

The workout/recovery cycle

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As you train, your body undergoes a specific and predictable cycle. At the beginning of a workout, you feel strong and fresh, but as it progresses, you become increasingly fatigued. This is known as overloading the body, and is a requirement for athletic development; you need to push just past your current fitness level in order to stimulate fitness gains. Upon completion of the workout, recovery begins as your body “defends” itself by restoring depleted energy reserves and rehydrating, while repairing structures and tissues that were damaged during the workout. Beyond mere restoration, however, lies the concept of supercompensation, whereby fitness “bounces back,” or recovers to a level *above* what it was before the workout. Over time, this effect is manifested through increased power and/or endurance.

Here is a graphical depiction of a single cycle of this process:

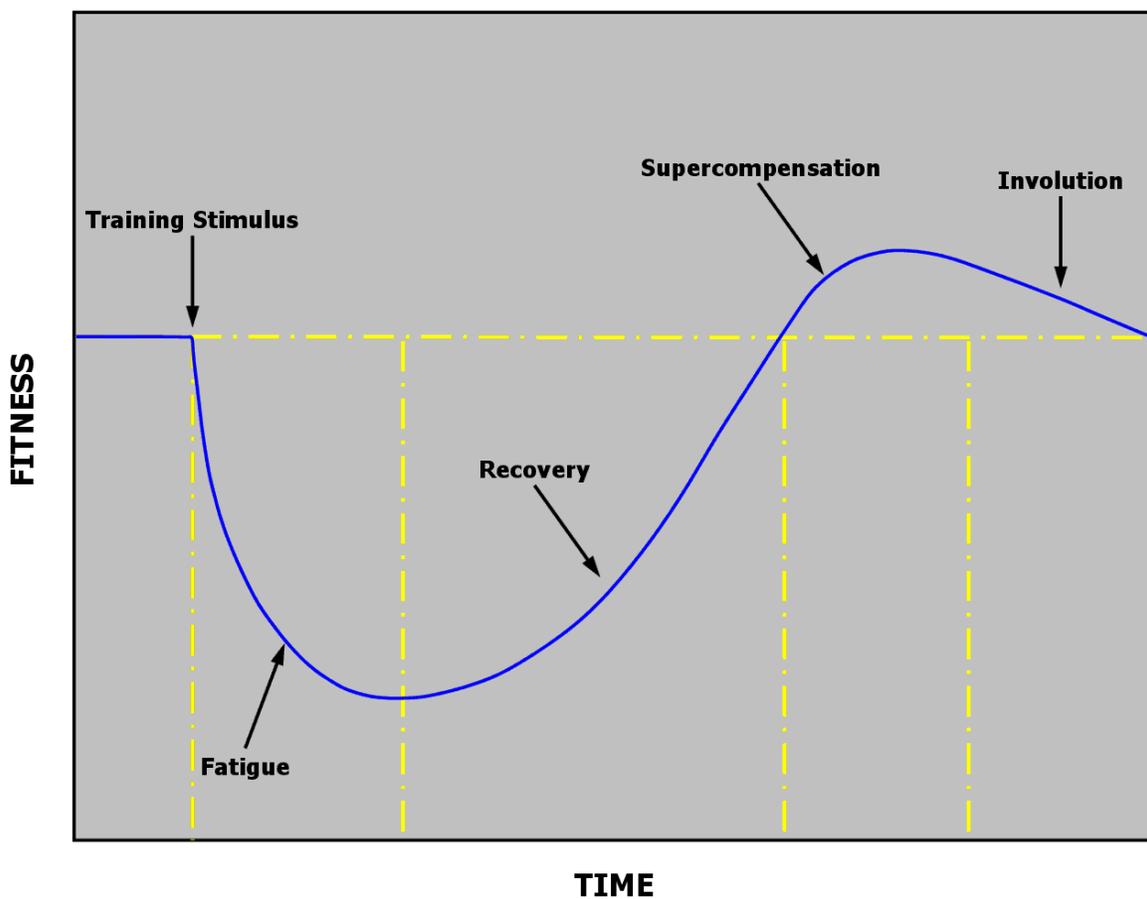


Figure 1 – generalized workout/recovery cycle.

The curved blue line represents fitness level, i.e., the ability to perform work at a given rate. As a workout progresses, this actually decreases, in that work capacity lessens as you become fatigued. The lowest point of the curve represents the greatest level of fatigue experienced, and corresponds to the end of the workout, whereupon recovery commences, and continues until the body is adequately refreshed and restored. Time required for recovery will vary with the workout type and the individual. Over time, the summation of these workout/recovery cycles is known as the training effect, and the increase in fitness is represented by the upward-sloping dotted line in Figure 2.

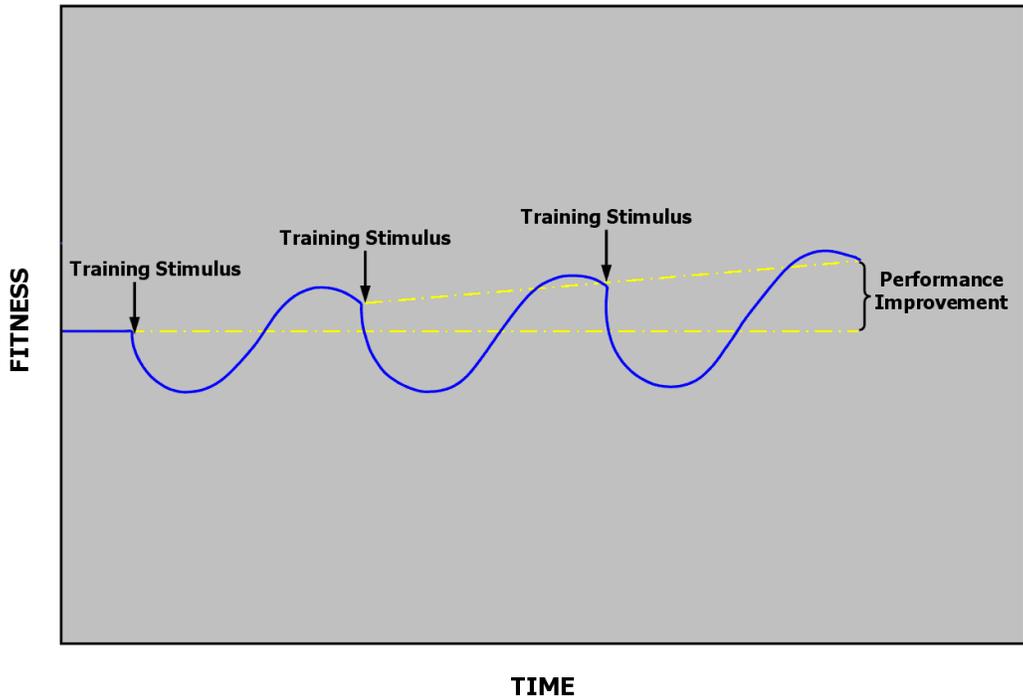


Figure 2 – adaptation to training load

Simply put, workout fatigue + recovery = training effect, and increases in fitness are the result of repeated cycles where fatigue and recovery are adequately balanced. Effectively managing this cycle is therefore of primary importance to athletes. On the other hand, when training stimulus is applied before the athlete is adequately recovered and “fresh,” fatigue will accumulate, and fitness gains may stop or even reverse:

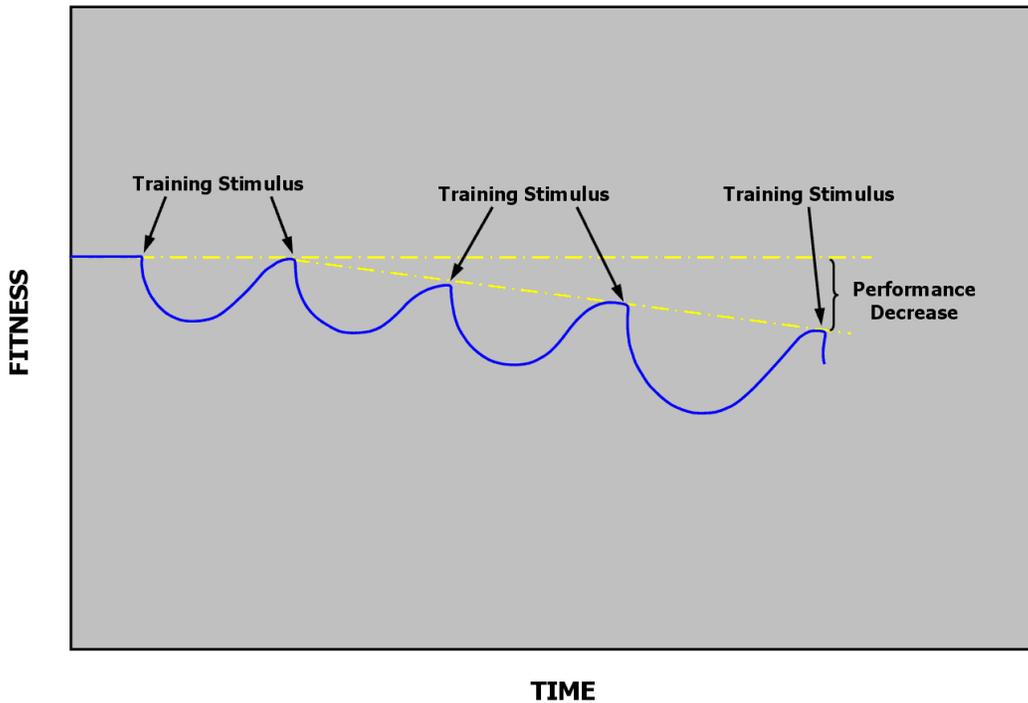


Figure 3 – inadequate recovery, decrement in performance

If this occurs over the course of several days, it is called overreaching, which is actually a valuable component of a training program, such as when preparing for a stage race where back-to-back long/intense days are required, but when the overreaching cycle continues for too long, overtraining can set in, which is a more serious condition brought on by chronically incorporating more training load (load = volume + intensity + duration) than can be recovered from through a normal period of rest. Overtraining is usually identified by markers that vary by individual (and are often debated), including feelings of tiredness and fatigue, decreased motivation to train, disturbed sleep cycles, tendonitis or other injury, irritability, abnormal heart rate (both resting and in response to exercise), appetite disturbances, and muscle soreness, among others. The only true indicator of overtraining, however, is decreased performance, which can only be verified by accurately measuring work output. If overtraining is detected quickly enough, and adequate rest is applied, perhaps no more than a week may be needed to restore fitness, but if left unchecked, it can take weeks or even months to recover from fully, and may permanently alter an athlete's desire to participate in a sport or training program.

At the other extreme, if training bouts are too infrequent, performance can stagnate:

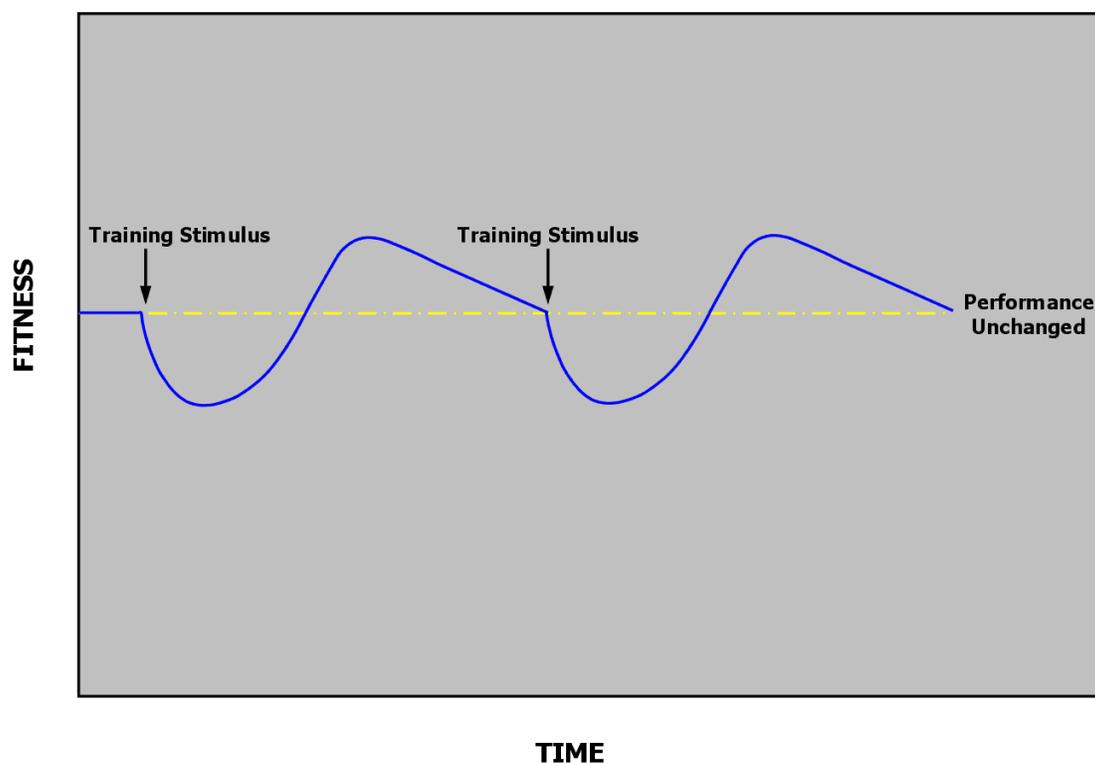


Figure 4 – excessive recovery, performance unchanged

In other words, if there is not another training bout soon enough after supercompensation, an involution (decrease in fitness level due to detraining) can occur, but even a minimal amount of activity can prevent this. Involution also introduces the concept of detraining, or a decrease in fitness level. A complete discussion of the topic is beyond this article, but in general terms, there are two factors to keep in mind: first, the more time you've spent acquiring your fitness, the longer it will take to lose it, e.g., if you have been training steadily for a year, it will take longer to lose all your fitness than if you've only been training for a month. Second, the higher your fitness level is, the faster your fitness drops. Said another way, if you are in absolute peak form, you can lose 5-8% of your fitness after just one week of complete inactivity. Again, a reduced level of training volume can maintain your fitness, and high-intensity training helps maintain fitness the best.

Different workouts and combinations of workouts yield different workout/recovery cycles, and how long it might take to completely recover and supercompensate from various types of workouts will shape training program design. Broadly speaking, the greater the intensity or volume of a workout, the greater the fatigue:

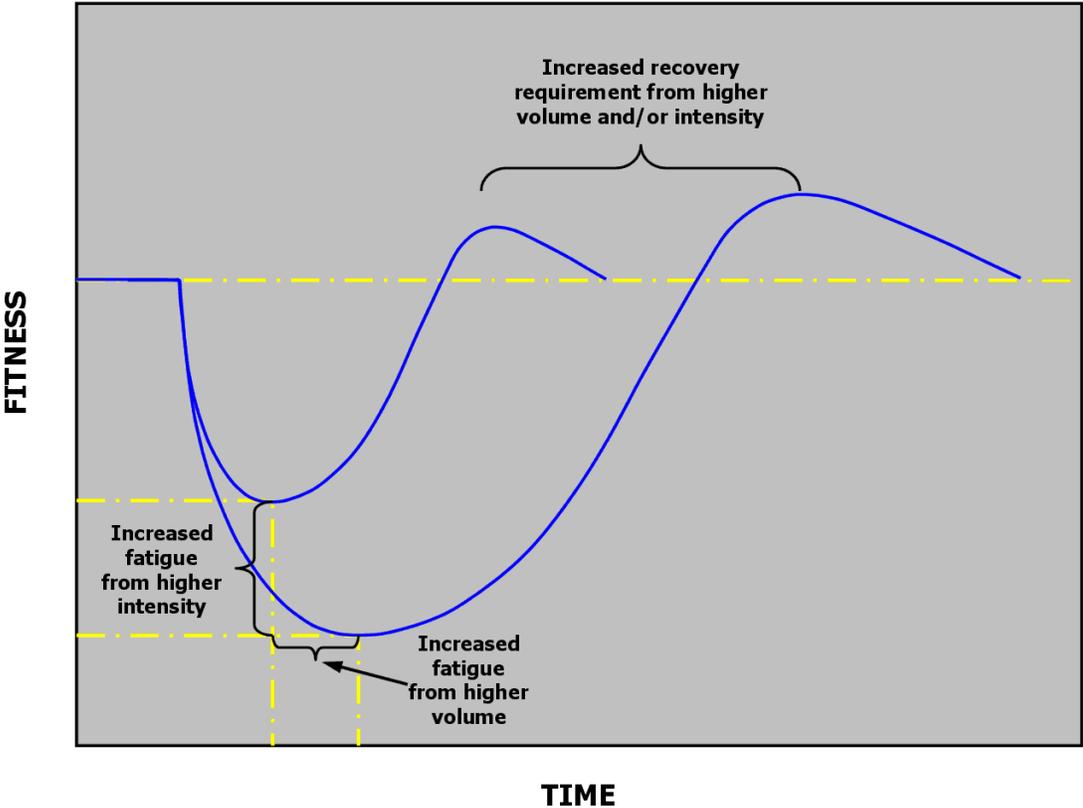


Figure 5 – increased volume/intensity

The deeper the fatigue level, the longer it takes to recover, and below a certain theoretical threshold, the likelihood of muscular/skeletal injury increases significantly, while mental fatigue can increase the chance of a crash or accident. This threshold is determined mainly by your athletic background and current fitness level (training status). Here are some general guidelines for recovery time from various workouts:

WORKOUT TYPE	APPROXIMATE RECOVERY REQUIREMENT
Endurance Ride – within regular abilities	6 to 24 hours
Endurance Ride – build period	12 to 36 hours
Tempo – within regular abilities	12 to 24 hours
Tempo – building period	12 to 36 hours
Lactate threshold interval workout – within regular abilities	12 to 24 hours
Lactate threshold interval workout – building period	24 to 36 hours
Anaerobic capacity interval workout	24 to 36 hours
Hard group ride	24 to 36 hours
Race	36 to 48 hours

These are drawn from a purely from a physiological point of view; rest, stress, heat, travel, normal activity, etc. all affect recovery, as does individual variation.

Drawing on the workout/recovery relationship outlined in Figure 1 and the recovery timetable just given, here is a plan for structuring your workout week to fit in as many quality workouts as possible, yet still be recovering and supercompensating from your workouts. This is intended for an intermediate-level cyclist in the late spring:

Monday – rest day (completely off)

Tuesday – anaerobic capacity intervals (8-20 x 1 minute)

Wednesday – recovery ride (60 minutes, very light intensity)

Thursday – lactate threshold intervals (2 x 20 minutes)

Friday – endurance (2 hours, light intensity)

Saturday – recovery ride/open up for race

Sunday – spirited group ride or race

Keep in mind that there are numerous possible weekly workout combinations that may work for a given athlete, and your workout schedule will look very different at different times of the year.

To summarize, the workout/recovery cycle can be thought of as the master principle of training, as it describes the relationship between a workout, recovery, and subsequent increases in fitness. It applies to nearly all sports, as some level of overload, fatigue, and recovery are required to stimulate supercompensation and increases in fitness. Your ability to understand, implement, and manipulate these principles will have significant effect on the fitness gains you achieve, and can help you avoid overtraining and injury.