Over the past 15 years, the notion of recovery has received considerable attention from researchers, coaches, athletes and practitioners. But what, in fact, is recovery? As defined by Kellmann and Kallus, recovery is considered as “an inter-individual and intra-individual multi-level (e.g. psychological, physiological, social) process in time for the re-establishment of performance abilities”. With this in mind, it is clear that recovery is a multidisciplinary phenomenon that demands attention from practitioners from every discipline to contribute positively to an athlete’s successful management of stress and recovery states towards optimising positive adaptations to training and ultimately enhanced performances.

It is widely acknowledged that optimal performances result when extended periods of intense training or competition frequency are followed by sufficient opportunity for rest and restoration thus allowing the individual to react effectively and cope successfully with the general and sport-specific stress associated with training and competitive performances. As the pressure and demands of elite training and performance environments continue to rise, the pursuit of recovery activities by elite performers must also increase in order to ensure achievement and/or maintenance of a necessary homeostatic balance to ensure training adaptations and performance optimisation.

Important to the prevention of overtraining (through the optimisation of recovery) is the notion that increased levels of recovery must compliment increasing levels of stress in order to keep the stress-recovery states in balance. As stress levels increase, athletes may be unable to engage in a sufficient level of recovery. If left untreated, this can lead to periods of both overreaching and possible overtraining.

In addition, the accumulation of stress in athletes must be considered across both the sport and non-sport environment, as many athletes struggle to balance the various demands associated with their careers and other tertiary activities. Given this, the assessment and management of stress and recovery states in athletes requires a holistic approach, acknowledging both the athletic and ‘sport-specific’ stress and recovery states, as well as aspects of stress and recovery that encompass an athlete’s various other roles and habits they engage in away from the field of play. In many cases, poor recovery can be linked to stress caused by an athlete’s university demands, part-time work or marketing and media responsibilities or from relationship
difficulties with their spouse and/or partner or from family.

MONITORING STRESS AND RECOVERY

Many have argued for the importance of continual stress and recovery monitoring in detecting early signs of overtraining in order to make small but important adjustments to the training stimulus and/or recovery activities in order to prevent underperformance in athletes. Rushall noted the importance of measuring the various symptoms associated with stress to allow coaches to adjust training demands. In support of this approach, the Daily Analyses of Life Demands for Athletes (DALDA) was developed to assist coaches and athletes with the detection of early signs of excessive stress in order to achieve appropriate training and recovery balance throughout the athlete’s season.

The subjective self-reporting of psychological factors is well-established as an important indicator of the potential onset of excessive stress in the body. While both physiological and psychological markers can provide the most effective means to monitoring stress and recovery, it is not always feasible to collect important biochemical and/or physiological parameters on a regular basis. In a recent study by Brink and his colleagues, it was reported that infection risk among elite youth soccer players was increased when a player reported experiencing lack of sleep or severe psychosocial stress. The use of simple, valid questions and inventories can offer a practical and feasible method of monitoring an athlete’s stress and recovery states over time, thus ensuring a proactive intervention strategy is considered and implemented.

When embarking on the implementation of a stress and recovery monitoring programme, a period of baseline measure should be implemented to allow for effective intra-individual comparison, in order to see how an athlete’s stress and recovery states appear during periods of rest or phases of training where volumes and intensities of training or competitive demands are within a moderate range. Additionally, there are many individual differences regarding one’s typical appraisal of general stress and these must be taken into account when determining the relative value and reporting of one’s stress with regard to the specific areas that are of concern at a particular point in time.

While there are several reported strategies and approaches pertaining to stress and recovery monitoring, the following parameters have been included within many of the questionnaires that are used by athletes (and coaches) for these purposes:

- Muscle soreness/pain.
- Self-regulation (adherence to usual recovery activities).
- Positive social recovery (connecting with spouse, family and/or friends).
- Sleep quantity and quality.
- Self-confidence (current level of expectation regarding the achievement of goals).
- Session perceived exertion.
- Degree of enjoyment with training and competitions.
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- Mood (in particular the degree of vigour and irritability).
- Training monotony (the level of boredom an athlete is experiencing with regards to training).
- Between-session recovery (how tired an athlete feels before the start of their next training session).

Coaches and athletes should be encouraged to compile a list of psychological factors that they feel are the best predictors of overtraining given the individual considerations of the athletes along with the specific and unique demands that relate to the nature of the sport in question.

**THE CASE FOR SLEEP**

While many important aspects of recovery have been discussed, sleep is of considerable importance to ensure that athletes can achieve the desired adaptations and continued performance ability over time. While there is clearly a need for further research examining the links between sleep and the post-exercise recovery, most elite athletes, coaches and sport scientists have identified sleep as an important aspect of the stress-recovery process. Given the strong relationship that exists between physiological recovery during sleep and an athlete’s ability to train at their maximum capacity, monitoring an athlete’s total sleep need (which is highly individual) is of critical importance in optimising post-exercise recovery and an athlete’s potential for overtraining.

Achieving extra sleep over an extended period of time has been demonstrated to improve athletic performance, alertness and mood. In addition to total sleep (sleep quantity), sleep quality (or the degree of non-restorative sleep) can be an important feature that can be a critical determinant of poor levels of recovery. Samuels describes sleep quality as sleep that is disturbed or fragmented as a result of recurrent arousal throughout the sleep period that can involve recurrent awakening. Very often athletes report experiencing periods of disturbed sleep and this can have a negative impact on the quality of recovery and possibly performance at training and competitions.

An important aspect of optimising sleep is to ensure that stress is not introduced, as this can create tension or disturb our waking-sleeping cycle. Certain behaviours and/or activities too close to bedtime (e.g. consumption of caffeine, sugar, arguments or negativity) can make it difficult to fall asleep.

Many athletes report ‘thinking too much’ either prior to or during early attempts to fall asleep. Worries, anxieties or thoughts of the past or the future can result in sleeplessness. The following strategies, if followed, can assist athletes in optimising both the quality and quantity of sleep:

1. Restrict the length of their daytime naps to just 20 minutes.
2. Encourage athletes to create an environment that will facilitate sleep. Their bedroom, whenever possible, should be dedicated to sleep alone. Advise them to eliminate light and noise that could disturb their sleep and to never read, watch TV or reflect about their training or performance issues in the bedroom (or when lying in their bed). In time, this will create an expectation in their body that the bedroom is where they go to relax and rest.
3. Encourage them to follow an end of day routine and to go to bed about the same time every night. This helps to create a routine that prepares both the body and mind for sleep. They should begin this process approximately 30 minutes before going to bed. They can choose to read a book for a few minutes and then sit quietly for a period of relaxation.

**POST-TRAINING AND COMPETITION DEBRIEFING**

We are all aware of the need to refuel and rehydrate properly after a match, as well as performing a proper cool-down (active recovery, ice baths etc.). It is also important that athletes have debriefed their performance effectively in order to learn as much as possible and then let go of any and all ‘performance thoughts’ until the next training opportunity has arrived. The following simple questions can be used as a guide to establishing effective post-performance debriefs. While many athletes simply think about these, it is recommended that these ‘performance conversations’ take place with important technical staff or that the answers are written in a notebook as a way of making a symbolic gesture that can promote acceptance and help process residual emotion that can be related to the previous performance.
1. What went well? What did you deliver on that were among your targets you established for the game? How did you contribute to the success of the team?
2. What needs improvement? What needs to be addressed in training or during your work-ons prior to the next game? Importantly, if you are not 100% sure, ask the coaches or your teammates.

Athletes must be encouraged to asking the tougher questions from time to time. Especially if they have had a couple of poor performances in a row (e.g. is it about how they are preparing for the game or rather their attitude or decisions away from the game that is affecting how they are performing at the present time)?

Regardless of the approach adapted, the critical component is that athletes are encouraged to debrief their performance before they leave the performance environment.

When an athlete arrives home, they should be encouraged to use a cue such as closing the car door or the door of the house as a 'trigger' that reminds them to 'let go' of the recent training or competitive performance and simply immerse themselves in being at home so that a sufficient period of rest and recovery can begin. The answers to a poor performance are most frequently found at training and from critical conversations with coaches and teammates and very seldom from overthinking at home or in conversations with spouses and/or family members.

CONCLUSION
There is little doubt that achieving the optimal stress and recovery states are of considerable importance for elite performers. Moreover, early detection and ongoing monitoring of an athlete’s stress and recovery states will assist in making the necessary adjustments and recommendations to ensure that adaptations to training are achieved while optimising performance consistency over time.

References