A practical approach to persistent fatigue in athletes

MATT CHAMBERLAIN MB BS, GradDip(Epi)
KYLIE SHAW MB ChB(Otago), MSPMed(Melb), FACSP

Fatigue in athletes is a common presentation in general practice. Persistent fatigue is suggestive of inadequate recovery but may also signal an underlying medical cause.

Fatigue in athletes is a common presentation in general practice. It may be physiological (which is associated with higher training loads) or pathological (which is longer lasting and may be multifactorial in origin).[1] The hallmark of physiological fatigue is reversal with brief cessation or reduction in training. In contrast, pathological fatigue is persistent and results in impaired performance.

This article discusses common causes of persistent fatigue in athletes and presents a practical approach to management.

MedicineToday 2014; 15(9): 57-59

Dr Chamberlain is a sports physician registrar at MP Sports Physicians, Frankston, Melbourne, Vic. Dr Shaw is a sports and exercise medicine physician practising at Canberra Orthopaedics and Sports Medicine, Calvary Clinic, Canberra, ACT.

TRAINING-RELATED CONTRIBUTING FACTORS

Persistent fatigue is suggestive of inadequate recovery after training. Some of the most common contributing factors are discussed below.

Overtraining syndrome

Overtraining syndrome (OTS) represents a maladaptive response to the overreaching component of a training cycle and is a common cause of fatigue in the athletic population. Overreaching, which is an essential component of a training cycle,[2] involves a planned progressive period of intense training resulting in transient fatigue, mood changes and performance decline that usually resolve within two weeks. With appropriate periods of rest, a compensatory increase in performance can be achieved, resulting in gains in fitness, strength and endurance.

Overtraining has been defined as an accumulation of training stress and/or nontraining stress that results in a long-term decrement in performance capacity, with restoration of performance capacity that may take several weeks to months.[3] The most common association is an imbalance between load and recovery, which leads to a prolonged maladaptive process.[2] The features shown most consistently to be associated with OTS are: performance decline (despite increased training), persistent fatigue, decreased

maximal heart rate, neuroendocrine changes (reduced urinary norepinephrine excretion) and high stress levels and sleep disturbance.[4] Other symptoms will often develop but these are not consistently present and not reliable indicators of OTS.

OTS should only be diagnosed in a tired athlete after an underlying organic disorder has been excluded, but it may coexist alongside other metabolic and psychological stressors. There is no definitive test for OTS, but a variety of biochemical and metabolic abnormalities have been reported, including decreased blood lactate at maximal heart rate, decreased maximal cortisol levels, and decreased testosterone:cortisol ratio.[2] Self-reported ratings of fatigue, stress levels and sleep disturbance, particularly after periods of rest, and an increase in perceived level of exertion for a given exercise load, may provide clinical clues that an athlete is on the decline towards OTS.

Treatment for OTS is supportive, with reduction or cessation of training and optimisation of diet and sleep. Psychology input is often required, and athletes typically take many weeks to months to recover.

Dietary inadequacy

Dietary inadequacy forms a significant subset of issues related to the fatigued athlete. Most elite athletes have access to a nutritionist, but athletes who participate at a subelite or recreational level may not have this and are often unable to balance their energy intake and expenditure. Evidence suggests that inadequate carbohydrate intake is associated with more rapid onset of overreaching symptoms.[5] There are guidelines for carbohydrate ingestion to minimise fatigue and optimise recovery in training, but in most circumstances the involvement of a dietician will provide the best approach to helping an athlete achieve this energy balance.[6]

Lack of dietary protein has also been cited as a cause of fatigue in the athletic population. However, the purported mechanism for this has yet to be established.

Sleep issues

Sleep is an essential tool for managing fatigue and optimising recovery. Lack of sleep has an impact on training performance, cognitive function, mood state and desire to exercise.[7] There are no guidelines recommending a certain amount of sleep that will prevent fatigue in athletes.

MEDICAL CONDITIONS

Persistent fatigue in an athlete may signal the presence of an underlying medical cause. The most common conditions are listed below.

Viral infections

It is well established that intense training has effects on the immune system, including suppression of innate (natural killer cell) and adaptive (T and B cell) immune function, leading to increased susceptibility to infection. There is some evidence that intense exercise is associated with a higher level of risk for upper respiratory tract infection (URTI), although not all research has supported this conclusion. A J-curve model has been proposed, in which regular moderate exercise decreases URTI risk below that of inactive individuals, with more intense exercise increasing the risk above that of the inactive population.[8] The thresholds at which exercise either increase or decrease URTI risk remain unknown. Viral illnesses such as influenza and Epstein–Barr virus and cytomegalovirus infections should be routinely considered in athletes, as they should be in the general population.

Iron depletion

Depletion of stored iron is a common cause of fatigue in endurance athletes. Early stages of iron deficiency reflecting storage depletion (reduced ferritin) result in tiredness and impaired performance. Serum ferritin levels of less than 30 μg/L in females and less than 50 μg/L in males are considered evidence of iron depletion. Levels below these thresholds should prompt dietary review, iron supplementation and investigation for genitourinary and gastrointestinal losses.

Low vitamin D level

There is substantial evidence for a role of vitamin D in muscle function and recovery and, to a lesser effect, immune function.[9] However, there is scant evidence for low vitamin D levels as an isolated cause of fatigue.

Chronic fatigue syndrome

Chronic fatigue syndrome (CFS) is most commonly seen in young people (aged 20 to 40 years), and it may be more common in athletes than in the general population.[10] CFS is defined as persistent or relapsing fatigue that lasts six months or more, with an associated substantial reduction in functional activity and/or four or more symptoms that persist for at least six months of the illness (including impairment in short-term memory, sore throat, tender lymph nodes, myalgias, multiple joint pains, headaches, unrefreshing sleep and postexertion malaise for more than 24 hours).[11] Crushing fatigue is characteristic symptom of CFS, particularly following exercise. In the athletic population, there is considerable overlap between CFS, overtraining syndrome and depressive disorders.[12]

Mental health issues

A significant amount of evidence exists to suggest that moderate physical activity is protective against the onset of depression. However, there is concern that among athletes who compete at elite levels depressive disorders may be more common, although this remains poorly documented. In a study of swimmers, increased training loads were found to increase depressive

symptoms, which then decreased as the training load dropped off.[13] Intercurrent injury is an established risk factor for depression in athletes.[14]

ASSESSMENT

History

It is important to establish the degree of fatigue and possible contributors in an athlete who presents with fatigue. A careful clinical history should determine the duration and severity of symptoms, and whether the fatigue is constant or intermittent (related to training only). The profound fatigue of CFS is characteristic.

A training history will provide useful information; the athlete may have a training diary to review. Details to be noted include any recent increases in frequency, volume and intensity of training. The structure of training and periodisation of schedule (e.g. precompetition phase) is also relevant. Information should be sought about sleep (duration, quality, whether waking up feeling refreshed), diet (carbohydrate, protein and iron intake, hydration, eating disorders) and medication usage.

It is helpful to enquire about viral symptoms, including a history of sore throat, cough or exposure to infectious mononucleosis, as well as recurrent illness and overseas travel. Other medical symptoms should be noted, as disease within most body systems will have fatigue as an element. In female athletes it is necessary to enquire about menstrual history, menorrhagia and amenorrhoea (associated with energy insufficiency or pregnancy).

The patient's psychological health should also be reviewed. Anxiety related to competition and high expectations (by self and coach) is common among athletes. Other common stressors for athletes include their home/living situation, demands of concurrent study, financial pressures and alcohol/drug use.

Examination

A thorough physical examination should be considered, with particular attention paid to signs of chronic disease, infection, malnutrition or eating disorders.

Investigations

The selection of tests that may assist further in the investigation of an underlying cause will be dependent on the findings of the medical history and examination. Baseline blood tests might include: full blood examination; measurements of electrolytes/urea/creatinine, erythrocyte sedimentation rate, C-reactive protein, glucose, iron/ferritin, vitamin D, vitamin B_{12}, folate and thyroid function; and pregnancy test. At presentation, blood tests may be of limited value in management.[15] Nonetheless, athletes who present within seven days of the onset of fatigue (and their coaches) have been shown to have high expectations of screening blood tests.[16]

EARLY MANAGEMENT

Self-monitoring of symptoms is useful for athletes who present with a complaint of fatigue and will guide early management. Patients can use a diary to record their symptoms relative to training, nutritional intake (with particular attention to carbohydrate and protein intake relative to training) and sleep. Athletes are likely to know what their normal resting heart rate is when well. Resting heart rate, taken prior to getting out of bed in the morning, can be used as an objective measure in cases of persistent fatigue. This is often elevated when the athlete is fatigued, and will normalise on recovery.

Complete rest should be advised for an athlete whose resting heart rate is elevated by more than 40% above their normal resting heart rate. In other cases, relative rest from training can be advised, reducing volume of training by 10 to 50%, implementing rest days, or cross-training with low intensity. Liaising with the coach can help to improve compliance.

Referral to specialists (e.g. dietician, psychologist) should be considered as appropriate. Practices that improve perceived exertion (e.g. massage) and increasing time spent in other enjoyable activities (outside of sport) may be encouraged.

RETURN TO SPORT

Advice regarding when an athlete should to return to sport will depend on many factors, including normalisation of self-reported stress, fatigue and sleep disturbance and resting heart rate. Patients may need specific advice for preventing recurrence, such as:

- correcting any contributing factors, including dietary inadequacies, training factors and psychosocial stressors
- implementing periodised training, such as having one day of complete rest per week, monthly schedules with one week of lighter training, and adequate tapering time prior to competition.

In addition, athlete and coaches may require information regarding continuing self-monitoring to prevent recurrence of contributing factors, such as excessive training, inadequate nutrition and inadequate sleep.

FINAL COMMENTS

Most cases of fatigue in athletes can be resolved within weeks by addressing training loads and dietary intake and by implementing recovery measures. Overtraining syndrome and medical conditions may be underlying persistent fatigue that does not respond to these measures. MT

REFERENCES

A list of references is included in the website version (www.medicinetoday.com.au) and the iPad app version of this article.

COMPETING INTERESTS: None.

A practical approach to persistent fatigue in athletes

MATT CHAMBERLAIN MB BS, GradDip(Epi); **KYLIE SHAW** MB ChB(Otago), MSPMed (Melb), FACSP

REFERENCES

1. Derman W, Schwellnus MP, Lambert MI, et al. The 'worn-out athlete': a clinical approach to chronic fatigue in athletes. J Sports Sci 1997; 15: 341-351.
2. Meeusen R, Duclos M, Foster C, et al; American College of Sports Medicine. Prevention, diagnosis, and treatment of the overtraining syndrome: joint consensus statement of the European College of Sport Science and the American College of Sports Medicine. Med Sci Sports Exerc 2013; 45: 186-205.
3. Kreider R, Fry AC, O'Toole M. Overtraining in sport: terms, definitions, and prevalence. In: Kreider R, Fry AC, O'Toole M, eds. Overtraining in sport. Champaign (IL): Human Kinetics; 1998.
4. Mackinnon L, Hooper S, Jones S, et al. Hormonal, immunological, and haematological responses to intensified training in elite swimmers. Med Sci Sports Exerc 1997; 29: 1637-1645.
5. Achten J, Halson SL, Moseley L, et al. Higher dietary carbohydrate content during intensified running training results in better maintenance of performance and mood state. J Appl Physiol 2004; 96: 1331-1340.
6. Burke LM, Loucks AB, Broad N. Energy and carbohydrate for training and recovery. J Sports Sci 2006; 24: 675-685.
7. Horne JA, Pettitt AN. Sleep deprivation and the physiological response to exercise under steady-state conditions in untrained subjects. Sleep 1984; 7: 168-179.
8. Nieman DC. Is infection risk linked to exercise workload? Med Sci Sports Exerc 2000; 32(7 Suppl): S406-S411.
9. Shuler FD, Wingate MK, Moore GH, et al. Sports health benefits of vitamin D. Sports Health 2012; 4: 496-501.
10. Parker S, Brukner P. Is your sportsperson suffering from chronic fatigue syndrome? Sports Health 1994; 12: 15-17.
11. Fukuda K, Straus SE, Hickie I, Sharpe MC, Dobbins JG, Komaroff A. The chronic fatigue syndrome: a comprehensive approach to its definition and study. International Chronic Fatigue Syndrome Study Group. Ann Intern Med 1994; 121: 953-959.
12. Shephard RJ. Chronic fatigue syndrome: an update. Sports Med 2001; 31: 167-194.
13. Morgan WP, Brown DR, Raglin JS, O'Connor PJ, Ellickson KA. Psychological monitoring of overtraining and staleness. Br J Sports Med 1987; 21: 107-114.
14. Yang J, Peek-Asa C, Corlette JD, et al. Prevalence of and risk factors associated with symptoms of depression in competitive collegiate student athletes. Clin J Sport Med 2007; 17: 481-487.
15. Fallon KE. Clinical utility of blood tests in elite athletes with short term fatigue. Br J Sports Med 2006; 40: 541-544.
16. Fallon KE. Blood tests in tired elite athletes: expectations of athletes, coaches and sport science/sports medicine staff. Br J Sports Med 2007; 41: 41-44.