

FFA Sports Science Education Series

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*Scope: The aim of the FFA Education Series is to summarise either:
1) a hot topic or 2) a top article from the research literature.*

A consensus statement on Sports Related Concussion.

The paper reviewed:

Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016

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Preamble and considerations:

- This paper represents the most updated version of an ongoing consensus statement on the symptoms, diagnosis, treatment and care for sports related concussion (SRC). It is written by a group of internationally respected applied researchers and physicians, following a consensus meeting at the 5th International Conference on Concussion in Sport held in Berlin, 2016.
- The consensus statement is not proposed as a clinical practice guideline or standard of care. The purpose is to provide general recommendations. Individual treatment of a player suffering SRC must be based and delivered on the facts and context surrounding each individual case.
- Whilst some level of agreement exists on the key messages presented in the paper, there is an acknowledgement that the level of robust scientific evidence to support these key messages is still lacking and requires continued development.
- Given the lack of comprehensive research, management of the diagnosis and recovery of players following SRC should be individualised, and these decisions are best guided by the clinical judgments of informed stakeholders (Physicians, Rehab etc.).
- The current (2017) Berlin Statement on management of sports-related concussion (SRC) is structured with the ensuing “11 R’s of sports-related concussion management”, including;
 1. Recognise
 2. Remove
 3. Re-evaluate
 4. Rest
 5. Rehabilitation
 6. Refer
 7. Recover
 8. Return-to-sport
 9. Reconsider
 10. Residual effects and sequelae
 11. Risk Reduction.

Recognise:

- SRC is defined as the “*immediate and transient symptoms of traumatic brain injury*”.
- It is recognised this definition does not allude to mechanisms, severity, persistence or individuality.
- More detailed classification and definitions are provided below:

Sport related concussion is a traumatic brain injury induced by biomechanical forces. Several common features that may be utilised in clinically defining the nature of a concussive head injury include:

- ▶ *SRC may be caused either by a direct blow to the head, face, neck or elsewhere on the body with an impulsive force transmitted to the head.*
- ▶ *SRC typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously. However, in some cases, signs and symptoms evolve over a number of minutes to hours.*
- ▶ *SRC may result in neuropathological changes, but the acute clinical signs and symptoms largely reflect a functional disturbance rather than a structural injury and, as such, no abnormality is seen on standard structural neuroimaging studies.*
- ▶ *SRC results in a range of clinical signs and symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive features typically follows a sequential course. However, in some cases symptoms may be prolonged.*

The clinical signs and symptoms cannot be explained by drug, alcohol, or medication use, other injuries (such as cervical injuries, peripheral vestibular dysfunction, etc) or other comorbidities (eg, psychological factors or coexisting medical conditions).

- Determining the occurrence of SRC remains difficult. Sideline observation of a SRC incident still remains the most useful method to confirm a potential SRC event has occurred.
- Subsequent rapid sideline screening for suspected SRC is viewed as critical.
- Sideline evaluation and inspection of players who have potentially had a SRC remains an essential part of diagnosis. However, this should not be deemed as a comprehensive assessment, with subsequent more specific and comprehensive neurological evaluation recommended.
- The challenge of recognising and evaluating suspected SRC in a sideline environment under time pressure remains a difficult task. Currently, a multi-dimensional approach is recommended, with sideline video replay facilities, medical physician assessment, and simple SRC tests (i.e. SCAT5) forming the most optimal approach in that environment.
- The use of player- or equipment-mounted sensors to objectively determine the presence of SRC is not viewed as accurate or informative enough yet to diagnose or assess SRC. Ongoing research is recognised as having the potential to develop this area.

- Diagnosis of acute SRC can include:
 - a. Symptoms: somatic (eg, headache), cognitive (eg, feeling like in a fog) and/or emotional symptoms (eg, lability)
 - b. Physical signs (eg, loss of consciousness, amnesia, neurological deficit)
 - c. Balance impairment (eg, gait unsteadiness)
 - d. Behavioural changes (eg, irritability)
 - e. Cognitive impairment (eg, slowed reaction times)
 - f. Sleep/wake disturbance (eg, somnolence, drowsiness)

Remove:

- With suspected SRC, immediate removal of an athlete from the sporting environments (training or competition) is critical. Following removal, a multi-dimensional assessment of SRC is important. The testing environment should be standardised, quiet, removed from the public/spectators/stadium staff, and with minimal observers etc.
- Adequate facilities should be available for this appropriate medical assessment. The final decision with regard to returning to play should be a medical diagnosis.
- When athletes are under consideration for a SRC:
 - a. The player should be evaluated by a physician or other licensed healthcare provider on site using standard emergency management principles, and particular attention should be given to excluding a cervical spine injury.
 - b. The appropriate disposition of the player must be determined by the treating healthcare provider in a timely manner. If no healthcare provider is available, the player should be safely removed from practice or play and urgent referral to a physician arranged.
 - c. Once the first aid issues are addressed, an assessment of the concussive injury should be made using the SCAT5 or other sideline assessment tools.
 - d. The player should not be left alone after the injury, and serial monitoring for deterioration is essential over the initial few hours after injury.
 - e. A player with diagnosed SRC should not be allowed to return to play on the day of injury.

Re-evaluate:

- Further re-evaluation of the player in an appropriate medical facility may be required. This further consultation should include:
 - More detailed medical and neurological examination, along with a comprehensive check of the player's previous medical and SRC history.
 - Determination of the clinical state of the suspected SRC athlete and the acute improvement or deterioration of symptoms since initial sideline evaluation.
 - Determine the need for neuroimaging or other more detailed medical assessment.
- Neuropsychological assessment is deemed important, though this assessment should be undertaken by an appropriately skilled Neuropsychologist.
- Baseline or pre-season neuropsychological assessments were not deemed mandatory, but could be useful as contextual information for when post-SRC examinations are conducted.
- Neuropsychological assessments of SRC were highlighted as critical post-injury. However, the eventual decision upon return to play will be when the athlete is fully asymptomatic.

Rest:

- Prescribing the athlete rest until symptom-free remains the most common management of SRC.
- However, insufficient evidence exists to support the notion that “complete rest” results in faster recuperation.
- Acute rest (24-48h) in the aftermath of a SRC is certainly essential, though following this initial period gradual and progressive activity is appropriate as long as symptoms remain absent.
- Higher-intensity or vigorous activity should be avoided until the athlete is totally asymptomatic.

Rehabilitation:

- Rehabilitation as a sub-heading is a new addition to the Berlin Concussion consensus statement.
- With that in mind it has been copied verbatim below:

SRCs can result in diverse symptoms and problems, and can be associated with concurrent injury to the cervical spine and peripheral vestibular system. The literature has not evaluated early interventions, as most individuals recover in 10–14 days. A variety of treatments may be required for ongoing or persistent symptoms and impairments following injury. The data support interventions including psychological, cervical and vestibular rehabilitation.

In addition, closely monitored active rehabilitation programmes involving controlled sub-symptom-threshold, submaximal exercise have been shown to be safe and may be of benefit in facilitating recovery. A collaborative approach to treatment, including controlled cognitive stress, pharmacological treatment, and school accommodations, may be beneficial.

Further research evaluating rest and active treatments should be performed using high-quality designs that account for potential confounding factors, and have matched controls and effect modifiers to best inform clinical practice and facilitate recovery after SRC.

Refer:

- If persistent symptoms exist following a period of rest after a SRC event, further clinical assessment should be sought.
- A standard definition of “persistent symptoms” is currently missing, though this consensus statement proposes it should “reflect failure of normal clinical recovery, in that symptoms persist beyond the expected 10-14 days in adults or 4 weeks in children”.
- It should be noted that persistent symptoms refers to a collection of non-specific, post-traumatic symptoms that may be linked or coexist with the SRC event (rather than a single pathophysiological marker).
- If further clinical assessment is required for persistent symptoms, a multimodal assessment is required, and could include detailed analysis of athlete history of SRC, physical medical examination and appropriate stress test (i.e. exercise test). Whilst advanced neuroimaging and EEG techniques are recommended in clinical settings, research evidence for their use is minimal.
- Further treatment should be determined based on these clinical tests and be individualised to the player. Treatment should include a graduated exercise program, physical therapy program and mood and behavioural intervention program.

Recovery:

- SRC induces adverse effects on cognitive functioning and balance in the initial 24-72h following a SRC episode.
- These symptoms often dissipate within 10-14 days post-injury, but the recovery timeline is individualised and should be treated accordingly.
- Earlier studies often concluded symptoms would disappear within 10 days. More recent studies tend to suggest longer than 10-14 days to obtain full recovery is required.
- This discrepancy in results between older (<10 days recovery) and newer (>10days recovery) studies is thought to result from current medical management of SRC adopting a more gradual and conservative return-to-play management process i.e. more conservative practices, thus resulting in longer recovery timelines.
- Recovery of neurobiological symptoms (i.e. amnesia, dizziness, migraines, mood disturbances or motor function impairment) can extend beyond the timelines suggested from clinical measures, as symptoms may persist for some months. Psychological and wellbeing factors should be recognised as playing a role in this recovery timeline.
- Of note, previous SRC's represent a risk factor for future SRC occurrence, and multiple SRC's are associated with more severe symptoms in subsequent SRC's.
- It is not possible to define a specific recovery timeline following SRC based on a single physiological or neurobiological measure given the multi-factorial nature of SRC. Once the athlete is asymptomatic, a further "buffer zone" of time (i.e. days-week) should exist before returning to contact sport with appropriate recovery criteria being met.

The strongest and most consistent predictor of slower recovery from SRC is the severity of a person's initial symptoms in the first day, or initial few days, after injury. Conversely, and importantly, having a low level of symptoms in the first day after injury is a favourable prognostic indicator. The development of subacute problems with migraine headaches or depression are likely risk factors for persistent symptoms lasting more than a

Return-to-sport:

- Return-to-sport should be considered a stepwise process in an extension of the recovery process.
- Once concussion based symptoms have resolved, athletes can increase their engagement in sport-related activity in a gradual process. This process should follow a stepwise process of gradual increase in volume or intensity of activity every 24 hours. This allows the clinician to observe how the athlete responded and whether symptoms reappeared as a result of that upgrade in activity in comparison to the prior 24 hours.
- Once players are asymptomatic, a full week is stated by the consensus as the minimum time frame to progress athletes through the step-wise rehabilitation program back into appropriate sport-specific activity.
- Athletes should remain asymptomatic during this progression into sport-specific activity, and the appearance of any symptoms should result in regression in level of activity and recommencement at lower volumes/intensities/types of activity.

Reconsider:

- The guidelines provided by the consensus statements are generally aimed at mature and professional athletes; hence, it may be necessary to adapt these guidelines for younger or less trained populations.
- In particular, a longer timeline to recovery and more conservative care is suggested for child (5-12 years) and adolescent (13-18 years) athletes.
- Age-specific assessment tools and more conservative approaches are suggested in the consensus statement.
- Discussion on school-specific and policy adaptations are also summarised:
 - A lack of research exists to guide the suitable management of SRC in children and adolescents (<18 years old).
 - Expected duration of symptoms is up to 4 weeks in these populations.
 - Any assessment scales of SRC symptoms or cognitive functioning need to be validated and age-specific, thus assessment tools for adults are inappropriate in these populations.
 - Schools/Clubs should have SRC policies built around education, awareness, management and support.
 - Return to sport should not occur until successful return to school in an asymptomatic state.

Residual effects and sequelae:

- Descriptive research on neurobehavioral sequelae and long-term consequences of SRC are inconsistent and further research is required.
- Whilst cause-and-effect relationships still cannot be drawn, practitioners must be conscious of the long-term ramification of repeated Traumatic Brain Injury (i.e. chronic traumatic encephalopathy).
- Further information can be obtained at the new US National Institute of Neurological Disease and Stroke (NINDS) and National Institute of Biomedical Imaging and Bioengineering (NIBIB) consensus criteria.

Risk reduction:

- An awareness of the history of SRC in athletes prior to participation in sport is important to then mitigate the risks of future SRC.
- With a greater understanding of an athlete's previous history of SRC it allows a more informed view of the risk of future SRC and evaluation of any actual SRC occurrence. However, most athletes won't know or understand the extent of their prior SRC history. Thus sourcing further forms of information on athlete SRC history are useful, if possible.
- Tailoring of pre-participation questions to document symptoms, length of recovery time, as well as volume of SRC is important. Capturing information on previous injurious events to maxillo-facial and cervical spine is useful as an addition to information solely on prior SRC.

Consensus statement conclusion:

This consensus document reflects the current state of knowledge and will need to be modified according to the development of new knowledge. It should be read in conjunction with the systematic reviews and methodology papers that accompany this document (*British Journal of Sports Medicine*, issues 9 and 10, 2017). This document is first and foremost intended to inform clinical practice; however, it must be remembered that, while agreement exists on the principal messages conveyed by this document, the authors acknowledge that the science of concussion is incomplete and therefore management and return-to-play decisions lie largely in the realm of clinical judgement on an individualised basis.

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