

Recovery

Recovery is the readiness of fitness systems to make further efforts following training and non-training fatigue.

Training stressors relate to the volume and intensity of efforts.

Non-training stressors include psychological, climate, travel and many other factors.

Reducing training and non-training stressors reduces the amount of recovery required.



CYCLE ARTICLE

Training and Non-Training Stress

Improving recovery allows effective training to resume sooner or competition to be more successful.

Many athletes and coaches consider recovery only in terms of the physical exertion of training and racing.

Non-training factors, which will be discussed in detail, can significantly contribute to the stress load. By reducing or eliminating non-training stressors, athletes can train harder or compete more successfully.

Short-Term vs. Long-Term Recovery vs. Rehabilitation

Some types of fatigue result from a single training session. Other types of fatigue accumulate over multiple sessions or several weeks or months of training.

In the same way, some forms of recovery may be needed from a single training session; other forms of recovery may be required from a longer period such as a racing season. For example, nutritional recovery may be needed from a long endurance ride; psychological recovery may be needed from a racing season.

Short-term recovery and short-term overtraining, and long-term recovery and long-term overtraining form a continuum—they overlap.

Rehabilitation refers to an injured athlete. The need for rehabilitation may be the result of an accident or inadequate recovery—for example, from overtraining.

Markers of the Need for Recovery

How do you know if you need recovery?

Many athletes rely solely on how they feel.

For example, their legs feel tired or heavy. Others feel relatively weak. Their mood may be tired or depressed; or they may lack enthusiasm.

Others use more objective methods. The first four bullets below are associated with a lack of nutritional recovery. Dehydration alone raises heart rate and decreases body weight. As carbohydrate energy stores (glycogen) in muscle bind roughly three times their weight in water, body weight may be down until glycogen is replaced.

None of the bullet guidelines below are foolproof—however they can help athletes and coaches objectify the need for recovery:

- Resting heart rate elevated more than 10%.
- Orthostatic heart rate (the rise in heart rate that occurs when standing from a lying position) more than 20 beats per minute.
- Two-minute recovery heart rate after intervals raised more than 10%.
- Body weight decreased more than 3%.
- Sleep hours decreased more than 10%.
- Biochemical markers or lab tests. A variety have been used; few have proved valuable.

In general, if you think you need a day off, you are right, you do. If you know you need a day off, you need two.

Plan for Recovery

A common error is to train or race until too tired to effectively continue.

The essence of training is the equation:
TRAINING = WORK + RECOVERY.

Improvements in fitness come from the recovery that occurs after training or racing.

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Plan for recovery. Depending upon fitness level, after a hard day, plan to go easy the next. After a hard stage race, plan to ride easy for many days.

Specific Recovery from Training

Training stresses a number of physiologic systems. How to plan the recovery of training fatigue is outlined below:

Nutrition

Fluids

Sweat rates in hot, humid conditions are commonly about two quarts (liters) per hour. Higher rates have been recorded.

The best approach is to minimize losses during training or racing by drinking as tolerated up to a quart and a half during exercise.

Drink a bottle or two after your training or race—you are almost certainly dehydrated.

You may need to replace twice as much fluid as you have lost. If you are down three quarts after a long training session or race, it may take five or six quarts to replace your fluids.

This is due to the fact that your kidneys will eliminate some of the fluid you drink before it has a chance to go to your tissues.

Sodium

Replacing the electrolyte sodium can help for many reasons.

1. Sodium stimulates thirst. So you are more likely to rehydrate.
2. Sodium helps the stomach and gut process fluids, and so improves fluid absorption.
3. Sodium helps the body hold on to water. If you are down three quarts and if you ingest sodium with your fluids you may need only four quarts to replace your fluids rather than five or six.
4. Sodium itself may need replacing. Many athletes lose about 1,000 mg of sodium per quart of sweat. If you have worked out for an hour or two and have lost only a couple of quarts your background daily intake of a few grams (say 3,000 mg) sodium is likely to be sufficient. If you have worked out long and hard on a hot, humid day, you may have lost 10 quarts of sweat. Now you must increase your sodium intake to replace your losses.
5. Sodium ingestion may help prevent cramps.

Energy Sources

If you are planning on training or racing again in the next few days, you have to resupply your energy tanks—and sooner is better.

If possible, it is best that you have consumed at least 300 calories per hour, mostly carbohydrates, while exercising.

How many calories you need after exercise depends upon how many you have burned and how many you have replaced along the way.

- Assuming you have worked out hard for a few hours, and consumed 300 mostly carbohydrate calories per hour during exercise, you'll need to replace 200 to 1000 calories of carbohydrate to restock your energy supplies.
- Immediately after hard training or competition, liquid carbohydrates are often easier to consume than solid foods.
- For many athletes real foods such as sandwiches, fruit, yogurt, cookies, milk, and juices may be a better recovery choice than the more expensive and marketed recovery drinks.
- Do not wait hours for dinner—certainly have dinner later, but eat something ASAP.

Protein

It is currently popular to believe that protein replacement after exercise is important.

Scientific evidence about the role of protein is unclear. Some advocate protein consumption equal to about one-fourth the amount of carbohydrate ingested. Some recommend the protein building blocks of glutamine and branched-chain amino acids.

Others doubt that more than about 6 grams of protein is needed, and believe that the protein has proven helpful only when protein has helped meet overall caloric need—when carbohydrate replacement has been insufficient.

Antioxidants and Other Vitamins

Exercise increases chemical reactions, often through a biochemical process called oxidation. This leads to so-called free radicals that *may* be associated with reduced immunity or cancer.

Antioxidants, including vitamin A and derivatives, vitamin C, and Vitamin E *may* reduce this oxidative damage.

The operative word is here is *may*. The scientific evidence that antioxidants or other vitamins aid recovery is hardly convincing.

Muscles

Get off your legs.

Those legs of yours have worked hard. Don't stand around for a couple of hours chatting or watching the next race. You can still be friendly and exchange war stories. But sit down to do it—get off your legs.

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Vibration

Mountain biking or rough road riding can result in vibration damage to muscles. Most athletes require cross-training on smooth roads to optimize the training of fitness systems and limit vibration stress to muscles.

Eccentric Damage

Work performed while muscles lengthen under tension often results in muscle soreness.

This type of exercise is not common during general bicycle riding; it does occur with some one-legged riding and high-cadence exercises. It is also typical of many weight-room routines.

Reduce or avoid this type of work for several weeks before racing.

Crotch/Buttocks

- Pressure and moisture are hostile to skin health.
- Biking shorts are great for biking—but the tightness and dampness are bad for crotch hygiene and promote saddle sores. Change out of those tight damp shorts promptly after rides.
- Neoprene seat covers, double shorts, Bag-Balm, and post-ride warm baths are some of many methods of reducing crotch and buttocks stress.

Thermal Stress

Heat increases the metabolic demands on the body. If it is a hot sunny day, and you stay exposed, you will delay recovery. If you are not going home, get in the shade.

If it is cold or rainy, of course you will want to get out of the weather and get into warm, dry clothes as soon as possible.

Sunscreen

Of course it protects your skin. It can also prevent you from getting overheated and can keep you working longer. Preapply, carry, and reapply as necessary.

Eyes

Wind, dry air, sun, dust, pollution, bugs and other debris tire the eyes.

Eye protection (e.g. sunglasses) helps reduce stress.

A cool, damp towel on the eyes after the ride and low-level lighting helps make the eyes feel better.

Training Routine

Varying workouts during the week, month and year (periodization) helps keep athletes physiologically and psychologically fresher.

Although hard work in training and racing may be required, many athletes benefit from training and racing “vacations.”

Allow yourself to adapt and progress before working at hard levels of perceived exertion.

Think of some of the things you don’t want to do after hard training or racing. For example, you probably wouldn’t want to do heavy yard work. Don’t fatigue yourself with such activities before heavy training or racing.

Warm Up and Cool Down

Gradually increasing the blood flow to muscles and allowing blood flow to carry away waste products after hard exertion are just two of many reasons why warm-ups and cool-downs probably reduce the need for, or assist, recovery.

Non-Training Stresses

Non-training stressors include psychological stress; travel stress including time-zone change; race-logistics stress; climate change stress; and ergolytics—performance-robbing foods, over-the-counter, recreational, and prescription drugs.

Psychological Stress

Although most athletes and coaches consider the psychological stresses of training and racing, many neglect the common, everyday life-stresses related to finances, relationships and family, and work.

Anxiety and depression prevalent in the general population is equally present in the athletic community. These everyday psychological stresses can significantly interfere with training and racing.

Of course, medical illness in self or family, death of a loved one, or the loss of a job are negative stresses. Psychological stress comes not only from “bad” things but can result from any change.

Too many good changes are also stressful and potentially an impediment to effective training and racing.

For example, a new job, relationship, marriage, a new car or house may be desirable. But too many of these events close together can impede an athlete’s training or racing.

Resolving or limiting conflicts and major life events can help prevent or treat psychological stress.

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Decrease Psychological Stress

- Keep things simple.
- Avoid sweating the small stuff.
For example, a little change in diet is not worth more anxiety to “correct.”
- Keep perspective.
Even if you have high cholesterol, if stranded on a desert island, it is okay to eat bacon and eggs (that is, if there are pigs and chickens around).
- Resolve problems.
Don’t keep dwelling on problems. Don’t be stuck. Resolve conflicts and issues.
- Make sure goals are realistic.
If you set unrealistically high goals, you’ll be stressed trying to reach impossible objectives.
- Plan; avoid crises.
Take care ahead of time what you can. Plan to arrive early. Don’t procrastinate; avoid rushing.
- Relaxation techniques.
There are a variety that help many. These are discussed in more detail below. If you reduce life’s stresses, you won’t need to rush home to meditate.
- Strive for a psychologically healthy lifestyle: friendly, well-balanced, with good working relationships. Don’t be contentious. Avoid contentious people.

Travel Stress

Although some athletes thrive on travel, most are stressed by it. Although professional athletes are helped by a road manager, checking into and out of hotels, sharing quarters, decreased or increased time alone, changes in diet including eating in restaurants, packing and unpacking equipment, rental cars, roads and traffic, missing items, and travel delays all contribute to travel stress and can burn out athletes.

Most athletes become familiar with their tolerance to travel stress. Athletes and coaches should schedule races so as to allow athletes to minimize travel stress before major competitions.

Decrease Travel Stress

- Prepared travel bags, toiletries.
If you travel frequently, have dedicated clothes, toiletries, and travel gear permanently ready-to-go.
- Packing lists.
If you race every weekend you’ll probably bring more or less the same stuff. Have a checklist prepared so you don’t forget anything.

- Extra time for delays.
Give yourself a cushion. Allow for *Plan B*.
- Travel light.
Don’t weigh yourself down. Pack what you’ll likely need. Don’t overpack.
- Luggage on wheels.
Small or large, luggage you can roll saves lifting and carrying.
- Time zones:
If practical, allow yourself one day per time zone crossed before major competitions. If you are traveling across more than five time zones, consider using a prescription sleeping pill for a day or two to reset your internal clock.
- Car rental #1 clubs.
If you frequently rent a car, the convenience of a ready-to-go vehicle saves time and hassle on arrival and departure.
- Book motels ahead.
Reservations are generally free. A downstairs motel room saves schlepping gear up and down stairs. Ask for a non-smoking room and a discount on the rack rate if you are interested.
- Known, tried fast foods.
Travel a lot? Familiarize yourself with a few national chain restaurants, and find menu items that work for you. Avoid the unknown before major competitions.

Race Logistics Stress

Is preregistration required? How long before the race should I arrive? Where is the registration table at race site? Do I have my racing license? Did I remember my wallet? Is there a warm-up area? Where is it? Where are the toilets? Are there feed zones? Where? Is feeding allowed throughout the race? Is there neutral feed? Is there bike support? Are there pit areas? Is the race start hard to find? What is the start like? Is the start on time? The finish? Are the roads in good condition? Are there road hazards to be aware of?

Most of us are stressed to a greater or lesser extent by the details of racing.

Decrease Race Logistics Stress

- Packing lists.
Who hasn’t forgotten their shoes or racing license? Make a list. Check it twice.
- Maps.
You think you know exactly where you are going, until you get off that freeway and don’t remember the next turn.

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- Preregister, prefill out entry forms.
Preregistering generally saves some race-day long lines and hassle. If preregistering is not an option, fill out a standard athlete release, make copies, and use those copies to save time filling out race forms.
- Arrive early, but not too early.
You need to have time to do all that you need to do. Allow a little extra. But arriving hours early may increase psychological stress and expose you to adverse climate conditions, noise, and other noxious situations.
- Stationary trainer to warm-up.
Mountain bikers should warm up their skills, too, on the dirt. If there is no warm-up area, or it is cold and rainy, a stationary trainer can allow you that super warm-up you want and need.
- Quiet.
Stay away from noisy and busy areas of the venue that will interfere with your pre-race routine.
- Earplugs.
Earplugs may improve concentration while warming up on stationary trainer or reduce noise stress while on the start line, especially for long mountain bike start-line introductions.
- Extra food and fluids in case of delays.
- Dry clothes for post race.
- Don't hang around unnecessarily after race.
Sure you need to stay for the award ceremony if you have made the podium. And you want to bond with teammates or fans. But as soon as you otherwise can, go back to the motel room or home, and avoid delaying recovery.

Climate Stress

- Whether it is hot, sunny, and humid weather or cold and rainy, climate changes create stresses. The body requires adaptation to any new environment.

Decrease Climate Stress

- Heat and humidity.
Acclimation takes about 10 days. If it is an important competition, and you have the time, acclimatize.
- Cold or wet.
Get the right clothing and other gear to protect yourself from the elements.
- Altitude.
If possible, allow one day at altitude for every 1,000 feet above your usual abode.

Ergolytics

Many ingested substances rob athletes of energy. These may be prescribed, recreational, or over-the-counter drugs. They may be herbs or foodstuffs.

Some of the substances touted to improve energy do help some athletes perform. But all substances have the potential to cause harm in some athletes.

For example, although caffeine helps some athletes, it makes others nervous, upsets gastrointestinal tracts, increases the need to urinate, reduces coordination, and worsens their performance.

- Many substances almost always worsen performance. For example, alcohol almost never helps and commonly hurts athletic performance.
- Avoid new substances before important training or competition; use only familiar substances known to be helpful to you.

Rest

Rest helps training and non-training stresses.

Active Recovery

On recovery days, low-intensity training helps improve recovery for some athletes better than no training at all. The duration of this light training depends on the athlete. Riders who train 10 hours a week or less may find 20 to 30 minutes of light exercise helpful in promoting recovery. Some Tour de France riders may ride four hours on rest days to improve performance in later stages.

Riders often notice that they feel better after light training than at the beginning of their training session. Heart rates at the end of such sessions are often lower than at the beginning.

Light cross-training helps other riders. An easy swim, using non-cycling muscle groups, may be beneficial.

Passive Recovery

"Get off your legs," the creed of many cycling coaches, has merit.

Professional cyclists often avoid walking. They sit rather than stand; they lie down when possible.

And when lying, they often raise their legs up, either on a recliner, or inclined up against a wall.

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Mental Relaxation

There are many techniques. They include book and magazine reading, crossword puzzles, quiet music, and computer games. Specialized techniques include progressive autogenic and muscular relaxation, meditation, hypnosis, self-hypnosis, autosuggestion, autogenics, visualization, guided imagery, learning techniques, biofeedback, and electrodermal devices.

Sleep

- Sleep provides the deepest rest of all. Many athletes perform best with nine or more hours of sleep a night. Many sleep researchers feel that not only athletes but also the general population is severely sleep deprived. Perhaps we'd all do better with more sleep.
- Napping helps many athletes. In general, avoid napping more than one and half hours daily or nighttime sleep quality may be reduced.
- Good sleep hygiene improves sleep quality. Good sleep habits include:
 - Regular sleep schedule.
Generally go to bed and arise at the same time each day.
- Dark, quiet room.
A blindfold or earplugs may help where noise or light is a problem.
- Avoid before sleep excitement, arguments, violent TV, alcohol or other drugs.
These often prevent a good night's sleep.
- Before sleep bath or read.
A warm bath or good book helps many sleep soundly.
- Sleep on the right side.
This helps many athletes. The heart's beating action is least noticeable when sleeping on the right side. This can be especially helpful if exercise has been late in the day and the heart's action is still forceful.

Ancillary Methods

There are many other techniques to improve recovery. Most methods should theoretically work by one or more of the following mechanisms:

- Increase blood flow to damaged muscles or other tissues
- Decrease muscle tension

- Accelerate inflow of nutrients
- Accelerate outflow of waste products
- Relax nervous system, reduce adrenalin

All of the methods described below have been found helpful by some athletes, although few have been shown scientifically to consistently work by any known physiologic mechanism.

Perhaps the underlying mechanism has more to do with the athlete's or coach's belief that the method works, or the psychological rest that the method allows.

Physical Therapies

Massage

Including self-massage, acupressure, shiatsu, trigger point massage, therapeutic touch, and reflexology.

Stretching

Including self-stretching, passive stretching, PNF (a form of assisted stretching).

Stretching should generally take place after, not before, training or competition.

Balneotherapy

Baths, saunas, and showers. Including hot tubs and whirlpools. Showers recommended at 99° to 105°, up to 10 minutes. Baths at 98° to 103°, up to 20 minutes.

Avoid overdoing it. Guard against increased fatigue or dehydration.

Other

Less common, but helpful to some athletes, including: light therapies, training in forests, floatation tanks, aromatherapy, postural realignment, Tai Chi, Yoga, magnets, ice therapy, vibromassage, exercise machines, electrostimulation, diathermy, laser therapies, acupuncture, barotherapy (with pressure chambers or gases), and ultrasound.

Pharmacological

A number of drugs have helped some athletes. Some are prescription, some are over-the-counter, and some are banned or illegal for use by athletes in or out of competition.

Since most don't help much or are banned, I list only a few examples:

- Antiinflammatories, including aspirin, non-steroidal anti-inflammatory drugs, and COX-2 inhibitors.

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- Herbs, including ginseng.
- Steroids and other hormones.
Anabolic steroids in men and women; estrogens, especially in post-menopausal women; and human growth hormone probably do help recovery.

Their use may be unethical or banned. They are often dangerous because athletes tend to misuse such substances with overdosage, combination with other drugs, or other hazardous practices.

A Personal Approach

If I travel to a ride or race by car, I bring a cooler and gallon jug of iced carbohydrate drink.

After the ride or race, I change into baggy shorts. I drink plenty of fluids and eat a variety of foods—often sandwiches, fruit, and cookies.

When I return home I have a warm bath, stretch my leg muscles in the bath. I then have an hour nap.

Summary

- Training and non-training fatigue requires recovery.
- Periodized training and planning for recovery helps keep the athlete physiologically and psychologically fit.
- Recovery from training includes fluids, calories, and rest.
- Reduce the need for recovery fluids and calories by drinking and eating during training or racing.
- The role of psychological factors in producing fatigue is important.
- Training and race-related stressors, including travel stressors, race-logistics stressors, and weather stressors can be reduced to improve physical performance.
- A variety of ancillary methods, including physical and other therapies, have proved useful to some athletes.

/B