OVERTRAINING

Constant intense training that does not provide adequate time for recovery.

Overtraining: Too Much of a Good Thing

With intense and prolonged training athletes can experience **overtraining**, **staleness**, or **burnout**. The overtrained condition reflects more than just a short-term inability t train as hard as usual or a slight dip in competition-level performance; rather, it involves a more chronic fatigue experienced during exercise workouts and subsequent recovery periods. Overtraining associates with sustained poor exercise performance, frequent infections (particularly of the upper respiratory tract), and a general malaise and loss of interest in high-level training. Injuries also are more frequent in the overtrained state. The specific symptom of overtraining are highly individualized, with those outlined in the accompanying table most common. Little is known about the cause of this syndrome, although neuroendocrine alterations that affect the sympathetic nervous system, as well as alterations in immune function, are probably involved. These symptoms persist unless the athlete rests, with complete recovery requiring weeks or even months.

CARBOHYDRATES' POSSIBLE ROLE IN OVERTRAINING

A gradual depletion of the body's carbohydrate reserves with repeated strenuous training exacerbate the overtraining syndrome. A pioneering study showed that after 3 successive days of running 16.1 km (10 miles), glycogen in the thigh muscle became nearly depleted. This occurred even though the runners' diets contained 40% to 60% of total calories as carbohydrates. In addition, glycogen use on the third day of the run averaged about 72% less than on day 1. The mechanism by which repeated occurrences of glycogen depletion may contribute to overtraining remains unclear.

TAPERING OFTEN HELPS

Overtraining symptoms may range from mild to severe. They more often occur in highly motivated individuals when a large increase in training occurs abruptly and when the overall training program does not include sufficient rest an recovery.

Overtraining symptoms often occur before season-ending competition. To achieve peak performance, athletes should reduce their training volume and increase their carbohydrate intake for at least several days before competition—a practice called **tapering**. The goal of tapering is to provide time for muscles to resynthesize glycogen to maximal levels and allow them to heal from training-induced damage.

OVERTRAINING SIGNS AND SYMPTOMS

Performance-Related Symptoms
1. Consistent performance decline
2. Persistent fatigue and sluggishness
3. Excessive recovery required after competitive events
4. Inconsistent performance

Physiologic-Related Symptoms
1. Decrease in maximum work capacity
2. Frequent headaches or stomach aches
3. Insomnia
4. Persistent low-grade stiffness and muscle or joint soreness
5. Frequent constipation or diarrhea
6. Unexplained loss of appetite and body mass
7. Amenorrhea
8. Elevated resting heart rate on waking

Psychologic-Related Symptoms
1. Depression
2. General apathy
3. Decreased self-esteem
4. Mood changes
5. Difficulty concentratin
6. Loss of competitive drive

Kreher JB, Schwartz JB. Overtraining syndrome: a practical guide. *Sports Health*. 2012;4(2):128-138. Doi:10.1177/1941738111434406

Bell L, Ruddock A, Maden-Wilkinson T, Rogerson D. Overreaching and overtraining in strength sports and resistance training: A scoping review. J Sports Sci. 2020 Aug;38(16):1897-1912. Doi: 10.1080/02640414.2020.1763077. Epub 2020 Jun 30. PMID: 32602418.

Grandou C, Wallace L, Impellizzeri FM, Allen NG, Coutts AJ. Overtraining in Resistance Exercise: An Exploratory Systematic Review and Methodological Appraisal of the Literature. Sports Med. 2020 Apr;50(4):815-828. Doi: 10.1007/s40279-019-01242-2. PMID: 31820373.

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What causes overtraining?

Overtraining occurs as a result of an upcoming competition.

The basis for overtraining may have more to do with emotional or psychological reasons than physical ones. Much like eating disorders, exercise addiction is now recognized as a legitimate problem. Exercising beyond the point of exhaustion, while injured, or to the exclusion of other aspects of one's life are some of the signs of exercise addiction.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3435910/table/table1-1941738111434406/?report=objectonly

Table 1.

Terminology from position statement on overtraining by European College of Sport Science.[30]

Term	Synonym	Definition	Performance Decrement	Outcome
Functional overreaching	Short-term overreaching	Increased training leading to a temporary performance decrement and with improved performance after rest	Days to weeks	Positive (super-compensation)
Nonfunctional overreaching	Long-term overreaching	Intense training leading to a longer performance decrement but with full recovery after rest; accompanied by increased psychologic and/or neuroendocrinologic symptoms	Weeks to months	Negative due to symptoms and loss of training time
Overtraining syndrome		Consistent with extreme nonfunctional overreaching but with (1) longer performance decrement (> 2 months), (2) more severe symptomatology and maladapted physiology (psychologic, neurologic, endocrinologic, immunologic systems), (3) and an additional stressor not explained by other disease	Months	Negative due to symptoms and possible end to athletic career

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Table 2.

Symptoms of overtraining syndrome.

Parasympathetic Alterations[a]	Sympathetic Alterations[b]	Other
Fatigue	Insomnia	Anorexia
Depression	Irritability	Weight loss
Bradycardia	Agitation	Lack of mental concentration
Loss of motivation	Tachycardia	Heavy, sore, stiff muscles
	Hypertension	Anxiety
	Restlessness	Awakening unrefreshed

[a]More common in aerobic sports.

[b]More common in anaerobic sports.

PATHOPHYSIOLOGY

Glycogen hypothesis

Decreased glycogen causes fatigue and decreased performance

Central fatigue hypothesis

Increased tryptophan uptake in the brain leads to increased 5-HT centrally and mood symptoms

Glutamine hypothesis

Decreased glutamine causes immune dysfunction and increased susceptibility to infection

Oxidative stress hypothesis

Excessive oxidative stress causes muscle damage and fatigue

Autonomic nervous system hypothesis

Parasympathetic predominance causes many symptoms of overtraining syndrome

Hypothalamic hypothesis

Dysregulation of the hypothalamus and hormonal axes cause many symptoms of overtraining syndrome

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Cytokine hypothesis

Inflammation and cytokine release causes most of the above effects and symptoms of overtraining syndrome

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