

coach to coach

Principles of Overload and Recovery

While strain is a natural part of training and competing, pain is a different story altogether. SARAH MORANTE reports on how you can help your students avoid overload and aid recovery.

it **N**o pain, no gain". Everyone has an opinion - some live by it, others hate it. As with most things, moderation is the key. A certain amount of strain is essential for any improvements in physical condition, but pain is an indicator that something is not quite right.

As coaches, we try to instill a strong work ethic in our students - teaching them that results come from countless hours of hard work. However, higher training loads don't automatically result in better performance. The art of coaching is to achieve a balance between the amount of overload and recovery within the training program. Most coaches are aware of the importance in progressively overloading a player in order to produce adaptations and improvement. However, it is often mistaken that physical improvements are achieved during the actual training. In fact it is the down time, when players are relaxing away from the tennis court and gym, that the physiological improvements are taking place. It is therefore, very important that coaches, players and parents be aware of the principles of overload and recovery, and their integral role in any training program.

General adaptation syndrome

The General Adaptation Syndrome (GAS) describes the generalized response of the body to any type of stress, and is illustrated below. Regardless of factors such as fitness, age and type of training, everyone responds to exercise according to this pattern.

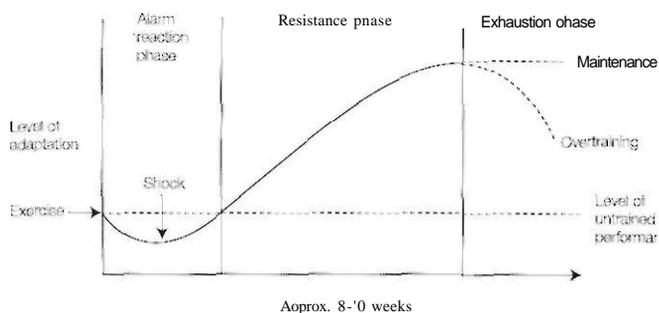


Figure 1. Response to an overloading training stimulus (general adaptation syndrome).

When the body experiences a stress (E.g. exercise) that is beyond the level at which it is accustomed, the person experiences fatigue and soreness (alarm reaction phase). The body then begins to adapt and remodel itself in order for that workload to no longer elicit such a strain (resistance phase). This is the reason a given workout becomes easier over time and why it is important to program progressive overload and variety in a training program. When the time arrives for the next overload to be applied, the coach must finely balance the increase in workload with the physiological capabilities of the player. If the workload is increased too early or too fast, the player will become

exhausted (overtraining). However, if the workload is increased too late or too little, the player will not continue to improve and will plateau in performance (maintenance). Coaches should plan to apply progressive overload at the end of the resistance phase to prevent a plateau in performance, yet avoid applying excessive overload that will result in exhaustion.

Principles of overload and recovery

The principles of overload and recovery in sports training are integral to the improvements that occur within a player over time. The principle of overload refers to the need for the training load (duration, intensity and frequency of training) to exceed the current capacity of the individual. In other words, the person must be pushed beyond their current level in order for improvements to take place. Once the training session is finished, a period of recovery must then become the focus. This is the time when the body adapts to the stress and improves beyond current levels.

A fine balance between overload and recovery is essential to this performance enhancement and avoidance of overtraining. When the amount of overload exceeds the amount of recovery, exhaustion occurs and there is no adaptation. This results in a deterioration in performance as the body protects itself against any stress that is potentially hazardous. Interestingly, a training load that is too hard in fact produces less adaptation than one that is too easy. This highlights the importance for coaches, players and parents not to push players too hard, too early, and to be aware of the symptoms of overtraining which may include an elevated resting heart rate, persistent muscle soreness and fatigue, impaired immune system - frequent colds, increased risk of injury, depressed mood etc.

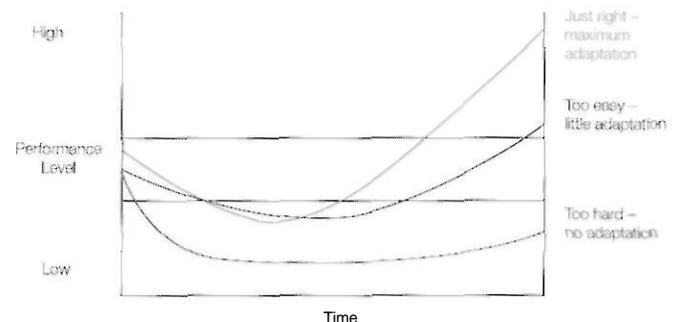


Figure 2. Performance outcomes of three different training programs.

Application for coaches

The first step for coaches in producing an optimal training load for maximum adaptation is to develop a periodised training plan. This enables times of high workload to be balanced with rest and recovery. It is also important to understand the starting condition of the player in order to determine initial training



loads. Once this is established, the training load can be gradually increased (progressive overload) by no more than 10% each week to prevent over-stressing the body. Alternatively, coaches can program for plenty of variety in the training program so that the body is continually forced to make adaptations, whilst the actual training load remains tolerable.

Coaches must also be conscious of planning 24 - 48 hours of recovery between hard training sessions, which enables the adaptation process to occur and prevents reaching a stage of exhaustion. Coaches should be mindful of the specific fitness components essential for competitive tennis and train only these areas. This increases the efficiency or quality of training, which enables the overall quantity of training to be reduced without compromising effectiveness.

Another important consideration is that everyone has a fitness threshold or peak level with any further training failing to produce improvements. This is known as the stage of diminishing returns where any attempts to further improve performance result in overtraining.

Finally, it is essential that coaches, players and parents be aware of other physical and mental stresses affecting the player. Factors such as poor nutrition, lack of sleep or emotional stress can magnify the overtraining symptoms produced by the training load. Therefore, players who are experiencing any other stresses cannot tolerate the same physical training loads and players who are achieving adequate recovery. The nature of tennis where hundreds of quick sprints, jumps and stops occur within a match mean the eccentric component of tennis is much greater than continuous, steady-state intensity sports such as running or swimming. Eccentric muscle contractions are the cause of the muscle soreness and fatigue that occurs after exercise, therefore a perfect balance between work and recovery of particular importance to tennis coaches.

Recovery strategies

Aside from ensuring work to rest ratios are balanced to elicit optimal improvement yet avoid overtraining, coaches can employ various other strategies to assist recovery. When recovery is more effective, higher training loads can be tolerated.

- **Diet.** Ensure players consume adequate carbohydrate (approx. 60% total energy intake or 400-600g per day) to maintain energy levels. Sufficient protein (approx. 0.8g per kg of body mass per day) is also required to facilitate the growth and repair of active muscles. Foods rich in antioxidants (E.g. fruits and vegetables) are important in scavenging free radicals produced by exercise that can cause tissue damage. Maintaining adequate hydration is also essential with players aiming to consume 1.5 litres of water each day with losses caused by exercise being replenished.
- **Relaxation techniques.** Deep breathing, meditation and yoga can assist in reducing emotional stresses that can impede physical performance. Alternatively, any enjoyable non-exercise activity such as listening to or playing music, reading etc. can provide effective relaxation and enhance recovery.
- **Massage, physio, spas and saunas.** Each of these methods can be used to assist physical recovery of sore, tired muscles and tendons. If the length and elasticity of muscles and tendons is maintained, recovery and performance will be maximized.

M Active recovery and cool-down. Low intensity, non-impact activities such as cycling and swimming are effective in



reducing post-exercise muscle soreness by working muscles through their range of motion and speeding the clearance of lactate. A 15-20 minute cool-down using light intensity exercise and stretching is also beneficial to recovery.

- **Sleep.** Most people need an average of 8 hours sleep per night, however athletes with high workloads often require more. The most restoration and recovery occurs during sleep so it is essential that it is not limited for the sake of additional training.

Coaches armed with this information need to inform their highly motivated players and those pushing parents that it is training quality rather than quantity that equals improvement. And furthermore, it is the balance between work and recovery that determines whether a player continues to improve, reaches a plateau or suffers from the damaging effects of overtraining. Whilst a handle must be kept on training loads, the balance largely comes down to recovery. If recovery is poor, the training load will not be tolerated and performance will suffer. However, if recovery is successful, significantly higher training loads can be managed and performance will be maximized.

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