MONITORING TRAINING LOADS

– perspectives on injury risk

(Part 1)

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There are not too many obstacles that can get in the way of highly motivated athletes. Save for injury or illness, which if not managed appropriately, can quite easily derail a competitive season.

Indeed, getting to the start line healthy is a challenge faced by many. For those who pursue an intensive competition schedule, the challenges to maintain good health are often more pronounced and certainly warrant meticulous planning and monitoring.

This two-part series will highlight key points associated with reducing the risk of developing training and competition induced injury (part 1) and illness (part 2); with reference to recent consensus guidelines on training loads, facilitated by the International Olympic Committee (Soligard et al., 2016).

LOADING

The term 'load' is synonymous with describing the impact of external and internal stressors an athlete experiences during and between training and competitions. Loads include physiological, psychological and mechanical stressors, and affect multiple biological levels. In a perfect world, coaches and health care providers can work closely together in planning, monitoring and managing athlete loads - to ensure adaptation and resilience develop with minimal injury risk. When the balance between load and recovery is inadequate, abnormal responses begin to accumulate, which include prolonged periods of fatigue, and accelerate the risk of injury and illness. While the loading that impacts soft and hard tissue, immune system and the like are inherently recognised, the effects of non-sport stressor responses (eg. day-to-day life management issues) are perhaps not so obvious to many. The deleterious magnitude of such loading outcomes vary considerably between athletes and are largely determined by age, gender, level of support and sport-life experiences.

MONITORING

During the past decade or so, scientific resources for performance monitoring have evolved rapidly. That said, there is no one particular method or system that can comprehensively predict the likelihood of injury or illness risk. As a starting point, however, there are numerous plug-and-play cloud-based platforms (e.g. TrainingPeaks) that coaches and athletes can utilise to plan training and competition, and monitor fundamental metrics of load, including; distance, time, speed, acceleration, heart rate, power output and athlete subjective feedback. Monitoring these basic metrics over time (weeks, months, and years) will greatly assist the coach and athlete understand where the athletes' "sweet spot" is when considering the combined effects of wellness, consistency and performance.

A range of specific internal monitoring methods, in response to external loads, are routinely facilitated by sports scientists, medical specialists and psychologists.

ONLINE: Programs like TrainingPeaks are a good resource for monitoring your training load.

Effective psychological internal load monitoring methods:

- Interval rating of perceived exertion (RPE)
- Session rating of perceived effort (minutes x RPE)
- Profile of mood states (POMS)
- Recovery-stress questionnaire for athletes (REST-Q-Sport)
- Daily analysis of life demands for athletes (DALDA)
- Sports anxiety scale (SAS)
- Sleep (quality and duration)

Effective physiological internal load monitoring methods:

- Heart rate (HR)
- HR to RPE ratio
- HR recovery (HRR)
- HR variability (HRV)
- Blood lactate concentrations
- Blood lactate to RPE ratio
- Lab-based evaluations – VO2, energy expense, HR, lactate, RPE

A certain degree of within-athlete physiological variability is expected, in accordance with the environment, the phase of training and nutritional status (amongst others). However, an experienced practitioner can interpret trends and make sense of whether changes are justifiable for a given load period, or perhaps associated with training maladaptation.

Subjective metrics are usually more sensitive than objective measures in determining athlete responses to loading over time. Put simply, how an athlete feels, and how they communicate those feelings should take priority in the pecking order of monitoring methods.

OVERUSE INJURY: Exceeding your load bearing capacity through rapid changes in training will risk progressive microdamage to your body.

INJURY RISK

Professional sports, particularly team sports, have established injury surveillance systems that provide databases reflecting the type of injury, whether acute or accumulative (chronic) and the time period that athletes are affected.

Prevalence of injury in the sport of triathlon is not managed by a central surveillance database as such, although trends and tendencies have been periodically reported in a number of scientific publications. For example, a prospective study by Andresen and colleagues (2013) involving 174 ultra-endurance triathletes, identified the

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prevalence of overuse injuries at 56% - with the most common comprising the knee (25%), lower leg (23%) and lower back (23%). Acute injuries comprise of mostly less predictable contusions, including fractures and sprains; predominantly affecting the knee, shoulder/clavicle and sternum/ribs (Andersen et al., 2013). In another study by Zwingenberger and colleagues (2014), 212 non-professional triathletes were surveyed for a 12-month retrospective period, about training habits and occurrence of injuries, with 49 of these triathletes also participating in a 12-month prospective trial. The highest prevalence of injuries occurred during running (50%), followed by cycling (43%) and swimming (7%). This study also highlighted that the primary injury risk for non-professional triathletes was actually participating in a competitive event.

High absolute training and/or competition load has been regularly identified as a risk factor for injury in triathlon. Although interestingly, high absolute loads have not been linked with increased injury risk in non-triathlete runners (Soligard et al., 2016). Furthermore, high absolute loads may offer musculoskeletal protection from injury in both elite and non-elite athletes.

Each individual athlete has an innate musculoskeletal loadbearing capacity at any given time during their sporting life. Indeed, the same applies to all biological tissue, systems and processes. When the loadbearing capacity is exceeded via rapid changes in training and/or competition loads, and/or inadequate recovery – the risk of progressive microdamage then becomes difficult to defray. Subsequently, overuse injury risk will typically materialise; particularly bone stress and tendinopathy.

As a rule, an athlete is considered underprepared for managing injury risk if their acute load (training or competition) significantly exceeds their chronic load. An acute load period may represent one week compared to a chronic load of four weeks, or also one month compared to the consistency of the previous six months. For medium to long-term sustainability, athletes respond best to small (<10%) progressive increments, and decrements, in loading.

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CONSIDERATIONS AND TAKE HOME MESSAGES

Engaging sensitive metrics to monitoring short, medium and long-term training loads provides athletes and coaches with pragmatic direction and confidence in adaptability, sustainability and performance progress. Furthermore, early detection of training overload or maladaptation makes it possible for timely intervention; notably modified loads and/or treatments. Small progressive loading is the key to preventing chronic overuse injuries. However, triathletes also need to embrace and integrate strength training into their regular programs. Improvements in strength have far-reaching benefits to bone, tendons and muscles – significantly reducing the risk of developing chronic soft tissue injuries. Ideally, athletes are advised to undertake baseline physiological and psychological evaluations when they are free of injury and illness (not necessarily at the peak fitness), which provides a reference point and the opportunity to implement specific intervention guidelines from an experienced sports scientist or exercise physiologist, and psychologist - focussed on achieving "load balance", improving performance and reducing risk of injury and illness. AT

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