

# Training Monitoring Helps Optimizing Performance and Recovery While Preventing Overtraining and Injuries

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Overtraining is an extreme state of fatigue that forces the athlete to rest for several weeks. It and can have a significant negative impact on performance, health and daily life. Overtraining is an extreme state of fatigue that forces the athlete to rest for several weeks. It and can have a significant negative impact on performance, health and daily life. Dr High Morton summarized it well when he said:

“Overtraining syndrome is a neuroendocrine disorder characterized by poor performance in competition, inability to maintain training loads, persistent fatigue, reduced catecholamine excretion, frequent illness, disturbed sleep and alterations in mood state.”

MacKinnon, 2000

Fortunately overtraining can be prevented by implementing a sensible training monitoring program and careful training planning.

The easy-to-implement strategies and guidelines presented in this document are based on recent research and real-life coaching and athletic experience. I hope you will find them useful and that they will help you helping your teams and athletes to train smarter and achieve their highest performance goals.

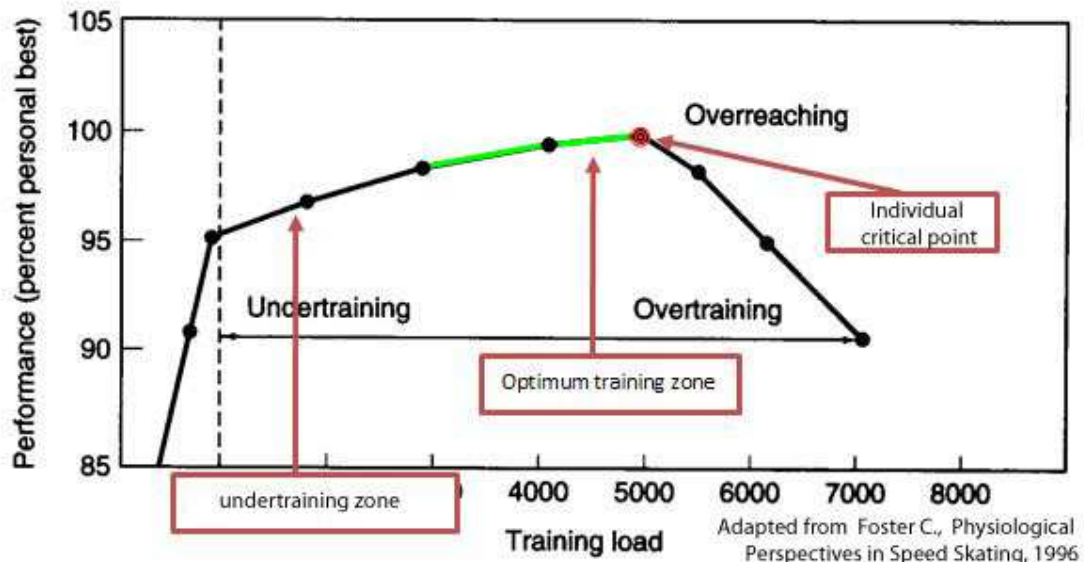
## The overtraining syndrome

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### **The Load-Performance Relationship**

Usually, the more athletes train, the better they perform. Unfortunately, this is only true up to a certain extent as, after a critical point, training becomes excessive and overcomes the ability of the athlete to recover from the imposed load. This leads to a state of overreaching, which, can quickly deteriorate into overtraining if steps are not taken to reduce training load and to ensure proper recovery.

The load-performance relationship and the ability to tolerate high training loads are highly individual. For beginners small training loads usually cause large performance improvements, while elite athletes need larger training loads to elicit small performance improvements.



To perform at the highest level, athletes must be able to sustain high training loads while avoiding overtraining. The critical point above which 'training' becomes 'overtraining' is individual and difficult to identify without a training monitoring program.

**The systematic monitoring of individual response to training load allow you to ensure that training loads are optimized to keep your athletes in the optimum training zone (the load that elicit the highest performance while minimizing the negative impacts of training). Only then, they will reach their maximal performance potential while staying healthy.**

## Overtraining is a widespread problem

Recent data shows that the overtraining syndrome is a widespread problem among athletes. It is estimated that an average of thirty seven percent (37%) of athletes are overtrained at some point in their career. Incidence rate is higher in individual sports than in team or physically less demanding sports (sailing, golf, curling, etc). Individual sports such as badminton or figure skating have a very high incidence of overtraining and the incidence of overtraining is greater in sports where the competitive season is both long and intense.

## Overtraining is often caused by training errors

Overtraining can be caused by many factors. The more common are:

- Excessive training and insufficient recovery

- Little variability in the training load (i.e.: all sessions are perceived 'hard' by the athlete)
- Abrupt increase of training volume and/or intensity
- Frequent competitions
- Inadequate nutrition or hydration
- Psychological stress (school, friends, coaches, parents, family, etc.)
- Unusual environmental stress (extreme cold, heat, altitude, humidity, etc).

## Symptoms of overtraining are numerous

Overtraining can be caused by several factors. The more widely encountered are:

- An unexplained underperformance,
- An increase in perceived effort of training
- An increased muscle soreness
- A need for prolonged recovery
- An unusual need for sleep or excessive fatigue
- Frequent infections (colds, flues infections, etc)
- Sleep and mood disturbance
- An loss of training and/or competitive drive
- An increased anxiety and irritation
- Decreased concentration ability

# A practical plan to avoid overtraining

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This section presents easy-to-implement strategies you may use with your athletes, in order to reduce the negative outcome of excessive training, maximize performance and prevent overtraining.

Recent research shows that an efficient overtraining prevention program is rather simple and that a coach / sport scientist must focus primarily on:

- **Monitoring and individualizing training load**
- **Monitoring athlete's fatigue, stress and recovery**
- **Ensuring adequate recovery and sleep**
- **Ensuring adequate nutrition and hydration**

## Monitoring the athlete's training load

The simplest, yet accurate way of measuring training load is the session RPE (sRPE) method. First published by Dr Carl Foster from the University of Wisconsin, this method is accurate, simple to use, doesn't require any particular equipment and, provides similar results than the TRIMP method without the need of recording training heart rate (or regularly measuring resting and maximal heart rate).

Online training monitoring systems, such as [AthleteMonitoring.com](http://AthleteMonitoring.com) can help with the data collection (example below) and calculations required by the sRPE method.

Date*	2012-04-28
Time (hh:mm)*	08:00
Activity*	Training game
Duration (min)	90
Weight (kg) (post)	67.7
Session RPE	4, Moderate
Satisfaction*	4, High

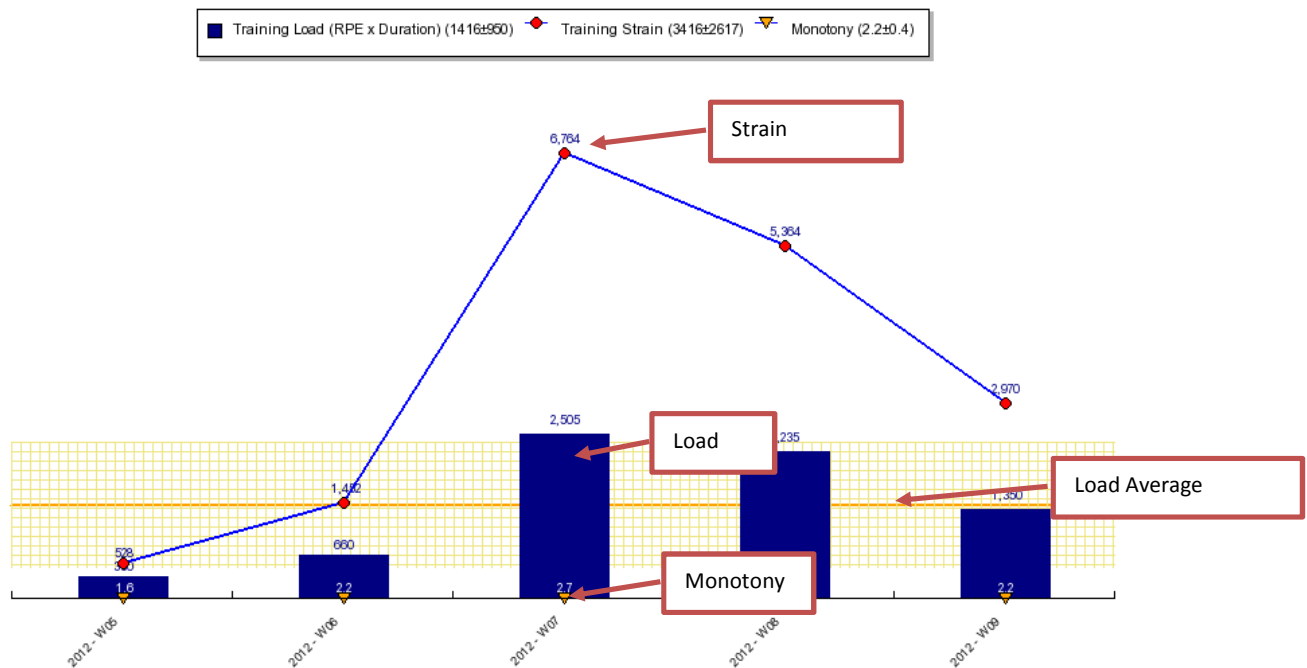
To calculate the sRPE, athletes must rate their perceived level of exertion (on a 0-10 points scale) ~30 minutes after each training session. The product of the RPE rating (0-10) x SESSION DURATION (in minutes) represents the session training load in arbitrary units (AU).

#### Formulas used by the sRPE method

1. **Session Training load** = session RPE x duration (minutes)
2. **Daily Training load** = Sum of all Session Training load for the entire day
3. **Weekly Training load** = Sum of all Daily Training load for the entire week
4. **Monotony** = standard deviation of Weekly Training load
5. **Training Strain** = Daily or Weekly Training load x Monotony

Once the sRPE training load has been recorded over 4-6 weeks, an individual baseline can be established. **Any elevation of the weekly load 3-5% above the individual baseline can be identified as an overreaching problem and discussed between the sport scientist/coach and the athlete.**

The chart below present training load, monotony and strain variables of one football player during the month of February 2012.



As a large percentage of illnesses and injuries can be explained by peaks in individual Training Strain in the preceding 10 days, monitoring these variables provides a simple and helpful way to control individual adaptation to the training load and to detect overtraining in its early stages.

### Monitor athlete's fatigue, stress and recovery

Questionnaires such as Profile Of Mood State (POMS), DALDA or custom Stress/Fatigue/Recovery questionnaires are practical and effective tools to detect daily changes in training-related stress.

However, to detect minor changes, questionnaire must be administered daily and on a relatively long period of time (a few months). Hence, to ensure long-term compliance, questionnaires must be simple, short and easy to fill. The questionnaire presented below, which comes with the [AthleteMonitoring.com](http://AthleteMonitoring.com) system is a good example. It can be completed in less than one minute by the athlete using a mobile device and provide crucial information to the coach or the sport scientist.

How fatigued are you?	<input type="radio"/> No fatigue <input type="radio"/> Minimal fatigue <input type="radio"/> Better than normal <input checked="" type="radio"/> Normal <input type="radio"/> Worse than normal <input type="radio"/> Very fatigued <input type="radio"/> Exhausted- major fatigue
How was your sleep last night?	<input type="radio"/> Outstanding <input type="radio"/> Very good <input checked="" type="radio"/> Better than normal <input type="radio"/> Normal <input type="radio"/> Worse than normal <input type="radio"/> Disrupted <input type="radio"/> Horrible - Virtually no sleep
How many hours did you sleep last night?	<input type="radio"/> 10 plus <input type="radio"/> 9-10 <input type="radio"/> 8-9 <input type="radio"/> 8 <input type="radio"/> 7-8 <input checked="" type="radio"/> 5-7 <input type="radio"/> 5 or less
Please rate your level of muscle soreness	<input type="radio"/> No soreness <input type="radio"/> Very little soreness <input checked="" type="radio"/> Better than normal <input type="radio"/> Normal <input type="radio"/> Worse than normal <input type="radio"/> Very sore/tight <input type="radio"/> Extremely sore/tight
How are you feeling psychologically?	<input type="radio"/> Feeling great-very relaxed <input type="radio"/> Feeling good-relaxed <input checked="" type="radio"/> Better than normal <input type="radio"/> Normal <input type="radio"/> Worse than normal <input type="radio"/> Stressed <input type="radio"/> Very stressed

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Once questionnaire data has been collected over 4-6 weeks, an individual baseline can be established. **Any elevation 3-5% above the baseline can be identified as a recovery problem and discussed between the sport scientist/coach and the athlete.**

## Ensure adequate recovery and sleep

Recovery is an essential part of the training process. Here are some tips to ensure your athletes are getting enough of it.

*Make sure your training program includes recovery periods and is individualized*

- Ensure athletes have at least one day per week of passive rest

- With elite athletes, do not plan more than 2-3 hard days (including competition) per week.
- With lower-level athletes a maximum of 1-2 hard days (including competition) per week is advisable.
- Children athletes shouldn't train for more than 18-20 hours a week.
- Systematically reduce training by 30-50 % during the back-to-school or exam period.
- Plan a recovery week (where training volume is reduced by 30-40 %) each 4-5 weeks
- Increase training volume and intensity progressively (beware of sudden training increase during intense training camps).

*If an athlete is in a state of overreaching, reduce the training load immediately*

- When an athlete is in a state of overreaching, reduce but don't stop training; Ask the athlete to take 2-3 days of complete rest and to reduce training intensity and volume (30-40%) for 1-2 weeks.
- When an athlete is in a state of overtraining, it is advisable to rest for one week and limit weekly training to 0-3 very easy sessions (10-20min at easy pace). If fatigue recedes, gradually progress to longer sessions over a 6-12 week period.

*Make sure your athletes are getting enough sleep*

- Sleep requirement is highly individual but ensure athletes has, at least, 8h of undisturbed per night
- Poor sleep during the night can be compensated by post-lunch naps, but only for a short period of time to avoid disruption of regular sleep patterns
- A full night of undisturbed sleep allows sleep recovery from a period of sleep loss

## **Ensure adequate nutrition and hydration**

Inadequate can also be a major factor in the apparition or excessive fatigue and the installation of overtraining.

Training hard increases significantly athlete's energy requirements and an intensive period of training is never a good time to try to lose weight by reducing caloric intake or modifying drastically the diet such as switching to a low-carbohydrate diet. If an athlete feels an unusual need for sleep or excessive fatigue, make sure his/her energy intake is sufficient.

The following guidelines will help you to ensure optimal hydration and nutrition.

- Accelerate the recovery process with adequate carbohydrates (CHO) intake immediately after training (1 g CHO/kg of body mass);
- Ensure adequate CHO intake during light to moderate training days (5-7 g CHO/ kg of body mass); during moderate to heavy days (7-10 g CHO/ kg of body mass); and during

days where extreme exercise sessions (>4h/day) are performed (10-12 g CHO/kg of body mass)

- Optimal carbohydrates intake must be scaled up and down based on the energy requirements of training days, competition, recovery days.
- There is usually no need to consume protein and antioxidant supplements as these nutrients are ingested in sufficient quantity when the athlete consumes a balanced diet.
- No athlete requires a protein intake higher than 1.7g/day/kg of body mass.
- Athletes should try to drink 1.2 to 1.5L of liquid for each kilogram of body mass lost during the training session / competition.
- Salt lost through sweating should be replaced as well (sports drink can be helpful). Food consumed after the session is usually enough to replace the salt loss during the effort.

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