

Keeping abreast of developments in treating sport-related concussion is crucial says APA Sport Physiotherapist

**Aerin Di Leva**, who will discuss research into this changing landscape at Momentum 2017.



# Talk tackles concussion head on

Concussion assessment and management is a continually evolving science. Concussions are an inevitable injury in high-risk sports, and medical teams need to be prepared and well-equipped to effectively manage them. Not limited to the professional athlete, sport-related concussion is a significant concern and a common injury among amateur and emerging young athletes. Physiotherapists have the potential to be presented with concussive episodes either on the sidelines or within a clinic setting. As such, it is critical to obtain evidence-based training and education and increase our knowledge to keep up with the rapidly evolving landscape of sport-related concussion.

## Defining concussion

The most recent international consensus statement defines sport-related concussion as a traumatic brain injury induced by biomechanical forces. The deformation that occurs because of these forces is thought to create both stretching and sheering to the white matter of the brain, which results in an ion imbalance and a severe biochemical energy deficit. The neurometabolic cascade of concussion was originally described by Giza and Hovda in 2001, and again in 2014, defined as two clear stages of initial excitation followed closely by a second phase of spreading depression.

Potential symptoms in the excitation phase:

- loss of consciousness
- seizures
- vacant stare
- delayed verbal or motor responses
- confusion or inability to focus attention
- disorientation
- slurred speech
- gross observable in-coordination
- emotional changes
- memory deficits

Potential symptoms in the depression phase:

- persistent low grade headache
- light headedness
- poor attention and concentration
- easy fatigability
- irritability
- intolerance to light and or noise
- difficulty focusing vision
- anxiety or depression
- sleep disturbance (limited or excessive)

Common concussion symptoms result from a functional disturbance in the brain rather than a structural injury, which could be seen on neuroimaging. Symptoms are often self-limiting and generally resolve spontaneously over time; most concussion patients recover symptomatically in seven to 10 days.

### Threshold of suspicion

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Initial recognition of a concussion is the first and most important step to appropriate management. Clear-cut instances of concussion occur when there is a significant impact to the head or body resulting in any immediate observable concussion-related signs or reported symptoms. There are times when a concussion injury may not be as obvious; however, in all cases, licensed healthcare practitioners should exercise caution. Any athlete who has suffered a significant impact (either witnessed or reported), or presents with any symptomatology representative of a concussive episode should be immediately removed from sport and assessed by a therapist with experience and training in concussion management (McCrorry et al 2017).

There are several tools available to help with the immediate identification of a concussed athlete such as the Pocket Concussion Recognition Tool or the Sport Concussion Assessment Tool (SCAT5), which provides a more thorough sideline assessment. Both are available online for free.

### Changing landscape of sport-related concussion

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Sport-related concussion and appropriate management is rapidly evolving. The 5th International Conference on Concussion in Sport was held in Berlin in October 2016. The latest consensus statement incorporated many pertinent changes, including those listed below:

- updated SCAT tool to the SCAT5 with supported use as a standardised multi-modal sideline assessment
- insufficient evidence for complete rest, and the exact amount and duration of rest is not yet defined
- support for early interventions including various forms of physical therapy
- addition of a return to school strategy for children and adolescents (below 18 years of age), and encouragement for

schools to have a concussion policy. Children should not be allowed to return to sport before successfully returning to school symptom-free

- trend towards support for baseline testing as an additional and helpful tool in concussion management (although not necessary in all cases), which may also provide for an educative opportunity for athletes
- persistent post-concussion syndrome definition—failure of normal clinical recovery, symptoms persisting beyond 10 to 14 days in adults and four weeks in children.

### Initial assessment process

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Following a comprehensive patient history assessment and ruling out red -flags, the examination should include a detailed neurological exam and assessment of mental status, cognitive functioning, sleep/wake disturbance, ocular function, vestibular function, gait and balance.

The SCAT5 tool is a standardised multidimensional tool, representing the most well-established and rigorously developed instrument available for sideline concussion assessment. Endorsed as an immediate assessment tool for differentiation of concussed versus non-concussed athletes, the SCAT5 has little reported clinical utility beyond three to five days post-injury (McCrorry et al 2017). Further, the SCAT5 has shown minimal clinical relevance in the guidance of ongoing rehabilitation and subsequent return to sport decisions.

The Vestibular Ocular Motor Screen (VOMS) is a tool developed by the University of Pittsburgh Medical Centre for the assessment of vestibular and ocular motor impairment using patient reported symptom provocation. The VOMS is a useful tool in the identification of symptom triggers, allowing for the specific prescription of early re-calibration exercises for the visual and vestibular systems.

### Acute management pathway

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Physiotherapists, as front line practitioners, are well positioned to play an essential role in the assessment and management of concussions, and provide ongoing support to athletes throughout the rehabilitation process. From initial assessment, education

and guidance to the identification of slowed progression, physiotherapists manage patients throughout their recovery, and apply the most timely and appropriate treatments. Access to an appropriate multi-disciplinary network of concussion-trained therapists can be helpful and speed the recovery process, including referrals to sports medicine doctors, neurologists, performance optometrists (vision therapy), neuropsychologists, and occupational therapists, among others.

Once a concussion diagnosis is made, the treating therapist should educate the patient as well as their parent or guardian, and provide the athlete with appropriate guidance and rehabilitation. Recent research shows that rest is no longer the best approach to concussion recovery, and there is limited evidence to support the use of complete rest. Following the first 24 to 48 hours of moderate, symptom-limited activity, athletes should be encouraged to become gradually more active and begin completing activities of daily living (ADL) while remaining below their symptom threshold. Light physical activity, closely monitored at sub-symptom threshold, has been shown to be safe and may benefit recovery. It is important to educate and reassure the patient that they will fully recover, and avoid reinforcing hyper-vigilant behaviours that may impact recovery, such as isolation, anxiety, depression, physical deconditioning and the potential reinforcement of high symptom load (Difazio et al 2015).

With a range of affected clinical domains, each concussion case is unique, and no concussion will be the same as the next. Therefore, the approach to rehabilitation must be individualised. There are many assessment techniques available to aid in rehabilitation, including:

- breathing exercises to calm sympathetic overload
- cervical spine treatment for associated whiplash and neck injury
- vestibular rehabilitation
- visual rehabilitation
- psychology for the affective domain
- submaximal, sub-symptom threshold physical rehabilitation for heart rate variability (require close monitoring and specific protocols)
- education and nutritional intervention

Return-to-sport guidance remains a gradual stepwise process, with each stage progression separated by 24 hours providing the athlete remains symptom-free. If the athlete experiences new or recurring

symptoms at any stage, then a regression by one step must occur for an additional 24 hours beyond symptom resolution.

**Table 1.** Return-to-school stages.

Stage	Aim
1	symptom-limited activity (ADLs)
2	light aerobic exercise (gradual heart rate increase, no resistance training)
3	sport-specific exercises (no head impact activities)
4	non-contact training (increased complexity of drills)
5	full contact practice (following medical clearance)
6	return to sport

It is now recommended for children and adolescents that successful return to school must precede the beginning of the staged return to sport process. This may be aided by progressive return to school with accommodations such as increased break/rest time; no homework, tests, physical education classes, or recess; and limited exposure to busy, noisy environments. As with return-to-sport stages, if a student experiences any new or worsening symptoms at any stage, they must return to the previous level.

**Table 2.** Return-to-school stages.

Stage	Aim
1	symptom-limited activity (ADLs)
2	school activities (symptom-limited cognitive work in home environment)
3	part-time return (eg, half day of school)
4	full-time return (eg, full day of school)
5	start return-to-sport stages (as above)

### Clinical utility of baseline testing

In the absence of a gold standard test to indicate full recovery from concussion, the question remains: how do we know when it is safe for an athlete to return to sport or an environment that poses the risk of a further concussive episode? It's important to understand that it is not the initial concussion that poses the largest risk, but the potential for further and more catastrophic injury by sustaining a second concussion prior to full recovery. This issue lies in the lack of correlation between symptom resolution and full metabolic recovery. A study conducted by Vagnozzi et al in Italy (2010) looked



at this disparity with the use of magnetic resonance spectroscopy. Despite subjective reports of symptom resolution at eight days, the study results suggested that full recovery of brain energy levels requires between 22 and 30 days post-concussion.

The Concussion in Sport Group has supported the use of multimodal baseline testing as a potentially helpful tool in the clinical decision-making process (although stating that it is not necessary for the interpretation of post-injury scores). Without a standardised test that indicates full metabolic recovery, understanding an athlete's pre-injury potential across multiple domains may currently be the best-case scenario for clinicians to make an objectively informed return-to-sport decision. It is important to remember that this process should be based on clinical judgment, and take into account athlete clinical history, clinical exam findings and results of further tests (including but not limited to referral consultations and baseline data).

### Emerging programs—future looking

With the recent introduction of full-service, evidence-based

concussion programs and networks into Australia, the way we assess and treat concussed amateur and emerging athletes continues to grow and evolve. In previous years, the very idea of a country-wide linked concussion network was well beyond what could be imagined. Now, these new international networks can ensure care of emerging athletes well beyond the reach of the individual clinician or clinic, allowing athletes of all levels to travel interstate and even abroad with immediate access to baseline results and standardised concussion care and rehabilitation. These are exciting times in the rapidly evolving landscape of concussion as we eagerly await the results of world-leading research in the race for a definitive diagnostic test.

**Aerin Di Leva is an accredited provider for both the NSW Institute of Sport and Olympic Winter Institute of Australia. Working year-round with winter sport athletes, Aerin has travelled to multiple World Cup and championship events as well as at the Sochi Winter Olympic Games. As a Canadian-accredited therapist, Aerin has taken a keen interest in the realm of sport-related concussion, gaining experience in a Whistler clinic focusing on leading evidence-based concussion identification and management.**

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