



**Guide To**

# **Training with Heart Rate Variability (HRV)**



**Know when to train and when to rest!**



## Introduction

Overtraining leads to injury, illness and diminished performance. The body can endure just so much continual physical stress before it begins to break down. So how do you know when to train and when to rest?

The answer is heart-rate variability (HRV) which measures the time-gap between your heartbeats when you're resting. The heart, in fact, speeds up when you inhale, and slows down when you exhale. The difference is known as heart-rate variability. A healthy, well-rested body will produce a wider gap than a stressed out, overtrained body.

**The ithlete is the first affordable device that measures HRV.**

The ithlete is a smart, simple-to-use device that works with your heart-rate monitor chest strap and your iPhone or iPod touch. A special app and receiver displays a color-coded graph of your HRV as well as a train / train easy / rest recommendation. The test takes just 60 seconds to complete.

ithlete will change the way you train and race.

### **ithlete features and benefits:**

- Objectively measure your body's response to each workout
- Improve performance without risk of injury or illness
- Decide when and how hard to train
- Optimize your recovery
- Receive early warnings to help avoid overtraining
- Perfect your taper period before big races
- Track long-term changes in your aerobic fitness
- Enjoy rest days without feeling guilty
- Receiver works with most heart rate monitor chest straps

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# Understanding the Basics of Heart-Rate Variability and Avoiding Overtraining

**Question: Why is overtraining such a misunderstood or neglected concept among endurance athletes – runners, cyclists, and triathletes?**

**Answer:** That's because the vast majority of endurance athletes don't appreciate the simple truth that you don't get fitter *during* exercise; instead you get fitter *recovering* from exercise. The emphasis is therefore always on maximizing training time (and usually intensity as well) in order to give the body the biggest stimulus for adaptation. That only works if the body has been able to repair and adapt before the next exercise session. As well as needing ample time for recovery, the body requires to be looked after in other ways in order to recover fully – quality of sleep, nutrition, and an absence of stress all play major roles here.

**Q: What are symptoms or red flags associated with overtraining?**

**A:** Most coaches regard a drop or plateau in the athlete's performance, despite continued training being a reliable indicator of overtraining. In addition, fatigue, mood disturbances and abnormal food cravings are all signs that overtraining syndrome may be developing. Overtraining is caused by too much physical stress combined with too little recovery over a period of time (usually a few weeks). It progresses from functional overreaching (the overload principle of training), through non-functional overreaching (when the body is unable to repair itself fast enough) to what's called sympathetic overtraining. This is the state that can sometimes be detected by looking for an elevated pulse during the traditional morning pulse check.

The sympathetic branch of the nervous system is often referred to as the 'fight or flight' branch since its purpose is to prepare us to fight or run away. It also involves production of stimulant hormones such as adrenaline and cortisol. We were never designed to have these hormones flowing around us for long, extended periods, and they are known to lead to problems including heart disease if they remain present for too long. Unfortunately, athletes will *still* keep on pushing and progress their overtraining to a state known as parasympathetic overtraining, when the fight or flight hormones become exhausted and extreme fatigue follows.

**Q: But properly using a heart rate monitor keeps training in check.**

**A:** Provided the athlete knows his or her personal heart rate aerobic and anaerobic zones. The use of an heart rate monitor (HRM) during exercise can help to prevent base training workouts from becoming anaerobic – a very frequent mistake that athletes make (especially those not under coach supervision).

**Q: What about using your resting heart rate when you first wake up in the morning as a gauge of overall health and fitness?**

**A:** Measuring your resting pulse first thing can tell you two things. One is that if the number is below 60 beats per minute, you are regarded as an athletic individual (many top cyclists have been below 30 bpm!). Secondly, by measuring the pulse every day, you can potentially spot an abnormally elevated heart rate that may signal sympathetic overtraining. However, the amount of change may be only 2 to 3 beats per minute in the overreaching stages, making it difficult to detect reliably. Another problem is that endurance athletes can get to a state of parasympathetic overtraining quickly, where the resulting lowered morning pulse rate is sometimes mistaken for improved fitness!

**Q: Is heart-rate variability offers a more accurate assessment than resting heart rate.**

**A:** Contrary to popular belief, the heart does not beat with metronome regularity, but varies according to the instructions it receives from the nervous system. Heart rate variability, or HRV as it's often known, allows us to observe the separate branches of the nervous system directly, rather than having all the signals mixed up together, as they are in the resting-pulse measure. Unlike resting pulse, a higher HRV is a good thing, and by making regular measurements, you can identify changes in the all-important balance between the sympathetic (fight or flight) and parasympathetic (rest and recovery) branches that can signal the earliest stages of overtraining

**Q: How does the ithlete work?**

**A:** The ithlete is an app for the iPhone and iPod touch that, together with the ithlete ECG receiver and a regular chest strap, allows the athlete to make a simple 60-second measurement of his or her HRV every morning right after waking up. Each day's reading is compared to one's personal baseline measure to give a recommendation on training for that day. This recommendation can range from "train normally" to "take it easy" to a "rest day". Longer term trend indicators help identify improving or declining aerobic fitness, giving you the precise opportunity to continue going with your program or make changes and find out what works for you.

**Q: Knowing one's HRV with the ithlete, when does one first notice results in training?**

**A:** You notice results in your training after about a week, once your baseline has been established. Then you know how you're likely to feel both during and after the session. During base building, you should notice an upward trend in your HRV that signals improving aerobic fitness. That will almost certainly translate into better form in the racing season.

**Q: Are there any additional benefits?**

**A:** By knowing your HRV, you can objectively measure your body's response to each workout. Often this coincides with your feelings or other measures, but there will be times when it indicates that you really need to take it easy, or take a rest day, then you will find you can train harder the next day. Conversely, you may be feeling sluggish after a long day at work, but with a normal it hlete reading, you can head out confidently for a bike ride or run and feel much better as a result. One of the biggest benefits is that you can consistently improve performance without the normal risks of injury or illness.

Most injuries happen when the body is stressed or tired, so by avoiding hard sessions when your body is already fatigued, you minimize that risk. You can also keep your training more flexible, allowing yourself to be guided by it hlete's recommendation, helping to reduce another common problem of training monotony in endurance athletes. Because HRV is much more sensitive than resting heart rate, you get feedback at an earlier stage that helps avoid the development of true overtraining. Also, for the first time, you can perfect your taper before a major race or competition by resting and watching your daily HRV rise to your optimum readiness level.

**Q: What is the correlation between it hlete/heart-rate variability and workouts using a heart-rate monitor?**

**A:** The most interesting observation is the relation between exercise intensity as measured by an HRM during exercise and the resulting fatigue, as measured by it hlete. For instance, an hour long run at a pace just below aerobic threshold produces very little fatigue, whereas a set of anaerobic intervals up to 30 minutes present the body with a heavy recovery load, often resulting in a significant drop in HRV the following morning, and an it hlete recommendation to have a light training day.

**Q: Have there been any scientific studies on heart-rate variability and triathletes, runners, or cyclists?**

**A:** Yes, HRV has been frequently used in sports science research with professional cyclists and elite Ironman competitors, leading to the conclusion that HRV is a sensitive indicator of current and accumulated fatigue. In the past two years, there has been a round of published sports studies appearing in professional journals indicating strong correlations between increases in HRV and race time improvements. This is definitely an area to watch!

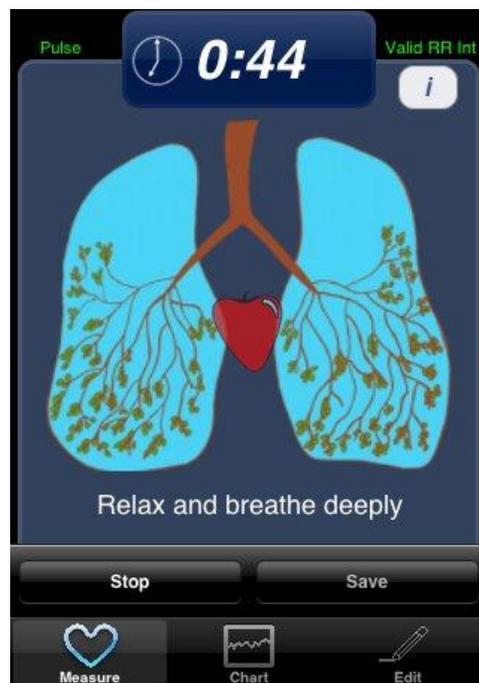
## HOW TO USE *ithlete*

### ***Performing the ithlete Daily Measurement***

Here are tips on taking your daily heart-rate variability (HRV) measurement:

**Take the 60-second test in the morning, before breakfast or caffeinated drinks.** The exact time is not as important as making sure you are relaxed. Some people find that the best time is straight after getting out of bed, whilst others prefer to walk around, go downstairs, or do a little light stretching first. After waking up, put on your chest strap, moisten the skin contacts, and insert the *ithlete* receiver into the headset jack of your iPhone or iPod touch, with the *ithlete* logo facing towards you. Hold the phone at the same level as your chest, and about 8" in front. Relax and concentrate on the animation of the lungs on the screen. Press Start to begin.

**Breathe deeply and relax, following the expanding lungs.** *ithlete* is based on paced breathing to stimulate your nervous system in a consistent way. We suggest breathing in through the nose, and out through pursed lips, but find whatever works best for you. It's not important if you don't expel all the air from your lungs, so don't force it!



**Your first week.** It usually takes a week or so to get used to the measurement, breathing pattern & for your baseline to be established. Trust the first reading, unless you have some real reason to doubt its accuracy, in which case wait a few mins & repeat. A few users have conducted their own tests with multiple *ithlete* readings, charting all the results in Excel, and come to the same conclusion. Heart rate variability is a sensitive measure for sure, and anxiety about a real or possible low reading can affect the reading itself.

**Stay consistent.** You can't compare readings made at different times of day - our bodies have daily (circadian) rhythms that naturally lead to fluctuations. Caffeine, alcohol and physical activity all have substantial effects on your reading. **First thing in the morning is the best time.** There will be some days when you get up especially early or late, compared to your normal routine. Readings on these days may be lower or higher than expected, and should be judged in the light of this.

**Body position.** You can't compare readings made in different positions ie lying / sitting / standing. The **standing position is best for athletes**, since athletes tend to have low resting heart rates (anything below 60 beats per minute). Researchers have found that if your resting heart-rate is very low lying down then the gap between heart beats reaches a maximum value and the HRV variability does not increase further. This is not a problem

medically, but it limits the range of measurement and you might miss some changes & further improvements in your daily value. When you stand up, your nervous system adjusts your heart rate upwards about 10 bpm or so (depends on your height, build etc), and you see the full range of HRV when you breathe. Researchers also found a better ability to detect overtraining from HRV in the standing position.

So, whilst we recommend doing the ithlete measurement standing up, if your usual resting heart-rate is in the mid 50s or higher and you are more comfortable doing the test sitting, or even lying down, then that should be OK. Some recent research studies have done morning HRV tests on moderately fit recreational athletes lying down and had good results.

**Faulty or erratic reading.** The indicator at the top right of the measurement screen (Valid RR Int) turning red shows that a particular heart beat interval has been excluded from the HRV calculation. This can be caused by a couple of reasons:

1. Poor contact between the chest strap and your skin - make sure the strap is tight enough and the contacts are moistened.
2. Erratic heart beats - everyone's heart naturally produces erratic beats from time to time, and in fact athletes often more so than sedentary people.

It's OK for the indicator to go red a couple of times during the measurement, and it won't affect the result. If there are a large number of erratic beats, ithlete will stop the measurement and suggest you restart.

## ***Interpreting your Readings***

**The number at the top of the screen.** This is on a scale from 1-100 and represents your HRV. Unlike resting-pulse, a higher HRV number is better. It's not a percentage though, and in theory an ultra-fit person could go over 100, but we haven't seen it yet!

The ithlete number is created from a standardized measurement of parasympathetic heart-rate variability. Increased parasympathetic activity enables recovery.

Factors that **decrease HRV**:

- Physical stress from intensive training
- Mental stress ie work, life stress
- Insufficient recovery, rest & sleep
- Poor diet (eg. too many refined carbs, not enough fruit, vegetables, fish)
- High altitude, dehydration, jetlag
- Excessive alcohol, hangovers
- Smoking
- Illness, inflammation and disease
- Increasing age

Factors that **increase HRV**:



- Recovery, rest and sleep
- Higher aerobic fitness levels
- Relaxation (including social activities, listening to music, yoga & breathing exercises)
- Good nutritional choices (especially, fish, fruits & vegetables). A recent study on the benefits of the Mediterranean Diet found increased HRV to be closely associated with improved heart health

Athletes are likely to have average scores of 65 or higher, with endurance competitors in the 80s to mid 90s on the athlete scale.

**Daily Change indicator.** This is the key indicator that helps you assess how well-recovered you are from previous training and other stress sources.

The number in the center of the indicator compares today's reading with yesterday's, and the color coding shows whether or not today's reading has changed significantly compared to your baseline.



This indicator will turn:

- **Amber** the first day your reading is significantly low compared to baseline  
=> **train lightly (reduced intensity and volume)**
- **Red** if that state continues for a second day  
=> **rest required**
- **Blue or Green** to show you are recovered sufficiently  
=> **train normally according to your training plan**

If the indicator is **amber**, you can either train lightly, keeping the intensity low, or take a rest day. Light intensity (fully aerobic) training is much less stressful than anaerobic training, and may assist with speeding up recovery. A **red** indication on the other hand, really means rest!

There is one situation where you can get a **red** daily change indicator directly on the first day, and that is if your resting heart rate has suddenly lowered significantly, often accompanied by an *unusually high* HRV reading. This could indicate the onset of parasympathetic overreaching, where your body is really exhausted. It's a condition that's difficult to diagnose reliably, and hard to cure, so if you



see a red daily change, together with an unusually low heart-rate always ask yourself honestly if there's a reason or if you have been overdoing it. If in doubt, repeat the test after doing some gentle warms ups, household tasks, or light stretching.

**Weekly Change indicator.** The number in the middle of this indicator shows the change in the average of your daily readings over the last 7 days. It is used to gain an indication of the short term trend in your stress / recovery state.

During a period of intensive training preparing for or participating in competition, this indicator may go amber, showing that your nervous system is becoming more sympathetic (fight or flight) dominant. This is not necessarily bad in the short term, and it may be that you achieve good performances in this 'peaked' state, but if the indicator turns red, you may well need a couple of days extra rest or active recovery to avoid early stage overtraining.

Conversely, a green Weekly Change indication can follow intensive weeks, and is a good sign during tapering or during the easy week of monthly periodisation. A green shows that your body is responding well to the change of emphasis away from high intensity.

**Monthly Change Indicator.** Just as for the Weekly Change indicator, the number in the middle shows the change in average HRV over the past month, and therefore the trend.

A positive number, often accompanied by a green indicates improving aerobic fitness during the endurance base building phase, or it could indicate lifestyle improvements, such as more / better quality sleep, or a healthier diet. It is quite usual to see the Weekly and Monthly indicators turn green during holidays – this shows that rest and change of environment were definitely needed!

A negative number accompanied by an amber may follow a transition from off season or base building to the higher intensities pre-competition, or may indicate temporary overreaching, but red is a sign that overtraining trouble could be on the way.

## Chart

**Bright blue line.** This is a 7-day moving average baseline of all your daily HRV values.

**Multicolored zig-zag line.** This is the line joining your daily readings. It is the daily changes in your morning HRV measurement from this baseline that athlete uses to give you personalized fatigue & recovery information. Basically, if your daily value is close to the average – you will get a white line, indicating you're OK to train normally.

If, as a result of training or other life stresses, your body is experiencing significant fatigue, then your daily HRV mark on the chart will be lower than the baseline, leading a downward pointing amber line segment on the chart.



If you have recovered by the following day, then the line segment will turn white again, and the Daily Change indicator will be a neutral blue colour, so you are OK to train normally again.

If on the other hand, the fatigue you are experiencing continues to affect your body, then the line segment will turn red, indicating the need for a rest day.

You can also get ambers & reds from late nights, alcohol & work stress - your body reacts to them all the same (!).

Finally, if you experience very good recovery from one day to the next, you may see a green line segment & daily change indicator.

## Periodization examples

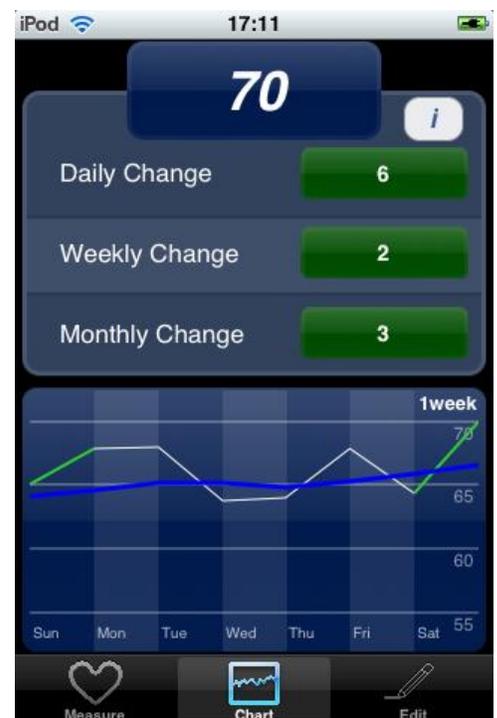
**Intense training block.** Athletes who periodize their training into blocks of a few weeks, followed by a week's recovery, may see charts like those to the right and below. In the first chart, from the beginning of the week of 12 April, a series of relatively intense training sessions cause:

1. Daily Changes that generate amber recovery warnings
2. The overall trend of the blue line is clearly downwards, reflected in the amber Monthly Change of -3 to indicate a period where bodily stress is greater than recovery

You will note that although intense, this period did not bring red Daily, Weekly or Monthly indicators, and in fact overtraining did not appear.

**Recovery week.** The final chart on the right is an example of an effective recovery week, where although some training continues, there are no amber Daily Change indications, and clear positive trends on the Weekly and Monthly indicators. In the case of a 4wk block, a positive Monthly Change at the end of the recovery week, as on this chart, indicates an overall positive impact on fitness from the training block.

When tapering (ie reducing volume) before an event, you should look for a steady rise in the blue line indicating that your body is rebuilding itself stronger than before, but don't forget to include a few high intensity sessions to make sure your body's 'fight or flight' response stays active for the competition itself. These high intensity sessions should not be of sufficient length to cause an amber Daily Change.



# The Overtraining Syndrome

By Dr. Philip Maffetone

*The following essay is excerpted with permission from “The Big Book of Endurance Training and Racing,” by Dr. Philip Maffetone, who is an internationally recognized researcher, educator, clinician, and author in the field of nutrition, exercise and sports medicine, stress management, and biofeedback. He was named coach of the year by Triathlete Magazine and honored by Inside Triathlon magazine as one of the top twenty most influential people in endurance sports worldwide. He is the author of more than a dozen books on sports, fitness, and health. “The Big Book of Endurance Training and Racing” is his most recent book.*

Overtraining is the most common problem that prevents endurance athletes from reaching their potential. It's also the most common cause of injury and ill-health for millions of athletes. And overtraining is a problem that many athletes, coaches, and healthcare professionals don't recognize until it becomes a more serious condition. As a result, overtraining is not recognized soon enough to prevent loss of training time, injury, ill-health, or poor performance.

Overtraining has been traditionally described as diminished performance that results from an increase in either training volume or intensity. Let me emphasize this point again: Overtraining is an imbalance in our simple endurance equation:

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

Let's look at the big picture of overtraining, not just its more obvious components. This is a holistic approach. And to do so, we first need to take a look at how our nervous system works since this will have a profound impact on how the body responds to training.

Understanding the details of the brain and the rest of the nervous system, and all its components, including the autonomic system, can get quite complicated. So here's an analogy. Consider a house with all the many wires going throughout, some wires being different types for specific purposes. All these wires represent different parts of the nervous system. Some go to switches and lights, some to large users of electricity like air conditioners and refrigerators, still others to phones and modems, while others to low voltage devices like doorbells. The brain would be like the main electric box, and the autonomic system comprised of a cable of two wires, like those used for phone lines: one wire for sympathetic and another for parasympathetic.

The sympathetic part of the autonomic system raises your heart rate and blood pressure, increases muscle power and speed, and other actions used in a race, for example. We feel this as pre-race tension, an important way to prepare for competition. The parasympathetic part is important for recovery, relaxation of muscles, slowing the heart rate, and lowering blood pressure. And it activates the intestines for better digestion.

The sympathetic has been compared to the accelerator in your car, making things go faster, while the parasympathetic component is likened to the brakes, slowing it down. While the autonomic system functions automatically, we can influence it through lifestyle. The sympathetic part tends to be ready to go into action much of the time, so we often control autonomic function through the addition of more parasympathetic activities to balance both. We can do this by choosing to relax, by meditating, and by avoiding too much caffeine (a sympathetic stimulator).

When autonomic imbalance occurs, it's usually associated with too much sympathetic and too little parasympathetic activity; with chronic imbalance, as seen in the third stage of stress, just the opposite occurs: the sympathetics "burn out" and can't function well, and the parasympathetics take over. Overtraining follows this pattern and, the same as Selye's General Adaptation Syndrome, has three stages of stress.

The negative consequences of overtraining are often gradual. The body is quite good at masking the earliest symptoms. But overtraining is a canny adversary. The problems it engenders will triumph in the end, unless changes are made to training, diet, and stress level.

- *Stage 1 or functional overtraining:* The onset and earliest stage, very subtle indicators can clue you in that you're heading for more serious problems.
- *Stage 2 or sympathetic overtraining.* Brain and nervous system and hormonal imbalances cause a variety of signs and symptoms.
- *Stage 3 or parasympathetic overtraining.* A serious condition, it results in exhaustion, severely affecting the nervous system, muscles, and hormonal levels.

The overtraining syndrome typically results in poor athletic performance, structural injury, such as in the foot, knee, or lower back, secondary to muscle imbalance, and metabolic problems, such as fatigue, infection, bone loss, sexual dysfunction, altered mood states, and brain and nervous system dysfunction. The signs and symptoms go beyond training and competition problems; they can even affect a person's quality of life, sometimes for many years. More importantly, in the earliest stage many of the problems of overtraining are somewhat vague and indistinct unless a careful evaluation is made.

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

## **Stage 1: Functional Overtraining**

The first stage of overtraining is not usually accompanied by obvious problems, but rather, by very subtle or subclinical ones. The most obvious may be an abnormal plateau or regression in your MAF (Maximal Aerobic Function) Test, indicating an imbalance between aerobic and anaerobic function. In addition, changes in such measurements as heart rate variability begin to appear, and resting heart rate may start to rise.

Interestingly, this first stage of overtraining is sometimes accompanied by a sudden, short-lived improvement in competitive performance that may convince one that training is progressing well. This temporary improvement, which often exists in one race, for example, may be caused by the autonomic nervous system imbalance resulting in overactivity of the sympathetic part, temporarily improving muscle function and strength. This is accompanied by an imbalance between the aerobic and anaerobic systems.

Stage 1 overtraining develops out of the phenomenon of overreaching, the normal state in which athletes train slightly beyond their ability. This slight stress on the body's physical, chemical, and mental state is an important aspect of becoming a better athlete, so it's necessary. In fact, studies show this gray area between easy training and overtraining—overreaching—can boost performance. But without backing off, many athletes continue pushing down the road to overtraining. Exactly when you go from overreaching to overtraining is difficult to assess. But if the MAF Test shows a slowing of pace, you've passed the normal state of overreaching into the first stage of overtraining. You may even have one last good performance in you, although in some cases you're already injured and can't race. In the overreaching state, more time is needed for recovery, and when this is not done, the onset of overtraining amplifies minor functional imbalances, often progressing to symptoms of pain or fatigue, along with signs of higher resting heart rates and slowing MAF Tests.

The first stage of overtraining is usually accompanied by two other functional problems. The first is adrenal gland dysfunction and, typically, aerobic deficiency is also part of the overtraining syndrome at this early period. Fatigue, physical injury, sleeping irregularities, abnormal hunger, or cravings, especially for sweets and refined carbohydrates, and other complaints related to adrenal and aerobic problems mark a more obvious Stage 1 overtraining. Some athletes may be unable to lose that extra body fat, get sleepy after meals, and have an uncanny craving for caffeine, or other signs and symptoms.

Other complaints common in the first stage of overtraining include:

- Increasing vulnerability to back, knee, ankle, and foot injuries
- Abnormal adrenal hormone levels—typically, elevations in cortisol only at certain times of the day or evening, with secondary lowering of testosterone, estrogen, and/or DHEA levels
- Amenorrhea in women, or secondarily, premenstrual syndrome or menopausal

symptoms

- Reduced sexual desire, with infertility in some cases
- Mental and emotional stress, including mild depression and anxiety

When the first stage of functional overtraining is not corrected by making the appropriate training, stress, diet, or other changes, all these signs, symptoms, and functional problems worsen, and the athlete enters into the second stage of the overtraining syndrome.

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

Many healthcare professionals and athletes recognize the start of overtraining in Stage 2. But by this point, as overtraining progresses, imbalances of various systems worsen and become more difficult to remedy easily. Specifically, the sympathetic part of the nervous system becomes even more overactive than in Stage 1, with further worsening of the aerobic system. There is a more significant elevation in the resting heart rate and training heart rate, which further worsens the MAF Test. Many athletes become aware of this if they regularly measure their morning heart rate and train with a heart monitor. Often associated with this is restlessness and over-excitability.

Stage 2 overtraining is more common in athletes with anaerobic training as a significant part of their workout schedules, including those with too much training volume, those with too much lifestyle stress, and most often those athletes who have a combination of these factors.

Adrenal gland dysfunction and aerobic deficiency more noticeably worsen during sympathetic overtraining. Cortisol output may rise to abnormal levels at various points throughout the day and night. The keen awareness and fine eye-hand coordination required in some sports are adversely affected by these hormone problems. High cortisol levels also have a harmful effect on the physical, chemical, and mental state, much like that produced by exhaustive, prolonged training, including the development of more significant muscle imbalances.

High cortisol also can increase insulin levels, which reduces fat burning and increases fat storage. While aerobic training usually suppresses insulin production during exercise, studies show that maximal training intensities can increase the insulin response significantly. This problem also further raises sympathetic system activity, increases carbohydrate intolerance with more carbohydrate foods converting to fat, and worsens the overtraining syndrome. In addition, elevated cortisol lowers testosterone and DHEA, both important for muscle recovery. Those who frequently wake in the middle of the night and don't easily fall back asleep typically have high cortisol levels, which is another sign of overtraining.

Fortunately, this hormone imbalance is relatively easy to correct through diet and lifestyle changes, including one's training and competition schedules. Those who don't listen to their body and continue overtraining can have worsening signs and symptoms,

including reduction in performance and development of chronic injuries. Many athletes remain stuck in this stage of overtraining for months and even years; some “progress” into a more serious and third stage of overtraining.

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

Chronic overtraining can lead to more serious brain, muscle, and metabolic imbalances. These continue to parallel chronic adrenal dysfunction and aerobic deficiency. Eventually, the body becomes exhausted, and many hormones are significantly reduced. In the adrenal glands, for example, the ability to produce normal levels of cortisol, DHEA, testosterone, and other hormones is lost; the result is just the opposite from Stages 1 and 2—low cortisol. This contributes to a worsening physical, chemical, and mental condition.

Stage 3 is typically accompanied by the lack of desire to compete and sometimes train, depression, significant injury, and most notably severe exhaustion. Performance may diminish considerably and many athletes in this state consider themselves “sidelined” or even retire from competitive sports. They are chronically fatigued, can’t keep up their normal training or racing paces, and typically have serious physical injuries. The MAF Test has usually regressed dramatically as the training heart rate is high, even though there is an abnormally low resting heart rate (the now overactive parasympathetic system lowers the resting heart rate). The chronic hormonal problems can result in increased sodium loss due to reduced aldosterone (the adrenal hormone that regulates minerals and water) 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, with some heading to chronic diseases of the heart, blood vessels, and other areas. Recovery and return to previous optimal levels of performance is a very difficult task.

### ***Preventing Overtraining***

To recap, overtraining is a reflection of an imbalance of the autonomic nervous system’s two components—the sympathetic and parasympathetic mechanisms. With imbalance, overtraining in Stages 1 and 2 is a demonstration of excess sympathetic and diminished parasympathetic activity, while Stage 3 is the loss of sympathetic function with too much parasympathetic.

Balance of the autonomic system is key. Both sympathetic and parasympathetic are working all the time in some type of balance depending on whether you’re working out, resting, or racing. For example, before a big event you generally feel a bit anxious and tense, some athletes more than others. This is normal, and an example of the sympathetic system preparing you for the event. When your race is done, and you finally settle in for a nice relaxing dinner—now your sympathetic system can quiet down—and your parasympathetic system is dominating. Imagine if that pre-race tension was always with you. Your sympathetic system would be stuck in the “on” position—you’d be unable to

relax and have continuous anxiety and tension. That's what the first two stages of overtraining are like.

### ***Heart Rate Variability (HRV)***

Heart rate variability reflects autonomic imbalance and can be used to monitor training, stress, and other relationships including heart health. HRV is a measurement of the time between each heart beat while resting and provides much more information than just knowing the resting rate. The heart, in fact, speeds up when you inhale, and slows down when you exhale. A healthy, well-rested body will produce a larger gap and higher HRV than a stressed-out, overtrained body.

Today, new technology such as *ithlete* allows athletes to more accurately monitor their HRV. The device provides great animation of the heart and lungs in action, graphs of your results, stores your personal information, and allows for daily testing comparing your weekly and monthly results. As such, *ithlete* warns you if HRV worsens, indicating an autonomic imbalance and the need for additional rest that day, or an easy rather than hard workout. As you would expect, autonomic balance, as measured by HRV, is maintained following an aerobic workout; however, after an anaerobic workout, autonomic balance is slightly disturbed until the body recovers. In addition, athletes who maintain a good balance of autonomic function, as indicated by HRV, perform better.

### ***Remedies for Overtraining***

While in the case of overtraining, especially, prevention is better than cure, the treatment of overtraining contains the following components.

#### **Training**

- 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 muscles and offers mental benefits much like those of meditation. Walking also helps redevelop the aerobic system—the first phase of retraining.
- Building (or rebuilding) the aerobic base may take three to six months and does not include any anaerobic training or competition. This time period should be sufficient for most athletes in Stages 1 and 2 to recover well. Stage 3 may take much longer.

## Diet and Nutrition

- Reduce (or eliminate) all high-glycemic foods, which are mostly processed grains such as most breads and products made from flour, and all sugar and sugar-containing 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, restless sleep.
- Adequate caloric intake is very important—never get hungry. Include moderate amounts of protein (especially eggs and meats) and healthy fats such as olive and coconut oils, avocados, and nuts and seeds.
- Overtraining may disrupt the normal balance of fats in the body, causing inflammatory-related injuries. 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 aggravate the overtrained state for many athletes. Avoid stimulants such as coffee, tea, soda, and chocolate (beware of caffeine-containing over-the-counter and prescription drugs). Some athletes can tolerate small amounts of caffeine, but many should avoid it completely.
- Malabsorption of nutrients is common in overtrained athletes due to the high stress levels causing poor intestinal function. This is especially common in those over the age of forty years. Dietary supplements such as betaine hydrochloride may improve digestion, and L-glutamine can improve nutrient absorption.

When committed, athletes can often recover rapidly from overtraining. This is especially true in Stage 1, where modifying the training schedule and making appropriate nutritional and dietary adjustments often provide improvements of symptoms and even the MAF Test within two weeks.

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.

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 though 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.

## Recovery Tips for when athlete Tells You To Take it Easy

You have trained or race hard, but *athlete* is now telling you to take it easy. Your body needs time for recovery-- because the down period is when you actually get stronger and rebuild those muscle fibres vital for endurance. Your hard-earned miles tear down your muscles; the rest and recovery period strengthens them. But by neglecting this critical stage, then within months, if not weeks, you can begin to experience early signs of overtraining such as fatigue, decreasing performance times, injury, lingering colds, and insomnia.

But what is specifically meant by the term “recovery”? According to the *Peak Performance* newsletter, recovery is defined as “the process of restoring the body to a rested level in preparation for training or competition.” The need for recovery is caused by both physical and mental stresses that affect everyone differently.

In addition to producing muscle wear and tear, there are two main physiological aspects resulting from intense physical activity that will impact your own recovery

**1. Dehydration.** Sweat losses in warm environments can exceed 2 liters (3 pints) per hour, and performance starts to decline after 2 percent of body weight has been lost through sweating, so it is essential to refill fluids during and immediately after exercise, as well as in the time between sessions.

**2. Glycogen (glucose) depletion.** Even endurance athletes who have trained their bodies to use fat efficiently as a fuel at lower intensities still get about half their total calories from carbohydrates, and this rises rapidly at higher exercise intensities. It is therefore crucial to start any competition with glycogen stores as full as possible and to top them up with energy drinks, gels and solid food whenever you can. The following list is a general guideline when preparing for competition or demanding training sessions:

- **Pre event meal.** 2-3 hours before containing low GI (glycemic index) carbohydrates and moderate amounts of protein.
- **Immediately before.** Medium to high GI snack.
- **During event.** Medium to high GI sports drinks, gels and snacks
- **Immediately post event.** High GI snack or recovery drink, supplying 1.5g of carbohydrate per kilo of body weight.

## Recovery Strategies

**Sleep.** Not only quantity, but quality is important. Human growth hormone (HGH), which is essential for body repair, is mostly produced during the first four hours of sleep, and these turn out to be the most critical hours for recovery. Alcohol, caffeine, eating late do not help quality of sleep. Naps during the day should be avoided if they interfere with your ability to sleep at least eight hours at night.

**Cold Therapy.** The therapeutic use of cold is called cryotherapy. It is a form of counter-irritation, where the skin and the areas beneath are slightly stimulated with cold temperatures in order to trigger a healing process by reducing inflammation and muscle tightness. Although ice can be helpful when properly applied, it can do harm when applied incorrectly. Ice should never be applied directly to your skin. Instead, use a moist cloth or towel on the skin with the ice applied on top of it. A moist towel helps transfer the cooling benefits whereas a dry one can partly insulate your skin from the cold. In this way, the cooling effect can reach all areas, including some bones. If you experience numbness, immediately remove the ice. There is also a safer and more effective form of cryotherapy, and that's soaking in a bathtub filled with cold water or finding a lake or stream. Even if you're not injured, a cold bath is a great way to speed recovery from long or hard training and competition.

**Massage.** A commonly used recovery method is massage therapy for both injury and prevention purposes. Massage focuses on increasing blood circulation and lymph flow, reducing muscle tension and spasm, improving range of motion, and helping to reduce pain. Massage involves soft tissue manipulation of the body's muscles and aids in stress reduction, which can help recovery from training and competition. It can also reduce high cortisol levels to help reduce anxiety, improve the immune system, and help other dysfunction associated with high levels of this stress hormone. A variety of techniques are used in sports massage, including effleurage, petrissage, and vibration. Swedish massage is particularly valuable for endurance athletes, especially those with adrenal dysfunction.

**Pool recovery.** This is a low-stress and therapeutic option because there is less impact on your joints. Find the shallow end of the pool, and go through a set of exercises that might include walking, jogging, knee lifts, and stretching. Of course, you can also swim laps using a variety of strokes to work your entire body.

**Active recovery.** Passive recovery is going to complete bed rest or doing no exercise. Active recovery, however, such as walking is a much better option for faster recovery. Depending on the duration and intensity of the event or hard training session, active recovery can start one to two days afterwards. Go with either a very light intensity of your particular sports or just plain walking for 30 minutes up to an hour.

## What the Coaches Say about ithmetic

### Interview with U.K. top sport physiologist and coach Eddie Fletcher, Wattbike Sports Scientist

*ithmetic spoke with one of U.K.'s foremost sport physiologists and coaches, Eddie Fletcher, who specializes in working with cyclists, runners, rowers, swimmers, triathletes and duathletes. He's currently Wattbike Sports Scientist, as well as opening his own Sport Science Laboratory. For more information, go to [www.fletchersportscience.co.uk](http://www.fletchersportscience.co.uk).*

#### **ithmetic: How do you know when an athlete needs more rest and recovery?**

**Eddie Fletcher:** I believe that "less is more." You can only train as hard as you can recover. So rest is good. That's not to say an athlete doesn't have to put in a lot of time. They do, most sports require many hours per week on honing skills and technique as well as training specifically aimed at physiological adaptation. As a physiologist, I separate out the two aspects although I'm always aware that there are recovery issues arising out of muscular fatigue rather than cardiovascular fatigue.

I monitor every session my athletes do using a combination of Suunto/Firstbeat hardware and software - I track the overall Training Effect (training load) as well as the Training Effect of individual sessions. I also obtain regular overnight (Firstbeat) heart recordings or morning ithmetic readings to track the HRV recovery index. This means that I can react immediately to any rest and recovery issues and make immediate changes to the training plan.

#### **ithmetic: What first made you try heart-rate variability assessment with your athletes?**

**Eddie Fletcher:** I had come across HRV when doing my Masters of Science Physiology degree in 2004 and immediately realized the possible advantages. I began to look around for practical ways of implementing it with my athletes.

#### **ithmetic: What convinced you of HRV's added value? How good is the reliability of HRV compared to morning pulse checks?**

**Eddie Fletcher:** I was able to gather hundreds of HRV files from a range of athletes, and what I saw was a consistency that I hadn't seen before: the ability to immediately respond to cardiovascular fatigue, prevent illness and injury, and to manage training load and recovery to optimize performance. My database now has thousands of HRV files from athletes of all shapes and sizes and abilities.

**ithlete: What about using the morning pulse rate?**

**Eddie Fletcher:** Using morning pulse rates is a crude measure; it tells you nothing about the underlying HRV recovery index. Just because resting heart rate appears normal it doesn't mean an athlete is fully recovered. Underlying fatigue will be masked. Using HRV recovery methods enables me to see the underlying fatigue and to respond appropriately.

**ithlete: What do you see as the future of HRV? Do you see more athletes using it?**

**Eddie Fletcher:** I hope so, some Coaches and athletes not using HRV, particularly to manage recovery, are missing a vital part of overall performance management. Unfortunately coaches are generally slow to adopt new ways of doing things.

**ithlete: How would you compare *ithlete* to expensive, professional systems such as FirstBeat, OmegaWave?**

**Eddie Fletcher:** *ithlete* is the least expensive, by a long way. You need to be a professional coach/physiologist to be able to use Firstbeat or OmegaWave (and be able to afford it). *ithlete* is a great starting point for beginning to understand the value of HRV-- which is a simple yet powerful tool that can give an athlete that crucial edge.

**ithlete: Are you still doing sports? Do you use HRV personally?**

**Eddie Fletcher:** I'm too old! I used to be a decent runner and rower but now at 57, I'm more concerned with keeping generally fit and functionally mobile. However I use HRV to track all of my exercise and regularly use it to make sure I'm recovered from the stress of my daily workload.

## **Interview with Landon Evans, Strength and Conditioning Coach and Nutritionist at Illinois State University**

*Landon Evans has been the Strength and Conditioning Coach for the last 7 years in both the NCAA (National Collegiate Athletic Association) and private sector.*

To give a quick background, I've been around nearly every sport in some capacity during my 7 years as a coach. My coaching philosophy is governed by the sciences of human performance, biological individuality, and interactions with countless sport and physical preparation coaches. Currently, my coaching duties are mainly involved with speed & power athletes. This includes such sports as American football, basketball, and I even consult for the sport of powerlifting.

Back in 2005, I attended a Yuri Verkhoshansky conference, and that was my first introduction to HRV as an athletic assessment tool. The tool that was being presented was the Omegawave system which is based out of Portland, Oregon. The system originated from leading edge Soviet science research of the 1970s that was generally unknown in the West. At the time, I believe the general consensus among the coaches thought the product was voodoo, but with my early background in engineering, it actually made sense to me. Since then, through validated research, and practical experience, I know that HRV is very real.

From an adaptation standpoint, our bodies have evolved hierarchical rules to deal with challenges from our environment, and the status of the autonomic nervous system (parasympathetic – rest/recovery, and sympathetic – fight or flight) often acts as an early indicator before other more serious symptoms manifest themselves. HRV is our tool to monitor our ANS to gauge the readiness of our athletes. Gives us some indication if our body is ready to support high training loads, low intensity loads, or is it over-stressed, sluggish, or mal-adapting to previous training. Theoretically, this should allow for more positive adaptations, thus yielding in a higher biological power.

One problem I see with the speed & power sector is some coaches think that autonomic nervous system monitoring is only useful for endurance athletes, and that monitoring the ANS for speed & power athletes is wasteful since there is not a ton of research validating its use with those types of athletes. If there would be a greater understanding of physiology on their behalf, they would immediately understand that it's quite useful, and definitely can help you gauge the adaptive processes of the entire organism since the cardiovascular system interacts closely with all other organs and systems in the body. If there is a "kink" in one or more of those interactions, there will be some sort of disturbance in the CVS, thus influencing the state of the ANS.

In conclusion, I believe that all sportspeople should have assessments and that HRV is an important one. Without regular assessment, athletes are just accepting workouts and training blind, assuming they are getting better but certainly not progressing in the fastest way from A to B, which is where we all want to get to in the end.

## My Experience using *ithlete*

**Graeme Howorth** “on days when I felt tired and not tempted to exercise, *ithlete* told me otherwise and not only did I exercise but glad I did”

**Occupation:** Company Director      **Primary Sports:** Running and Mountain Biking



Until I took up running again four years ago, I didn't really partake in any regular sports or exercise. Walking and occasional windsurfing were my only physical exercise. In my school days I was fit, running in county cross-country, playing rugby, and quite good on the track up to 1600 meters.

My fitness targets this year are one half-marathon (sub 1:45), two 10K races (sub 48). With running and mountain biking as my primary sports, I tend to cycle when my joints are giving me problems or when *ithlete* says "mild" exercise." I train by miles, running around 35 miles and cycling about 30 miles each week. I guess it averages between 7 - 10 hours per week. I partially tore my medial collateral ligament on my left knee about 18 months ago, and it took the best part of eight

months to fully heal. I used to run regardless how I felt and this led to periods of quite profound tiredness, needing sleep after longer runs -- which was unusual. I would have to stop all exercise for one to two weeks to get out of the cycle.

Because of fatigue, I wanted a way to find out what my body was telling me-- stop? go? rest? That's why I began using *ithlete*. The biggest difference is that I now seem to get back into my running fitness quicker. I feel less tired after longer runs and have fewer injuries (current knee problem excluded.)

I can normally guess correctly what *ithlete* is going to say; for example, a hard training session usually results in the HRV going down. If it says red (rest) I obey; if it gives me an orange (caution) I go with light runs or cycling (this seems to work); and I usually get a blue (go) the next day.

Before using *ithlete*, if I felt tired I would often not run. I now realize that "feeling tired" and HRV don't always go hand-in-hand. Surprisingly, some of my better runs have been when I felt physically tired. Instead I would go out and soon felt fine - simply by following what *ithlete* told me. In other words, when there were days when I felt tired and not tempted to exercise, *ithlete* told me otherwise and not only did I exercise but glad I did.

**Andy Howard**      “with *ithlete*, my sleeping has improved. Which makes *ithlete* worth its weight in gold!”

**Occupation:** Information Technology Consultant

**Primary Sports:** Triathlon, Cycling, Running



I've been using a heart-rate monitor for approximately 10 years. I've had several Polar monitors but now use a Garmin 310XT.

You might call me an “age-grouper weekend warrior,” though I was very unathletic before I hit my 30s. Mid-life crisis? Perhaps. I now train on average 15 hours per week, with 20 or more during peak periods.

I got my *ithlete* unit as a Christmas present, and after five months of use, I'm really impressed. I've previously gone on resting heart rate and often a higher rate has not corresponded with how I've felt.

Using *ithlete* I have had the slightly high resting heart-rate reading, but with an HRV reading very close to my “norm”, I have trained accordingly. The *ithlete* has also allowed me to “sneak in” a hard session when I've felt good by giving me confidence that everything was going well. I have also used *ithlete* to confirm to that I wasn't being a wuss by missing a training session if I didn't feel right.

The HRV is a good gauge to training response. And I like gadgets. I will often train if *ithlete* has given a lower reading but cut back on the intensity or distance. My graph or *ithlete* shows a steady progression upwards and is now fairly constant at 80+ so I'm happy that I'm progressing.

My upcoming goals are to complete Challenge Roth (Germany) Ironman-distance triathlon under 12 hours and run 50 miles in a local ultra.

I used to suffer from irregular sleep patterns when close to overtraining. No trouble getting to sleep, but would wake up at 3 or 4 am. But with *ithlete*, my sleeping has improved. Which makes *ithlete* worth its weight in gold!

**Mark Williams**      “the main thing with *ithlete* is that you learn about your body and keep healthy to ride hard all day”

**Occupation:** Design and R&D Engineer

**Primary Sport:** Cycling



I first started cycling in 2001 after getting a divorce; it was either fitness or the bottle. Mountain biking was the thing that grabbed me as I was an avid motor cyclist and loved speed and danger. After cycling for a couple of months and getting fitter. I found that I had burnt out all my mates so it was time to find a local mountain-biking club. I joined up and started racing and then did 24-hour race events. I then took up road cycling, much to my brother's joy since he loved the road stuff. Next I was talked into doing my first time-trial on a local course. It was not an easy one with rolling hills, but from that point on, the road is what I liked the best: time trialing and trips to the French alps. Pure joy there!

I train between 7 to 8 hours a week in the spring and summer; 5 to 6 hours in the fall and winter. I would experience fatigue from overtraining,

especially if my work week had been busy and I hadn't got to bed early enough. I have been using heart rate monitors now for over 10 years, I started with the Suunto X6hr, then moved on to the Polar S710i and AXN700, but now I use the Garmin Edge 705 and the Suunto t6c with a dual belt and memory belt. My goal this year is to beat my personal best in 10-mile, 25-mile and 50-mile time trials.

I started using *ithlete* because I needed to see how hard to train and how often. I really like *ithlete's* ease of use first thing in the morning. It's as close as you can get for very little money to gain experience with how training effects your body as well as knowing what to do with the readings that comes with usage.

When I got a bad cold early this year, I could track it with *ithlete* and rest until the symptoms had gone and my results came back to normal. For this alone, the *ithlete* is extremely valuable, But the main thing with *ithlete* is that you learn about your body and keep healthy to ride hard all day.

**Nigel Strong**

*“Otherwise peaking and tapering are just guesswork – when am I ready? With *ithlete*, I know when I’m ready to race”*

**Occupation:** Search Consultant & Life Coach

**Primary Sport:** Triathlon



My sport focus is with Olympic-distance triathlons—1.5K swim, 40K bike, 10K run. I’d like to do more but I sustained a shoulder injury that limits the swimming, I’d like to Goal sub 2:20 at this triathlon distance.

In the past, I had a couple of overtraining incidents: exhaustion, feeling obligation to train twice a day, not taking proper rest days, times got worse, and became susceptible to every illness out there. Psychologically, I was not even aware at the time that that is what's happening. That's where *ithlete* really becomes useful. *ithlete* says it’s okay to not to have a hard training session or take a day off. If you know you have put the training in, *ithlete* says rest up then you feel better the next day. My times are still getting better; in fact, I managed sub 2:30 over the Olympic distance at the London Triathlon.

This is now one of the most regularly used apps on my iPhone. I make sure I carry it around with me, especially when I'm traveling. What I really love about *ithlete* is that when I see a big drop, for instance to the high 60s, I can relate that figure to not feeling well, then watching it get higher (and feeling better) to the mid / high 80s. I normally listen to and follow the *ithlete* recommendation, but if I train when *ithlete* says I shouldn't, my heart-rate during exercise goes up, and my performance decreases. The scientific side of *ithlete* is very interesting.

I had a coach a few years ago who said that a morning pulse rate change of 5 to 10 percent can indicate fatigue, But the *ithlete* app is more sensitive and uses charts and indicators. When you start to see the data in this form it starts to take on much more of a reality. Not only athletes, but 'normal' or non-athletic people could also use this! Prevention is better than cure.

I've used a Suunto T6 heart-rate monitor for running in the past, but now I tend to use the *ithlete* morning measurement as a barometer on what sort of training I need to do that day. I've even recently used it as an indicator for peaking and tapering recently. For example. I got a normal reading before a sprint distance event, and so I knew with confidence that I could really push myself hard. It felt great picking off competitors during the triathlon. Otherwise peaking and tapering are just guesswork – when am I ready? With *ithlete*, I know when I'm ready to race.

**Michael Pinchen**      “after six months training in tandem with *ithlete*, I hit the same climb and was delighted to see a 7 percent improvement in my personal best time”

**Occupation:** Company Director and Semi-retired

**Primary Sport:** Cycling



Over the past few years I have increased the seriousness with which I have trained. My goal, as I approach 50, is to buck the trend and continue to improve despite the onset of middle age and attendant slowing of metabolism. I knew this would take a lot of work.

These days I'm training 10 hours a week. That's risen from 4 or 5 hours in the past. I have been reliant on heart-rate monitor data for many years. But the most noticeable impact of the onset of age has however been the length of recovery time needed after hard efforts. Combined with the increased level of training, this has led to overtraining syndrome on more than one occasion, as well as a general loss of energy and sporadic loss of form. This is where *ithlete* has really been a game-changer for me.

The *ithlete* was an unexpected birthday present from a friend. I'll be honest and say I was unconvinced at first, but once I started using *ithlete*, an initial fascination with daily resting heart rate was replaced by growing understanding of heart-rate variability and its impact on my training regime.

The one point I would make to any prospective purchaser of *ithlete* is to persevere. It took me three to four months to really appreciate *ithlete's* benefits and be able to identify trends that have had a genuinely positive impact on my training and performance.

What *ithlete* has allowed me to do is to make better use of my time - to target my training in a far more precise manner than before. In addition, it has gone a long way to explaining dips in performance and in so doing has prevented me from overtraining by way of compensation. I'm now happy to occasionally take a rest day out from my schedule - and be safe in the knowledge that it is doing me good in the long term.

In the past, often my legs would feel fine so I would hit the road only to find my energy levels were way down. On other days, my legs would feel stiff and I would spend the day

relaxing on the sofa. Now I can be pretty sure whether the stiff legs will recover after ten minutes of hard effort, or whether feeling good on the sofa with a cup of coffee will translate to meaningful training on my local training loop.

On this loop, there is a 12-kilometer climb that I've used as a benchmark for a few years. For the last couple of seasons, however, I've been unable to improve on my best time regardless of increases in training and noticeable weight loss. Having spent the last six months training in tandem with *ithlete*, I hit the same climb and was delighted to see a 7 percent improvement in my personal best time. Perhaps I could achieve the same results with a personal coach and sports science monitoring but frankly I could not afford such luxuries even if I had access to them.

The results I'm achieving this season make me a true believer in the benefits of HRV when used as part of an organized training regime. I've learnt to trust it. I'm beginning to understand my body's recovery cycles and the effects of both physical and mental stress on my performance. The *ithlete* has even improved my energy levels away from the bike.

## WHAT THE PRESS SAY ABOUT *ithlete*

**Triathlon** PLUS

**iThlete**  
**ITHLETE** £34.99  
[www.myithlete.com](http://www.myithlete.com)

**THIS NEW IPOD APPLICATION** measures heart rate variability; a research proven way of getting all-important feedback about your body's reaction to daily training and stress. It involves you spending one minute every morning following simple on-screen instructions, breathing in and out while a little plug-in receiver picks up a signal from the heart-rate monitor chest-strap you'll need to wear. Used consistently over a period of weeks and months you can track daily changes in the health of your nervous system, indicating stress levels from training and daily life. As well as on-screen graphs, the iThlete gives you a daily indicator; a green, amber or red light that indicates whether you should train hard, train easy, or rest up completely. Some expensive heart-rate watches perform a similar function, but we like iThlete's simplicity of use and value for money, making it a great way to train effectively.

**VERDICT** High-tech, low-cost training feedback for iPod Touch or iPhone owners  
**PERFORMANCE VALUE OVERALL**



**ithelite** £34.99



**AFTER** six months of use there is still much to learn from the ithelite — it's an incredible tool. The principle is simple: by measuring your heart rate variability (HRV) — the minute difference in resting heart rate when breathing in and breathing out — the ithelite calculates how tired/rested you are and puts a figure on it. Your daily HRV is then plotted on a graph and averaged. You do need to be very strict about how you test yourself each day though, as HRV can be influenced by other factors.

As an early warning of illness the ithelite was invaluable, it showed a massive drop in the HRV before any other normal indicator and, just as useful, it shows when the worst is over.

The ithelite has masses of uses and we can't help but feel a more complex version of the software would increase the appeal even further. MH  
 Contact: [www.myithlete.com](http://www.myithlete.com)

**Cycling**  
WEEKLY

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## What the Press say about ithlete

### NEW RELEASE

# ITHLETE APP

■ PRICE £34.99 ■ CONTACT [myithlete.com](http://myithlete.com)

#### WHAT IS HEART RATE VARIABILITY (HRV)?

It describes the way your heartbeat varies at rest and during exercise. It sounds counter-intuitive but a healthy heart does not beat like a metronome. Instead, it experiences tiny rhythmic disruptions in between beats. The greater the variability, the healthier the heart.

#### WHY IS IT USEFUL FOR TRAINING?

It's a more bespoke version of the practice of taking your pulse in the morning to determine your level of fatigue. Intensive exercise stresses your body, resulting in reduced HRV.

Proper recovery will cause your HRV to rise again, letting you know that you are getting fitter and ready to train again.

#### HOW DOES ITHLETE WORK?

It's an application for iPhone and iPod Touch. By inserting a dongle into the earphone jack you sync the app with your

heart-rate monitor (see Ithlete website for list of compatible HRMs).

You breathe deeply in and out for 55 seconds and then receive a reading between 1 and 100 (the higher the better), as well as a colour-coded judgement as to whether you should rest, train less strenuously or train normally that day. Each result is logged cumulatively in chart and graph format so you can follow progress over time.

#### VERDICT

The HRM and dongle took a while to sync during the first couple of uses, but thereafter it was a doddle to operate, the readings were easy to interpret and the results seemed to be accurate - I was able to train harder after days on which I'd been advised to ease up.



# RUNNER'S

WORLD

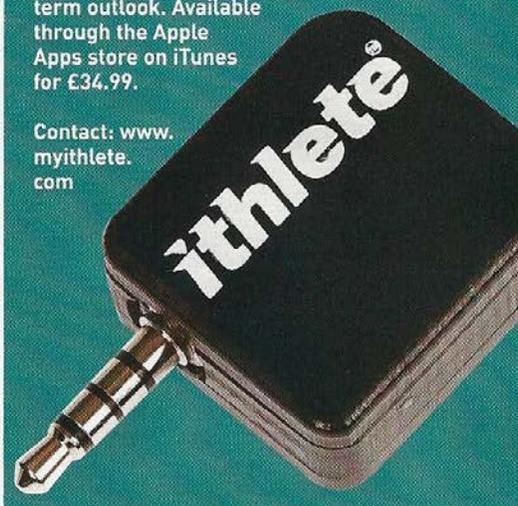
## What the Press say about ithlete

### ithlete

NOW here's a clever little gizmo for you. ithlete, like so many things that are dead clever, seems so simple, at least on the surface. Most people know about the concept of measuring heart rate first thing in the morning and noting daily changes to help spot the early signs of overtraining and/or illness. ithlete takes this a stage further.

By measuring heart rate variability (HRV) the ithlete gives you a measure of not only the stress level caused through training but, all importantly, and where so many of us non-full time sports people fail, the stress caused by everyday living, too. Be it a late night, long hours behind the desk or too much drinking, your body's ability to recover will be affected, resulting in a lower HRV. The ithlete works with your heart rate monitor strap to measure your resting heart rate and HRV on an iPhone first thing in the morning, recording each day's value and plotting it on a graph. Once a baseline is built up, the smart software's algorithms then tell you of the daily changes, and whether you are recovered and can therefore train normally, or whether you are getting tired and should ease back or are in need of a rest day. It also shows weekly and monthly progressions for a longer-term outlook. Available through the Apple Apps store on iTunes for £34.99.

Contact: [www.myithlete.com](http://www.myithlete.com)



**Cycling**  
WEEKLY

## **A message from Simon Wegerif, creator of ithlete and founder of HRV Fit Ltd.**

Like many endurance athletes - runners, cyclists and triathletes - I use a heart rate monitor. It helps me measure how hard my body is working during training as well as keeping me just to the right side of the red line during competition. Since I wasn't getting any younger and I liked to keep pace with the top local and yes, younger riders, I began investigating smarter training methods that would improve my performance but without the risk of injury due to overtraining. And this is how I discovered heart-rate variability.

In time, I became convinced that I needed to incorporate HRV as part of my own athletic training. My bike times had leveled off and I often wondered if I had been training too intensely without allowing for sufficient recovery. So I looked around to see what commercial products were available and came across software from companies such as Omegawave and FirstBeat Technologies. Both products are highly regarded, and used by top athletes under coach supervision. Yet these products cost from \$1,000 to more than \$20,000. And even though HRV is now included in high-end heart rate monitors from Polar and Suunto, they lacked several important measurement criteria, such as color-coded warning indicators, the ability to visualize your trends graphically, and the simplicity of a quick morning test that anyone can fit into his or her daily routine.

I came to the conclusion that there was not an easy-to-use, affordable product that could give one a direct and daily measure of HRV. But all was not lost. I am an engineer by profession. With my background and work experience at Philips Electronics, building an HRV system did not seem particularly daunting, though the process would turn out to be a longer journey than I first anticipated. I read almost 500 research papers on HRV and consulted with many experts, cardiologists, coaches and trainers. My device had to be scientifically valid, practical, and uncomplicated to use.

By early 2009, I had completed ithlete's first working system (which I immediately submitted to various patent offices in several countries). Several months later, I had created a small receiver, as well as a working app for the iPod touch and iPhone, which I specifically chose because of the great user interface and processing power. During this time, as I used the ithlete prototype, my confidence and belief in HRV continued to grow. Here was a simple measurement that took only 60 seconds each morning, and seemed to know my body better than I did.

The first customer to download the app from iTunes and obtain a receiver from the ithlete website was a cyclist from Wiltshire, U.K. Since then, close to 1,000 athletes worldwide have purchased ithlete - and the number continues to grow. Orders have come from Australia, South Africa, United States, Sweden and even Greenland, to name a few. Users have ranged from elite triathletes to recreational 10K and half marathon runners, who have had injuries and want to avoid repeating them, to competitive time-trial cyclists, and to weekend warriors wanting to lose weight using a regular exercise program and who want to avoid doing too much too soon.

I hope you enjoy using ithlete as much as I do - it's a great training tool!

## **Order and shipping info**

For all equipment, pricing and ordering information, please visit:

[www.myithlete.com](http://www.myithlete.com)

The ithlete app is available from the iTunes store, go direct to:

<http://itunes.com/app/ithlete>

