

Angela Calder

# Recovery and Regeneration

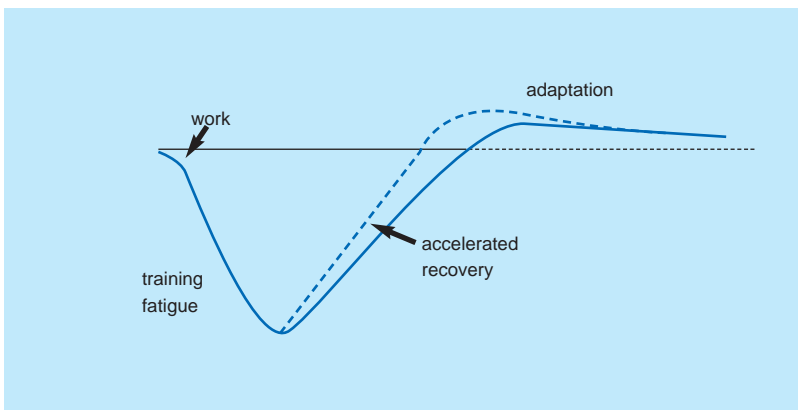
**“Recovery is what you do between training sessions and races so that you can train hard and perform well at the next session.”**

Cross country skier

actionplus

The main role of recovery is to help athletes adapt faster to training by reducing any performance fatigue that they experience, so they can bounce back and be ready for the next session or event. This process is a critical step in the overcompensation model.

*The astute coach will design programmes specifically to expose the athlete to many varieties of fatigue in order to extend the athlete's capabilities to perform.*



**Figure 1: Overcompensation model: the principle of recovery**

Unfortunately, the recovery component of the overcompensation model is often neglected when athletes and coaches focus more on training loads and work. In such instances, the recovery or adaptation phase is left to chance rather than undertaken as part of the training programme. However, both work and recovery are very important stages of the adaptive process. Without the appropriate training stimuli there would be no improvement in performance and no resulting fatigue. To maximise the potential for athletes to learn, adapt, and improve, it is important for them to start any training session or event in a non-fatigued state.

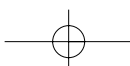
## Challenges for Coaches and Athletes

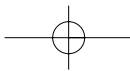
Starting a training session in a fresh state becomes increasingly difficult when athletes are required to train more than once a day, often over several days, and at the same time juggle their education or career and their personal lives. If all these factors are not balanced then athletes are more at risk of problems associated with overtraining, overuse and burnout. One of the ancillary benefits from the use of recovery strategies is to reduce the risk and incidence of these non-adaptive responses to fatigue and stress. To perform well and to perform consistently over the long haul without these problems occurring is a measure of a well-developed training programme.

## Recognising Fatigue

Prescribing training loads is a complex matter and coaches and athletes spend considerable time developing appropriate programmes to suit both the developmental stage and performance level of an athlete. However, identifying the ensuing fatigue from different types of training and stress tends to get much less attention and may even be overlooked by either or both the coach and athlete. A good coach understands not only what is being stimulated but also what is being fatigued.

There are several categories of training and competition fatigue for coaches and athletes to consider (Table 1 overleaf). If the coach can recognise the main causes of fatigue and the corresponding expressions of these in the athlete, then very specific recovery and regeneration strategies can be selected to deal with this fatigue.





### Sleep for Recovery and Regeneration

Passive rest, particularly the role of sleep as a regenerative strategy, is often misunderstood by coaches and athletes. A good night's sleep of seven to nine hours for adults and eight to ten hours for children, is probably the most important recovery mode. Too much or too little sleep, or long periods of sleep during the day, can restrict the athlete's ability to adapt to training.

*Sleep is the most undervalued and mismanaged regenerative strategy.*

During the deep stages of sleep, reparative hormones such as the human growth hormone, help regenerate stressed muscles and connective tissue (tendons, ligaments, and fascia). The immune system is also boosted by the hormone melatonin during the middle of the night, but too much of this hormone through oversleeping can make the athlete feel sluggish and even depressed. The lighter stages of sleep help to reinforce the neural pathways that have been stimulated during training. Dreaming states occur throughout the night and these help athletes to sort through emotional and social issues that they have experienced so they feel less stressed in the morning.

Disruptions to good quality sleep through illness, mismanagement of sleeping times, or excessive alcohol consumption can interfere with the athlete's ability to cope with training and lifestyle stresses. Coaches should educate athletes and parents of athletes about the role and benefits of a good night's sleep.

*Other forms of passive rest involve techniques that help the mind to switch off from all surrounding stimuli. Meditation, reading, or listening to relaxing music are examples of other strategies.*

### Selecting Recovery Strategies

The amount of recovery an athlete needs will depend on how well they are adapting to training and life stresses. Consequently, a regular monitoring system, such

as a training diary, and regular coach and athlete evaluation meetings should be established before the beginning of the training year. If the athlete is struggling to cope with training, extra recovery strategies may be needed, but if the athlete is adapting well then the basic strategies outlined in Table 2 on page 15 should suffice. A proactive approach to evaluating the training and adaptation responses of the athlete can promote maximum development and minimise the chances of under performance, illness and injury.

### Post-training Recovery

Ideally, athletes should use simple manageable recovery routines after every training session and post-competition based on the availability of facilities and services. These can range from situations where the athlete or coach provides everything, to situations with optimal facilities, such as access to a physiotherapist, massage therapist, spa or swimming pool.

*Educating athletes to hydrate before, during, and after training and competition, is extremely important. Often water is not sufficient and drinks containing carbohydrate, electrolytes, and protein are more beneficial.*

### Post-competition Recovery Strategies

The guidelines for post-competition recovery are identical to the post-training strategies with the addition of more psychological recovery strategies. A short post-event debriefing after a game or race followed by some unwinding activities such as music, visualisation, a movie, relaxing massage, or other relaxation techniques is important. The ability to recover psychologically post-event is particularly important during tournament situations, especially if these last several days.

If there is access to a pool then 10–15 minutes of light movements focusing on putting the major joints through a normal range of movement, is an excellent form of active recovery. Similarly, if there is access to a spa and plunge pool a routine of three to four minutes in the spa and 30–60 seconds in the cold plunge, repeated three times, is an excellent way to recover high lactate levels and to unwind psychologically. Please note: temperatures for cold pools or baths do not need to exceed 10°C to have a positive effect for metabolic recovery.

### Recovery Strategies on the Road

Thorough reconnaissance before travelling can minimise problems associated with travel fatigue, and locating appropriate services and facilities. The first priority to cover is the

nutritional requirements of the athlete. The amount, type, and availability of foodstuffs need to be identified before the journey commences. Pre-planning will enable the coach and athlete to identify what needs to be brought to the competition venue for consumption during and after competition. The availability of facilities such as showers, pools, spas, ice-making machines, physiotherapists or massage therapists can be identified in advance. More often than not, most of these services and facilities are less accessible so athletes must rely more heavily on their own resources.

The simple recovery routines developed in training can also be replicated on the road and should follow the same protocols:

- 1 Recover metabolic fatigue by re-hydrating and refuelling as soon as possible.
- 2 Recover neural fatigue by using some form of hydrotherapy, such as a shower, or pool, spa, sea, stream, or lake, and do some light active and static stretching, some self massage.
- 3 Recover psychological fatigue by unwinding with music, visualisation, a book, or movie.

### Summary

Every training session is important. It is an opportunity for athletes to maximise their sporting potential if they start training or competition sessions in a fatigue-free state. Recovery strategies are aimed at helping athletes reduce residual training fatigue and stress. Coaches can help this process by educating athletes about recovery strategies and teach them how to plan and manage these for themselves.

**Work Hard + Recover Well = Best Performance**



actionplus

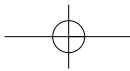
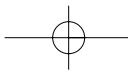


Table 1: Training and competition fatigue

Type of Fatigue	Characteristics and Recovery		
<b>Metabolic Fatigue (energy stores)</b>	<p><b>Main causes:</b></p> <ul style="list-style-type: none"> <li>• Training lasting one hour or more</li> <li>• Taking part in several, even shorter, sessions a day</li> <li>• It can be cumulative when training or performing over a number of days.</li> </ul>	<p><b>Expression of this type of fatigue:</b></p> <ul style="list-style-type: none"> <li>• Athlete fatigues sooner than is normal for him</li> <li>• Athlete struggles to complete a session or event.</li> </ul>	<p><b>Recovery strategies:</b></p> <ul style="list-style-type: none"> <li>• Rehydrate and refuel before, during and after training</li> <li>• Use contrast temperature showers, or pool, or spa and cold plunge, or active recovery activities</li> <li>• Eat a meal within one to two hours of training and monitor hydration.</li> </ul>
<b>Neurological (nervous system) and Peripheral Nervous System (muscles)</b>	<p><b>Main causes:</b></p> <ul style="list-style-type: none"> <li>• After short high intensity sessions, eg weight training, plyometrics, complex skill execution</li> <li>• After long but low intensity sessions especially involving repetitive movements, eg steady state swimming, running, cycling, paddling, rowing.</li> </ul>	<p><b>Expression of this type of fatigue:</b></p> <ul style="list-style-type: none"> <li>• Reduced localised force production, eg slow feet, reduced acceleration, poor technique.</li> </ul>	<p><b>Recovery strategies:</b></p> <ul style="list-style-type: none"> <li>• Rehydrate and refuel (including small amounts of protein as well as carbohydrates) before, during and after training</li> <li>• Within 5–15 minutes after training use a spa or shower with jets focused on the large and fatigued muscle groups</li> <li>• After training or later in the day massage large muscle groups using jostling/shaking techniques.</li> </ul>
<b>Neurological (nervous system) and Central Nervous System (brain)</b>	<p><b>Main causes:</b></p> <ul style="list-style-type: none"> <li>• Low blood glucose levels</li> <li>• High pressured training session – especially involving rapid decision-making and reactions</li> <li>• Poor motivation, eg monotony of training, emotional factors, injury.</li> </ul>	<p><b>Expression of this type of fatigue:</b></p> <ul style="list-style-type: none"> <li>• Lack of drive</li> <li>• Lack of motivation.</li> </ul>	<p><b>Recovery strategies:</b></p> <ul style="list-style-type: none"> <li>• Steady and regular intake of carbohydrates during and after training to maintain normal blood glucose levels</li> <li>• After training – <i>unwind</i>, eg listening to music, visualisation on the way home</li> <li>• Rest.</li> </ul>
<b>Psychological (emotional, cultural, and social)</b>	<p><b>Main causes:</b></p> <ul style="list-style-type: none"> <li>• Lack of team or squad cohesion, personality conflicts</li> <li>• Competition pressures, eg event venue and residential conditions, parents, coach, media, national sporting body</li> <li>• Other lifestyle stresses, eg home, school exams, personal relationships.</li> </ul>	<p><b>Expression of this type of stress:</b></p> <ul style="list-style-type: none"> <li>• Athlete loses self confidence or self esteem</li> <li>• Poor interaction and deteriorating communication with other athletes and staff</li> <li>• Athlete's body language, increased signs of anxiety, negative attitudes</li> <li>• Poor sleep patterns.</li> </ul>	<p><b>Recovery strategies:</b></p> <ul style="list-style-type: none"> <li>• Focus on process rather than outcome indicators</li> <li>• Debrief by identifying one to three things that worked well in training, and one to three that need more work</li> <li>• Take mind off training with an escapist or funny movie, TV, book, or socialise with family and friends</li> <li>• 10–15 minutes before bed – <i>switch-off</i> from the day by using relaxation techniques.</li> </ul>
<b>Environment and Travel Fatigue</b>	<p><b>Main causes:</b></p> <ul style="list-style-type: none"> <li>• Disruption of normal routines, especially the biological clock</li> <li>• Disrupted sleeping, waking, and meal times</li> <li>• Sedentary and limited body positions on long journeys, ie of 30 minutes or more</li> <li>• Adapting to different climatic conditions to those normally experienced.</li> </ul>	<p><b>Expression of this type of fatigue:</b></p> <ul style="list-style-type: none"> <li>• Athletes take longer to warm up, are slower to start</li> <li>• Unforced errors in the first 15 minutes are well above normal rates</li> <li>• Athletes fatigue sooner than normal.</li> </ul>	<p><b>Recovery strategies:</b></p> <ul style="list-style-type: none"> <li>• Preparation planning will minimise fatigue</li> <li>• Stay hydrated and refuelled</li> <li>• Stay cool in the heat, eg use a pool, shade, iced towels</li> <li>• Minimise visual fatigue by wearing sunglasses outside and limiting time on computers.</li> </ul>





**Table 2: Post-training recovery**

<p><b>Immediately after Training</b></p>	<ul style="list-style-type: none"> <li>• Start restoring fluid and energy levels immediately after training</li> <li>• Within the first five minutes post-exercise consume 600ml to 1 litre of sports drink or cordial, and eat some sandwiches, muffins or fruit</li> <li>• Stretch lightly, using both active and short held static stretches (10 seconds maximum) while the muscles are warm</li> <li>• Walk or move lightly to prevent venous pooling and assist with any lactate recovery</li> <li>• Check for sweat loss by comparing weight loss pre- and post-exercise</li> <li>• Listen to some relaxing or unwinding music on your way home.</li> </ul>
<p><b>When you get Home after Training</b></p>	<ul style="list-style-type: none"> <li>• Continue to rehydrate and refuel</li> <li>• Shower as soon as possible</li> <li>• Continue to do some light static stretches in the warm shower</li> <li>• Light self-massage strokes on chest and upper body in the shower</li> <li>• Alternate between hot (30 seconds) and cold (30 seconds) water in the shower, repeating three to five times</li> <li>• Within 60 minutes of training have a well balanced meal including carbohydrates and protein and continue hydrating</li> <li>• Use a relaxation technique or music to unwind.</li> </ul>
<p><b>Unwind in the Evening</b></p>	<ul style="list-style-type: none"> <li>• Shower, spa or bath to relax muscles</li> <li>• Relax in the evening, eg listen to music, TV, switch-off from the day's activities</li> <li>• Best time to do long held static stretches and PNF</li> <li>• Self massage, especially legs, feet and hips.</li> </ul>
<p><b>Prepare for Sleep</b></p>	<ul style="list-style-type: none"> <li>• 5–10 minutes before bed switch-off from the day</li> <li>• Use relaxation skills such as visualisation, breathing exercises or music</li> <li>• Get out of bed if you can't sleep – don't lie awake worrying.</li> </ul>
<p><b>Next Morning Evaluation</b></p>	<ul style="list-style-type: none"> <li>• Next morning monitor your response to training</li> <li>• Check your resting heart rate</li> <li>• Check your body weight to monitor your hydration</li> <li>• Record how you feel – refreshed, or still tired, quality of sleep</li> <li>• Plan your training to suit your response to yesterday's session.</li> </ul>



## Further Reading

[www.ask.net.au](http://www.ask.net.au)

Free coach and athlete resources and information on recovery and regeneration

[www.ais.org.au/nutrition](http://www.ais.org.au/nutrition)

Free information on sport-specific post-game nutrition and impartial evidence-based information on nutritional supplements.

## Biography

**Angela Calder** is a lecturer in Coaching Science at the University of Canberra, Australia. Prior to this, Angela worked at the Australian Institute of Sport as Recovery and High Performance Consultant, Sport Science Editor and Coach Educator. Angela's publications, lectures, research and education about recovery training are disseminated widely throughout Australia and overseas, and she has been consulted extensively by over 50 professional and non-professional sports worldwide.

