterone and DHEA, both important for muscle recovery. Those who waken in the middle of the night and don't easily fall back asleep typically have high cortisol levels.

Fortunately, this hormone imbalance is relatively easily remedied through diet and lifestyle changes, including one's training and racing schedule. However, chronic overtraining in this stage can lead to the third stage of overtraining.

### **Stage 3: Parasympathetic Overtraining**

Chronic overtraining can lead to more serious hormonal, neurological and mechanical imbalances (which continue to parallel adrenal dysfunction and aerobic deficiency). Eventually,

the sympathetic nervous system becomes exhausted, and most if not all hormone levels are significantly reduced, including cortisol.

Stage 3 is typically accompanied by the lack of desire to compete (and sometimes train), depression, significant injury and most notably exhaustion. Performance may diminish considerably and many athletes in this state consider themselves “sidelined.”

The MAF Test has usually regressed dramatically and plateaued at a poor level. This condition is associated with *abnormally* low resting heart rates and low heart-rate recovery from interval training or competition. (Some continue to misinterpret the low heart rate as a good sign.) The hormonal problems may result in increased sodium loss due to reduced aldosterone and may increase the athlete’s vulnerability to hyponatremia – a serious condition of low sodium (although this condition can also appear in Stage 2).

Athletes who are in the third stage of overtraining are seriously unwell. Recovery and return to previous optimal levels of performance is a very difficult task.

### **Remedies for Overtraining**

In order to remedy a problem, it must first be properly assessed. When properly performed, the MAF Test is the most important evaluation an athlete can make to assess overtraining in its earliest stage. Also effective are hormone tests, such as the simple and accurate salivary cortisol, DHEA, and sometimes others as needed, such as testosterone, estrogen and progesterone.

Another important assessment tool is a good history – taken by a coach, a family member, or most accurately by a health care professional. The important questions that pertain to mood, energy levels, sleep quality, performance and infections are important to answer honestly.

A diet analysis, which can often be done free of charge on the Internet or for a nominal cost through a health professional, or through the purchase of a simple computer program, is a very valuable tool that assesses the balance of macro- and micronutrients in the diet.

Two important remedies that can help correct overtraining include modifying the training schedule, and the nutritional state.

Correcting overtraining begins by immediately restructuring the training schedule, modifying lifestyle factors including diet and nutrition, and addressing all levels of stress. Finding a professional who can help is also a valuable adjunct.

Training. Although these changes should always be based on the individual’s need, some specific suggestions include:

- Decrease training *time* by 50 to 70 percent, or more if necessary.
- Immediately cease all anaerobic training and competition.
- A helpful remedy for an overtrained athlete is walking, which can gently stimulate circulation and aerobic muscle fiber activity, and offers mental benefits much like those of meditation. Walking also helps redevelop the aerobic system – the first phase of retraining.
- Retraining, that is, building the aerobic base, should last three to six months and does not include any anaerobic training or competition.

Diet & Nutrition. While individualized nutritional recommendations are ideal, some important suggestions should be considered:

- Reduce (or eliminate) all high-glycemic foods. Moderating carbohydrate intake overall can also be helpful as high-carbohydrate diets may further elevate cortisol levels.
- Consume smaller, more frequent meals to help control blood sugar and cortisol, especially for those with symptoms of depression, fatigue, hunger and restless sleep.
- Adequate caloric intake is very important – never get hungry. Include moderate amounts of protein (especially eggs and meats) and healthy fats.
- Overtraining may disrupt the normal balance of fats in the body, which help control inflammation, one reason why inflammatory-related injuries are

common. Reduce (or eliminate) the intake of vegetable oils (soy, peanut, safflower, corn) which can promote inflammation. EPA (fish oil) supplements can help reduce inflammation. (If serious inflammation exists, avoid all dairy fats too, including milk, cream, butter and cheese.)

- Caffeine consumption may be contraindicated for overtrained athletes. Avoid stimulants such as coffee, tea, soda, and chocolate (beware of caffeine-containing, over-the-counter and prescription drugs).
- Zinc may help control the abnormally high levels of cortisol, but timing is important when supplementing with zinc. Cortisol should be measured throughout the day to determine abnormal peak levels; then the zinc supplements should be taken two to three hours prior to cortisol peaks.
- Malabsorption of nutrients is common in overtrained athletes, due to the high stress levels and poor intestinal function. This is especially common in those over the age of 40 years. Products such as betaine hydrochloride may improve digestion, and L-glutamine supplements can improve nutrient absorption.

When committed, athletes can often recover rapidly from overtraining imbalances. This is especially true in the functional overtraining

stage. In this stage, modifying the training schedule, and making appropriate nutritional and dietary adjustments often provide improvements of symptoms and even training within one to two weeks. This rapid progress will be demonstrated in the MAF Test or other evaluations, including reductions in injuries and mental states.

Athletes in the first and second stages of overtraining can respond quickly to proper recovery. However, those with upcoming competitions may be required to modify or cancel those events to allow for a more complete recovery from overtraining. Building an acceptable aerobic base will take at least three to six months.

Athletes who are chronically overtrained – those in the third stage – generally respond much slower, even when the best care is available. They may need to cancel their next competitive season (as if they had a physical injury that prevented competing) and spend time building the aerobic system, reducing stress and improving their nutrition. These athletes will require six months or more, and sometimes a year or two, before resuming effective competition.

Overtraining is a serious problem, but one that is easily prevented.

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