

What Is Fatigue?

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Fatigue during exercise is not as simple as it seems on the surface. The cause varies with the intensity and duration of exercise. In a twenty-minute event in which you are working in Zone 5b you fatigue for a different reason than if doing a ten-hour event with heart rate in Zone 2. There are several causes of fatigue. Other than overheating and dehydration that can slow or stop your exercise, there are at least four, common physiological causes of fatigue during endurance events generally accepted by sports science.

Increasing Body Acidity

Hydrogen ions accumulate in and around the hard working muscles. Such fatigue is common in steady-state events lasting less than one hour and in the highest intensity moments in variably paced events when heart rate is in Zones 5a, 5b or 5c. It is marked by heavy, labored breathing and a burning sensation in the working limbs (legs or arms). There is a feeling that you are “redlined.” Workouts done in Zone 5 prepare the body for this kind of fatigue by producing buffers to offset the acid and by removing the hydrogen ions from the body.

Depletion of Muscle Glycogen

This is the body’s storage form of carbohydrate. Glycogen is a limited fuel source. Your body only has enough stored for about 90 to 120 minutes of intense exercise. If you don’t replace it by using a sports drink or something similar in

events lasting longer than about an hour then you will begin to feel tired and heavy and find it difficult to continue. There will be an overwhelming desire to stop moving. Many sports refer to this sensation as “bonking.”

Neuromuscular Junction Failure

The nervous system transmits electrochemical impulses from the spinal cord to the muscle fiber. Where the nerve axon meets the muscle fiber is where the muscle innervations occur. This stimulation late in an exercise session may fail for some unknown reason. When it does the athlete is unable to fully stimulate a muscle group to contract resulting in what may be called fatigue. This may also be associated with cramping. Neuromuscular junction failure may occur in events of any duration or heart rate intensity. Since this fatigue type is not fully understood avoiding it is somewhat of a mystery. The possibilities include being adequately hydrated, eating a diet rich in electrolytes, and having a high level of fitness relative to the event in which you are competing.

Tryptophan Build-up

We don't know a lot about this fatigue factor either. Here's what is known. In long-duration events, usually on the order of three hours or more with intensity in the lower zones, there are changes that take place in the blood amino acid levels. These changes lead to subtle, chemical reactions increasing tryptophan levels in the brain causing you to feel lethargic and sleepy (tryptophan is what helps you go to sleep at night). You may yawn, feel like lying down, and even

have trouble keeping your eyes open. Merely finishing becomes a struggle. You probably can't train to prevent this type of fatigue. It may help to supplement your diet with branched chain amino acids before the exercise session begins if you typically experience these fatigue symptoms.

Hard-Easy Cycles

What is described above is short-term fatigue that happens during exercise. But there is also long-term fatigue the biological causes of which are not fully understood. It may be as simple as chronically low levels of glycogen or as complex as neuromuscular or hormonal shifts. This type of fatigue will accumulate over time if allowed to go unchecked. The way to avoid this is to follow the principle of hard-easy training cycles.

Hard training days—meaning high heart rate zones or long duration workouts in low heart rate zones—should be followed by easy days. Easy days are those with short workouts done in heart rate Zone 1 or days with no exercise. In the same way, a few weeks of hard training should be followed by some easy days. Several months of hard training are best concluded with a number of easy weeks.

In order to prevent overtraining you must always be aware of fatigue, its causes and appropriate action when you experience it.

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