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# BokSmart Information Pack on Concussion



*The following Documents are prepared for the purpose of educating and circulating to all the players, parents, or families of those participating in Rugby at your School or Club.*

*This will assist them in making better 'player safety' decisions with regards to their own/son/daughter/spouse's medical management, care at home, and ultimately making best practice informed return to play decisions.*

*Please ensure that everyone is aware of World Rugby and SARU's requirements in terms of best practice identification, treatment, and management of these types of injuries.*

## ***We are dealing with the BRAIN here, NOT a muscle!***

*For more information on Concussion go to*

*[www.BokSmart.com/Concussion](http://www.BokSmart.com/Concussion),*

*<https://www.springboks.rugby/general/boksmart-medical-protocol-concussion-blue-card/>,*

*[www.sportsconcussion.co.za](http://www.sportsconcussion.co.za), and*

*<https://passport.world.rugby/player-welfare-medical/concussion-management-for-the-general-public/>.*



# Concussion Pack Content

1. Concussion Advice Sheet
2. Concussion identification and management.
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4. When can a player safely return to play.
5. Individualised Rehabilitation Infographic.
6. Returning to Learning.
7. Concussion Prevention.
8. Echemendia et al 2023 The CRT6 Tool.



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## Concussion Advice Sheet

### What is a concussion?

A concussion is an **injury to the brain** caused by a direct or indirect blow to the head or caused by the head striking something else such as the ground or a bony hip. A concussion can occur **whether or not a person is “knocked out.”** A concussion typically causes the rapid onset of short lived impairment of brain function that resolves spontaneously with time. However, occasionally there can be a more significant or longer lasting problem, and it is important that the symptoms from every concussion be monitored by team medics and doctors who understand concussion management protocol. When you suffer a concussion, you may suffer from:

- Physical symptoms e.g. headaches, nausea, dizziness, tiredness, intolerance of bright light
- Concentration difficulties, memory loss, difficulty reading or using a computer
- Emotional changes such as mood swings, irritability and aggression
- Sleeping pattern changes – sleeping more or difficulty falling asleep

### What should I watch for? (“Red Flags”)

After evaluation by a sideline medic, it may be determined that you are safe to go home. If you are sent home, you should not be left alone. A responsible adult must accompany you. Symptoms from your concussion may persist when you are sent home but should not worsen, nor should new symptoms develop.

Important symptoms to monitor over the next 48 hours include:

- Headaches that worsen
- Severe neck pain
- Loss of feeling or use of an arm or leg
- Confusion
- Slurred speech
- Deteriorating consciousness
- Seizures (fits)
- Repeated vomiting

The presence of **ANY** of these requires **urgent medical attention** and usually a **brain scan**. Report to a hospital casualty, preferably one with a neurosurgeon and brain scanning facilities.

### **Is it okay to go to sleep?**

Concussion often makes a player feel drowsy or tired. Once you have been medically assessed, as long as you are not getting worse, as noted above, it is alright for you to sleep. We do however want the responsible adult to be at home with you in case any problems arise.

### **May I take something for pain?**

Do not take any medication unless a doctor has told you to do so. Normally, we do not advise anything stronger than paracetamol (e.g. Panado). **Avoid anti-inflammatories** e.g. Voltaren, Cataflam, Brufen etc. and anything containing codeine e.g. Myprodol.

### **What should I avoid doing?**

**Avoid** actions that may worsen your symptoms, slow down recovery or place you at risk

- Do not consume **caffeine** (including coffee) or any other stimulants
- Stop taking any **supplements** that you may be using
- Do not consume **alcohol** for at least 48 hours after a concussion and until cleared by a medical doctor
- Do not **drive** a motor vehicle or motorcycle or ride a bicycle until cleared by a medical doctor
- Do not **exercise** at all until medically cleared to do so
- Do not spend long periods behind a **computer**, playing video games, watching TV or reading

### **May I eat after the practice or game?**

It is fine for you to eat if you are hungry. Remember, some athletes do have a sense of nausea and fatigue, and often find that their appetite is decreased immediately after a concussion. Do not force yourself to eat.

### **How long will I be observed?**

You must follow up with a medical doctor after your suspected or confirmed concussion. You must be monitored regularly and your symptoms observed until they have completely cleared. You must refrain from any physical exertion including strength conditioning until released to do so by the medical staff. Return-to-practice and return-to-play decisions are made at the appropriate time by the team physicians and these may differ from player to player.

Additional testing will be considered (e.g. computerized brain function testing) and this should be explained to you during your follow up visits. Determining if school activities (e.g. class, exams) need to be modified can also be evaluated by your doctor.

There is however a mandatory stand-down period away from contact-rugby, and a graduated return-to-sport or 'individualised rehabilitation' process that needs to be followed. This information can also be found on [www.BokSmart.com](http://www.BokSmart.com) at the following link: [www.BokSmart.com/Concussion](http://www.BokSmart.com/Concussion), or on MyBokSmart at: <https://my.boksmart.com/Documents/BokSmart#ConcussionManagement>.

**If symptoms persist, what other support is available to me?**

Your concussion may make it difficult to **concentrate, study, and/or attend class**. In such a situation, it's important for you to discuss with your medical team and teachers, different options for receiving academic support during this time including:

- (1) short-term adjustments such as a shorter school day, working in an isolated & quiet environment and limited reading and computer work
- (2) extended accommodations to be made regarding your academic assessments including deferring or allowing for additional time.

These options usually involve disclosing some information about your medical condition to other School or University offices and/or personnel.

**Important Contacts:**

Designation	Name	Tel no.	After hours no.	Email / Website
Doctor				
Hospital				
School/Club nurse				
BokSmart SpineLine operated by ER24		0800 678 678	0800 678 678	<a href="http://www.boksmart.com/Concussion">www.boksmart.com/Concussion</a> <a href="https://www.springboks.rugby/general/boksmart-spineLine/">https://www.springboks.rugby/general/boksmart-spineLine/</a>
Sports Concussion SA		011-3047724	0825746918	<a href="http://www.sportsconcussion.co.za">www.sportsconcussion.co.za</a> <a href="mailto:sportsconcussion@mweb.co.za">sportsconcussion@mweb.co.za</a>

*Document Compiled by Dr Jon Patricios*

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**Concussion Referral Note by Medical Personnel**

\_\_\_\_\_ has been assessed as having suffered either a suspected or confirmed  
concussion on \_\_\_\_\_ (date)

A SCAT6 / SCOAT6 Evaluation form is / is not attached.

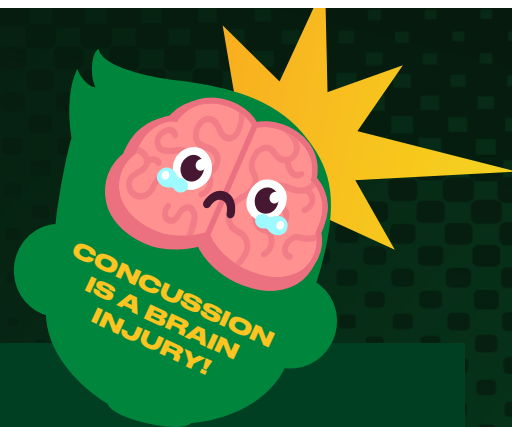
The patient has been referred:

- to \_\_\_\_\_ hospital for further evaluation.
- to home with a responsible adult for monitoring.

It is recommended that the guidelines on this form are strictly adhered to and that Dr \_\_\_\_\_  
at contact number \_\_\_\_\_ is consulted for further evaluation and advice.

Signed: \_\_\_\_\_ Date: \_\_\_\_\_ Tel no.: \_\_\_\_\_

# CONCUSSION MANAGEMENT



## PREVENTION

### 5Es

- 1. EDUCATE** your team, club or school on concussions
- 2. ENFORCE** the laws, protocols and policies in your players
- 3. ENHANCE** your players' protection against concussion by preparing them properly for rugby
- 4. EQUIP** your players with the right information about what works and what does not
- 5. EVALUATE** your concussion prevention process and policies yearly to ensure that you remain up to date with what is expected at the time

## IDENTIFICATION

### 6Rs

- 1. RECOGNISE** concussions
- 2. REMOVE** the player
- 3. REFER** them to a medical doctor to clear them of any complications, NOT for going back to rugby
- 4. REST** them completely for the first 24-48 hours
- 5. RECOVER** until sign and symptom free
- 6. RETURN** them to play, once they have gone through the rugby specific return to sport or 'individualised rehabilitation' process without any hiccups

## MANAGEMENT

### MEDICAL CLEARANCE STEPS:

1. Medical doctor clearance of complications straight after event.
2. Clearance to start the GRTS or 'individualised rehabilitation' Stages 4-6 and only once all symptoms have cleared.
3. Clearance to progress to full contact after completion of Stage 4 of GRTS or 'individualised rehabilitation'.

## MADDOCKS' QUESTIONS

### QUESTIONS YOU NEED TO ASK TO PLAYERS 13 YEARS OF AGE AND OLDER:

- What venue are we at?
- What team are you playing?
- What half is it?
- Who scored last in this game?
- Who did you play last week/game?
- Did your team win the last game?

### QUESTIONS YOU NEED TO ASK CHILDREN AGED 5-12:

- Where are we now?
- Is it before or after lunch?
- What did you have last lesson/class? or Who scored last in this game?
- What is your teacher's/coach's name?

**WHERE THERE IS ANY HESITATION, UNCERTAINTY OR ONE CANNOT VERIFY THE INFORMATION, HAVE THE PLAYER PERMANENTLY REMOVED FROM THE GAME OR TRAINING SESSION, AND SUSPECT A CONCUSSION.**

## SIGNS AND SYMPTOMS



### WHAT YOU NEED TO LOOK FOR:

- Dazed, vacant or blank expression
- Lying motionless on the ground or very slow to get up
- Unsteady on feet
- Balance problems or falling over
- Poor coordination
- Loss of consciousness or lack of responsiveness
- Confused or not aware of plays or events
- Grabbing or clutching the head
- Convulsions
- More emotional or irritable

### WHAT THE PLAYER MIGHT TELL YOU:

- Headache
- Dizziness
- Confusion or feeling slowed down
- Struggling with or blurred vision
- Nausea or vomiting
- Fatigue
- Drowsy, feeling in a fog or difficulty concentrating
- A feeling of pressure in the head
- Sensitivity to light or noise
- Memory loss for events before, during or after the game or practice

## MONITORING: CONCUSSION REGISTER

1. Must be done by a responsible person at School or Club
2. Step by Step monitoring of progression through the rugby-specific GRTS or 'Individualised Rehabilitation' process
3. Recordal of medical steps and processes

NAME OF PLAYER	SURNAME OF PLAYER	TEAM PLAYED FOR	DIVISION	AGE	DATE OF BIRTH	COACH	DATE OF CONCUSSION/SUSPECTED CONCUSSION	DATE OF MEDICAL ASSESSMENT TO RULE OUT COMPLICATIONS	NAME OF MEDICAL DOCTOR	COMPULSORY RECOVERY STAND-DOWN PERIOD AWAY FROM CONTACT-RUGBY	MEDICAL CLEARANCE RECEIVED TO ENTER STAGES 4-6 OF 'INDIVIDUALISED REHABILITATION'	DATE OF MEDICAL ASSESSMENT CLEARANCE RECEIVED	DATE OF COMPLETION OF GRTS OR 'INDIVIDUALISED REHABILITATION' PROCESS	PROCESS SIGNED OFF & ACKNOWLEDGED BY COACH	DATE RETURNED TO FULL MATCH PLAY (MINIMUM OF 21 DAYS)
Yster	Nkosi	Senior Adult	B	24	May 14, 2000	A.F. Rigtger	August 1, 2024	August 2, 2024	Dr Con Cussion	2 weeks	Yes	August 15, 2024	August 20, 2024	Yes	August 22, 2024



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Petro Jackson  
Rugby's Caring Hands







# THE REFEREE SPOTLIGHT BLUE CARD

## SA RUGBY CONCUSSION REGULATIONS

<https://www.springboks.rugby/general/boksmart-legislation>

### BLUE CARD CONCUSSION PROCESS

1. Referee or Medical professional recognises a potential concussion event
2. Referee then signals Blue Card to the player
3. Visual cue to all watching → Concussion or suspected concussion
4. Player is permanently removed from the field of play
5. Player is logged onto the Club or School's submitted Team Sheet as a Concussion
6. Referee to submit Blue Card report to the Provincial Rugby Union
7. Referee, Coach, Team management, Player, Parent or Family member logs the Blue Card onto the SA Rugby Online software [bluecard.footprintapp.net](http://bluecard.footprintapp.net)
8. All contact persons listed when logging the Blue Card on the App will receive emailed advice on the required GRTS processes to follow with the player
9. All Blue Card concussion events recorded on the App will be stored on a national database
10. Sport Concussion SA's information:  
**011-3047724, 0825746918,**  
Email: [sportsc concussion@mweb.co.za](mailto:sportsc concussion@mweb.co.za) will also be emailed to them should they wish to access Medical Doctors who are sufficiently knowledgeable in Concussion management for rugby union

The following are 11 OBVIOUS SIGNS & SYMPTOMS that you as a referee, coach or medical support staff simply cannot miss, and cannot allow players presenting with any of these to continue in a match or practice. THESE ARE IMMEDIATE BLUE CARDS!

#### THOSE SIGNS AND SYMPTOMS TYPICALLY SEEN ON-FIELD:

1. Confirmed loss of consciousness; this is clear and obvious, the player was knocked out
2. Suspected loss of consciousness, or from what you saw happen on the field, where you have a strong suspicion of the player having lost consciousness
3. Convulsions or fits after making contact
4. Tonic posturing, abnormal muscle contractions or muscle stiffening
5. Balance disturbance, ataxia, stumbling or falling over
6. Clearly dazed, dinged or unable to think or react properly

#### THOSE ADDITIONAL SIGNS AND SYMPTOMS TYPICALLY IDENTIFIED DURING AN ON-FIELD ASSESSMENT:

7. The player is clearly not orientated in time, place or person or doesn't know what time it is, where they are or who they are talking to
8. Definite signs of confusion in the player
9. Definite changes in behaviour for that player
10. Oculomotor signs for e.g. spontaneous nystagmus or rapid involuntary eye movements
11. On-field identification of regular signs or symptoms of concussion as highlighted in your pocket BokSmart Concussion Guides

**LAW 3.22 (C):** The referee decides (*with or without medical advice*) that it would be inadvisable for the player to continue. The referee orders that player to leave the playing area.

**LAW 3.24:** 'If, at any point during a match, a player is concussed or has suspected concussion, that player must be immediately and permanently removed from the playing area. This process is known as "RECOGNISE AND REMOVE".'





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### Return to play following a concussion.

#### Why is it so important to return to play at the appropriate time?

Returning too soon following a concussion may have serious short- and long-term consequences including:

- More serious brain injury and even death
- Persisting symptoms lasting weeks or months
- A greater risk of further concussions
- A higher risk of injuries to muscles, tendons and ligaments
- Interference with studies (school and university) and work
- Poor performance on the rugby field
- Potential longer-term brain effects including memory loss and emotional disturbances.

#### Mandatory time off from contact-rugby!

Unless advised by a specialist medical doctor with expertise in concussion management for Rugby Union, the following minimum stand-down periods away from contact-rugby are prescribed for players suspected of sustaining a concussion in rugby:

**Players 18 and younger** – time off from **contact-rugby** for a minimum of 2 weeks, followed by a period of Individualised Rehabilitation (see protocol below). Players may only return to match play at **21 days**.

**Players 19 and older** – time off from **contact-rugby** for a minimum of 2 weeks, followed by a period of Individualised Rehabilitation (see protocol below). Players may only return to match play at **21 days**.

These minimum periods away from **contact-rugby** only apply if the player no longer has **ANY** symptoms of concussion remaining.

**Note: It is recommended that, in all cases of suspected concussion, the player be referred to a medical professional.**

## The Individualised Rehabilitation Protocol




**Individualised Rehabilitation** Protocol – each Stage progression is a minimum of 24 hours. The day the player sustained the suspected or confirmed concussion is considered '**Day ZERO**'. Operationally, *Stages 1-3* of the individualised rehabilitation, forms part of the two-week stand-down period away from contact-rugby. During these stages, the player may still experience some symptoms. *Stages 4-6* begins after completion of Stages 1-3 *and* the 2-week contact-rugby stand-down period. Stages 4-6 prepare the player gradually for contact fitness and to get them ready to play again. To start Stages 4-6, the player must have no symptoms remaining.

Stage	Rehabilitation	Objective	Exercise Allowed
1	Symptom-limited Activity (relative rest)	Recovery. Gradual reintroduction of work/school	<ul style="list-style-type: none"> <li>Complete body and brain rest for the first 24-48 hours.</li> <li>Daily activities that do not exacerbate symptoms (e.g., walking).</li> </ul>
2	Aerobic exercise <b>2A—Light</b> (up to approximately 55% max HR) <b>then</b> <b>2B—Moderate</b> (up to approximately 70% max HR)	Increase heart rate.	<ul style="list-style-type: none"> <li>Stationary cycling or walking at slow to medium pace.</li> <li>May start light resistance training that does not result in more than mild and brief exacerbation* of concussion symptoms.</li> </ul>
3	Individual sport-specific exercise <b>Note:</b> If sport-specific training involves any risk of inadvertent head impact; medical clearance should occur prior to Stage 3	Add movement, change of direction.	<ul style="list-style-type: none"> <li>Sport-specific training away from the team environment (e.g., running, change of direction and/or individual training drills away from the team environment).</li> <li>No activities at risk of head impact.</li> <li>Running drills.</li> </ul>
<i>Stages 4–6 should begin after the resolution of any symptoms, abnormalities in cognitive function and any other clinical findings related to the current concussion, including with and after physical exertion.</i>			
4	Non-contact training drills.	Resume usual intensity of exercise, coordination and increased thinking	<ul style="list-style-type: none"> <li>Exercise to high intensity including more challenging training drills (e.g., passing drills, multiplayer training).</li> <li>Can integrate into a team environment.</li> <li>May start <i>progressive</i> resistance training.</li> <li>Player <b>MUST</b> be medically cleared at the end of this Stage before going to Full-contact training or Stage 5.</li> <li>If player remains sign and symptom-free for the full 24 hours, they then move onto Stage 5.</li> </ul>
5	Full Contact Practice.	Restore confidence and assess functional skills by coaching staff.	<ul style="list-style-type: none"> <li>Participate in normal training activities.</li> <li>If player remains sign and symptom-free for the full 24 hours, they then move onto Stage 6.</li> </ul>
6	Return To Match Play / Sport.	Recover. Normal game play.	<ul style="list-style-type: none"> <li>Player rehabilitated and can be progressively re-introduced into full match play.</li> </ul>
<p><b>*Mild and brief exacerbation of symptoms (i.e., an increase of no more than 2 points on a 0–10-point scale for less than an hour when compared with the baseline value reported prior to physical activity).</b></p> <p><b>Athletes may begin Stage 1 (i.e., symptom-limited activity – relative rest) within 24 hours of injury, then moving to Stages 2 and 3 within the 14-day or 2-week stand-down period away from <u>contact-rugby</u>, with progression through each subsequent Stage thereafter typically taking a minimum of 24 hours.</b></p> <p><b>If more than mild exacerbation of symptoms (i.e., more than 2 points on a 0–10 scale) occurs during Stages 1–3, the athlete should stop and attempt to exercise the next day.</b></p> <p><b>Athletes experiencing concussion-related symptoms during Stages 4–6 should return to Stage 3 to establish full resolution of symptoms with exertion before engaging in at-risk activities.</b></p> <p><b>Written determination of readiness to Return To Sport (RTS) should be provided by a medical doctor before unrestricted RTS as directed by local laws and/or sporting regulations.</b></p> <p style="text-align: center;"><i>Max HR, predicted maximal heart rate according to age (i.e., 220-age).</i></p>			

### Notes:

- **A player may only start the individualised rehabilitation Stages 4–6 once cleared by a medical doctor and all symptoms have cleared before, during, and after exercise in all three Stages 1-3.**
- **In individualised rehabilitation Stages 4–6 a player may only progress to the next stage if no symptoms occur before, during, and after exercise in each stage.**
- **A player must again be cleared by a medical doctor before starting full-contact training.**

**Summary of Individualised Rehabilitation Criteria for ALL Amateur Rugby Players with Suspected or Confirmed Concussions.**

AGE GROUP	COMPULSORY STAND-DOWN PERIOD AWAY FROM CONTACT-RUGBY POST CONCUSSION		<b>INDIVIDUALISED REHABILITATION</b>		NUMBER OF MISSED FULL WEEKS
<i>Players 18 and younger</i>	Minimum of <b>2 weeks</b> (14 days) off from <i>contact-rugby</i> , while starting the <i>individualised rehabilitation Stages 1-3</i> , can even be longer if any signs or symptoms remain.	<b>CAUTION!</b> individualised rehabilitation Stages 4-6 can be started only if the player is symptom free and off medication that modifies symptoms of concussion. <b>MEDICAL CLEARANCE REQUIRED</b>	<b>Individualised rehabilitation Stages 4-6</b> with progression to each next Stage if no symptoms experienced before, during, or after exercise, with a minimum duration of <b>24 hours</b> per Stage.	<b>CAUTION!</b> Contact Sport should be authorized only if the player is symptom free and off medication. <b>MEDICAL CLEARANCE REQUIRED</b>	<b><u>Earliest Return To Sport</u></b> <b>= 2 weeks (14 days) stand-down period away from contact-rugby post injury + individualised rehabilitation.</b> <b>(May only be cleared for Play earliest on <i>Day 21</i> post injury)</b>
<i>Players 19 and older</i>					
 <p><b>Any player with a history of multiple concussions ***, players with unusual presentations or prolonged recovery should be assessed and managed by health care providers (multidisciplinary) with experience in sports-related concussions. However, the medical doctor clearance is non-negotiable and must always be provided before entering the <i>individualised rehabilitation Stages 4-6</i>, and before starting full-contact training, regardless of who is available to manage or monitor the <i>individualised rehabilitation</i> process.</b></p>					

## **EXCEPTIONS:**

*Exceptions to SA Rugby's and World Rugby's Concussion protocols are only allowed where a player has accessed an 'Advanced Level of Concussion Care' clinical setting.*

*The two-week stand-down period away from contact-rugby (Stages 1-3) and the completion of the individualised rehabilitation programme Stages 4-6, as defined above are compulsory, regardless of whether the Player has become symptom free, unless the Player has successfully accessed an 'advanced level of concussion care' and has been medically cleared and managed for an earlier return to rugby.*

*An 'advanced level of concussion care' has been defined in the World Rugby Concussion Guidance and has been agreed upon on an individual basis by the World Rugby Chief Medical Officer and the South African Rugby Union.*

### **Advanced Level of Concussion Care**

*The following, World Rugby approved protocol, allows players who are removed from play with a suspected concussion to be evaluated by an SA Rugby or World Rugby recognised Advanced Care Concussion Doctor (ACCD)\*, following a robust and multimodal evaluation consistent with that offered at the highest level of the game. This may allow for return to full contact rugby/match play before 21 days but no sooner than 14 days.*

*Medical Centres and Healthcare Professionals qualifying to oversee Advanced Concussion Care must provide or have access to:*

- A medical doctor who has experience in concussion management, has completed the World Rugby online module: Concussion Management for Medical Practitioners and Healthcare Professionals (it is important to do the latest version as it has been updated to reflect the newest SCAT), and who is approved by the Chief Medical Officer of World Rugby and SA Rugby's General Manager: Medical as an Advanced Care Concussion Doctor (ACCD), and*
- Scientifically validated computerised technology such as neurocognitive testing (e.g. Impact or Neuroflex), and*
- Access to brain imaging including CT and MRI scans, and*
- Access to a wider support network of clinicians who may assist in the diagnosis of concussion, other neurological and mental health disorders including but not limited to, a neurologist, neurosurgeon, psychologist, physiotherapist, and optometrist.*

*All Advanced Care facilities should provide support to SA Rugby's Blue Card system and will be listed under their specific provincial region on the Sports Concussion SA (SCSA) website. They will also have the support of the international Your Brain Health network.*

All players are encouraged to enter an Advanced Care pathway and to seek optimal concussion management but, if a return sooner than 21 days is to be considered, the following criteria must be fulfilled:

1. No Criteria 1 signs\*\* are present.
2. The player does not have a significant history of concussion as defined by World Rugby\*\*\*.
3. The player has not sustained a concussion that season.
4. The team doctor completes a Concussion Risk Stratification on the player.
5. The player requires a preseason baseline performed in the last 12 months (preferably SCAT6 and/or computerised cognitive/Neuroflex test).
6. Following a confirmed or suspected concussion a player needs to undergo a SCAT6 within 48 hours but no later than 72 hours post the injury.
7. All the baseline data, post-match SCAT6 results, and any video footage of the event is reviewed by the SA Rugby / World Rugby recognised ACCD.
8. A multimodal clinical face-to-face evaluation (SCOAT6 or similar) is undertaken by the appointed ACCD. Follow-up consultations can be via tele-conference call.
9. The Graduated Return-To-Play or 'Individualised Rehabilitation' (pg10) process is followed, with the player being asymptomatic during Stages 4-6.

**\* An SA Rugby or World Rugby recognised ACCD**

- Are medical doctors, with experience and expertise in managing concussion, and are listed on the Sports Concussion South Africa website.

**\*\*Criteria 1 Signs.**

Players who are removed from play because the following signs and symptoms are evident will be noted as a confirmed concussion and will only be permitted to play after 21 days.

The following concussion signs are referred to as Criteria 1 signs:

- Confirmed loss of consciousness.
- Suspected loss of consciousness.
- Convulsion.
- Tonic posturing.
- Balance disturbance/ataxia.
- Clearly dazed and/or confused.

- *The player is clearly not orientated in time, place or person or doesn't know what time it is, where they are or who they are talking to.*
- *Definite changes in behaviour for that player.*
- *Oculomotor signs for e.g. spontaneous nystagmus or rapid involuntary eye movements.*

**\*\*\*Concussion History Definition:**

1. *Concussed within last 3 months.*
2. *Three or more concussions in the last 12 months.*
3. *Five or more career concussions.*
4. *Reduced impact threshold noted. \*\*\*\**
5. *Any previous concussion complicated by psychological issues.*
6. *Previous concussion with prolonged recovery (>21 days).*

**\*\*\*\*Reduced impact threshold describes where the team doctor, player or ACCD deem that in prior concussions the player sustained a concussion from impacts where a concussion was not normally expected.**

*Document Compiled by Professor Jon Patricios, Dr Leigh Gordon, Dr Pierre Viviers, Clint Readhead*



# THE GRADUATED RETURN TO SPORT (GRTS) OR 'INDIVIDUALISED REHABILITATION' PROTOCOL

EACH STAGE PROGRESSION IS A **MINIMUM OF 24 HOURS**.



PLEASE USE A **COMMON SENSE APPROACH**. You don't need a handbook to identify a suspected concussion. If you suspect one, take the player off, it's really that simple.

## STAGES 1-3

Operationally, Stages 1-3 of the individualised rehabilitation, forms part of the **two-week stand-down period** away from contact-rugby. During these stages, the player **may still experience some symptoms**. The day the player sustained the suspected or confirmed concussion is considered 'Day 0'.

## STAGES 4-6

Stages 4-6 begins after completion of Stages 1-3 and the 2-week contact-rugby stand-down period. Stages 4-6 **prepare the player gradually for contact fitness** and to get them ready to play again. To start Stages 4-6, the player must have **no symptoms remaining**.

STAGE	REHABILITATION	OBJECTIVE	EXERCISE ALLOWED
<b>1</b>	<b>SYMPTOM-LIMITED ACTIVITY (RELATIVE REST)</b>	<b>RECOVERY. GRADUAL REINTRODUCTION OF WORK/SCHOOL</b>	<ul style="list-style-type: none"> <li>Complete body and brain rest for the first 24-48 hours</li> <li>Daily activities that do not exacerbate symptoms (e.g., walking)</li> </ul>
<b>2</b>	<b>AEROBIC EXERCISE (20 MINUTES) 2A—LIGHT (UP TO APPROXIMATELY 55% MAX HR) THEN 2B—MODERATE (UP TO APPROXIMATELY 70% MAX HR)</b>	<b>INCREASE HEART RATE</b>	<ul style="list-style-type: none"> <li>Stationary cycling or walking at slow to medium pace</li> <li>May start light resistance training that does not result in more than mild and brief exacerbation* of concussion symptoms</li> </ul>
<b>3</b>	<b>INDIVIDUAL SPORT-SPECIFIC EXERCISE (25-30 MINUTES). NOTE: IF SPORT-SPECIFIC TRAINING INVOLVES ANY RISK OF INADVERTENT HEAD IMPACT; MEDICAL CLEARANCE SHOULD OCCUR PRIOR TO STAGE 3</b>	<b>ADD MOVEMENT, CHANGE OF DIRECTION</b>	<ul style="list-style-type: none"> <li>Sport-specific training away from the team environment (e.g., running, change of direction and/or individual training drills away from the team environment)</li> <li>No activities at risk of head impact</li> <li>Running drills</li> </ul>
<b>STAGES 4-6 SHOULD BEGIN AFTER THE RESOLUTION OF ANY SYMPTOMS, ABNORMALITIES IN COGNITIVE FUNCTION AND ANY OTHER CLINICAL FINDINGS RELATED TO THE CURRENT CONCUSSION, INCLUDING WITH AND AFTER PHYSICAL EXERTION</b>			
<b>4</b>	<b>NON-CONTACT TRAINING DRILLS</b>	<b>RESUME USUAL INTENSITY OF EXERCISE, COORDINATION AND INCREASED THINKING</b>	<ul style="list-style-type: none"> <li>Exercise to high intensity including more challenging training drills (e.g., passing drills, multiplayer training)</li> <li>Can integrate into a team environment</li> <li>May start progressive resistance training</li> <li>Player <b>MUST</b> be medically cleared at the end of this Stage before going to Full-contact training or Stage 5</li> <li>If player remains sign and symptom-free for the full 24 hours, they then move onto Stage 5</li> </ul>
<b>5</b>	<b>FULL-CONTACT PRACTICE</b>	<b>RESTORE CONFIDENCE AND ASSESS FUNCTIONAL SKILLS BY COACHING STAFF</b>	<ul style="list-style-type: none"> <li>Participate in normal training activities</li> <li>If player remains sign and symptom-free for the full 24 hours, they then move onto Stage 6</li> </ul>
<b>6</b>	<b>RETURN TO MATCH PLAY/SPORT</b>	<b>RECOVER. NORMAL GAME PLAY</b>	<ul style="list-style-type: none"> <li>Player rehabilitated and can be progressively re-introduced into full match play</li> </ul>

**Mild and brief exacerbation of symptoms** (i.e., an increase of no more than 2 points on a 0-10-point scale for less than an hour when compared with the baseline value reported prior to physical activity).

**Athletes may begin Stage 1** (i.e., symptom-limited activity - relative rest) within 24 hours of injury, then moving to Stages 2 and 3 within the 14-day or 2-week stand-down period away from contact-rugby, with progression through each subsequent Stage thereafter typically taking a minimum of 24 hours.

**If more than mild exacerbation of symptoms** (i.e., more than 2 points on a 0-10 scale) occurs during Stages 1-3, the athlete should stop and attempt to exercise the next day.

**Athletes experiencing concussion-related symptoms during Stages 4-6** should return to Stage 3 to establish full resolution of symptoms with exertion before engaging in at-risk activities.

**Written determination of readiness to Return To Sport (RTS)** should be provided by a medical doctor before unrestricted RTS as directed by local laws and/or sporting regulations.



Max HR, predicted maximal heart rate according to age (i.e., **220-age**).

### NOTES:

- A player may only start the individualised rehabilitation Stages 4-6 once cleared by a medical doctor and all symptoms have cleared before, during, and after exercise in all three Stages 1-3
- In individualised rehabilitation Stages 4-6 a player may only progress to the next stage if no symptoms occur before, during, and after exercise in each stage
- A player must again be cleared by a medical doctor before starting full-contact training

### EARLIEST RETURN TO SPORT:

= 2 weeks (14 days) stand-down period away from contact-rugby post injury + individualised rehabilitation. (May only be cleared for play earliest on Day 21 post injury)

COMPULSORY STAND-DOWN PERIOD AWAY FROM CONTACT-RUGBY POST CONCUSSION	CAUTION!	INDIVIDUALISED REHABILITATION	CAUTION!	NUMBER OF MISSED FULL WEEKS
Minimum of <b>2 weeks (14 days)</b> off from <b>contact-rugby</b> , while starting the <b>individualised rehabilitation Stages 1-3</b> , can even be longer if any signs or symptoms remain	<b>CAUTION! Individualised rehabilitation Stages 4-6 can be started only if the player is symptom free and off medication that modifies symptoms of concussion. MEDICAL CLEARANCE REQUIRED</b>	<b>Individualised rehabilitation Stages 4-6</b> with progression to each next Stage if no symptoms experienced before, during, or after exercise, with a minimum duration of <b>24 hours</b> per Stage	<b>CAUTION! Contact Sport should be authorized only if the player is symptom free and off medication. MEDICAL CLEARANCE REQUIRED</b>	<b>Earliest Return To Sport = 2 weeks (14 days) stand-down period away from contact-rugby post injury + individualised rehabilitation.</b> (May only be cleared for play earliest on <b>Day 21</b> post injury)

**CAUTION:** Any player with a history of multiple concussions, players with unusual presentations or prolonged recovery should be assessed and managed by health care providers (multidisciplinary) with experience in sports-related concussions.

However, the medical doctor clearance is non-negotiable and must always be provided before entering the **individualised rehabilitation** Stages 4-6, and before starting full-contact training, regardless of who is available to manage or monitor the **individualised rehabilitation** process.



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## “Return to Learning” (RTL) after Concussion

### **Important introductory NOTE for parents, teachers, and lecturers!**

This article talks about ‘concussed’ players, which implies a confirmed diagnosis of concussion. However, it is equally important to include those players who are suspected of having a concussion into this grouping. In many cases of concussion, the development of signs and symptoms is delayed. Therefore, when concussion is suspected, but the players do not show any classic signs or symptoms of concussion to initially confirm diagnosis, they should be monitored and treated in exactly the same way as the confirmed cases of concussion.

For clarity and for more information on SARU’s position on concussion in rugby, and the **SARU Regulation on Concussion**, go to the following links: <https://www.springboks.rugby/general/boksmart-legislation/> and <https://my.boksmart.com/Documents/BokSmart#ImportantRegulations>. The SARU regulation also stipulates a mandatory ‘individualised rehabilitation’ return-to-play process for players suspected of sustaining a concussion at school or amateur rugby. This process can also be sourced from the BokSmart website at the following page: [www.BokSmart.com/concussion](http://www.BokSmart.com/concussion) and on [MyBokSmart](#) Learning Management System (LMS) from here: <https://my.boksmart.com/Documents/BokSmart#ConcussionManagement>

### **What’s happening to the concussed brain?**

There is microscopic damage to the cells and nerves of the concussed brain and brain function is disrupted following complex chemical changes. There appears to be a “mismatch” between the brain’s energy requirements and needs. This causes a variety of symptoms and affects the brain’s ability to think, to concentrate for sustained periods and to absorb and retain information.

Adding cognitive (“thinking”) activities to an energy-deprived brain worsens symptoms. These changes are not visible which makes it difficult for school or tertiary education officials to understand the need for resting the brain in a learning environment. Although guidelines for reducing cognitive stress exposure are not as well defined as the guidelines for reducing physical activity, they are equally important.

### **What does this mean for students?**

As a result of these changes in the brain it is not unusual for performance in the classroom to be affected. Learning new tasks and recalling previously learnt material might become difficult. Moreover, stressing the brain by expecting it to cope with normal teaching loads, writing tests and exams, and completing long assignments may make students’ symptoms either reoccur or worsen, and may slow recovery.

Just as a strained hamstring muscle requires time to readjust to running as it repairs, a “strained” brain requires time to readapt to learning. There is no one set of ideal guidelines that fit all concussed students, therefore doctors, lecturers and teachers should adapt protocols to suit individual needs and recovery.

While resting the brain is necessary, getting behind on studying and assignments may create additional emotional stress that is also undesirable for recovery. Therefore there is a fine balance between resuming normal function, without overexerting the brain, and worsening symptoms.

Cognitive recovery after concussion for scholars or students is variable but usually occurs within 3 weeks. Recovery lasting longer than this requires further medical evaluation. Full return to academic and physical activities requires the student to be cleared using a spectrum of assessments that evaluate performance under conditions of both cognitive (computer and paper-based “thinking” tests) and physical (gym or field based activity) stress. Students need to pass all of these parameters to be properly cleared to return to full learning and rugby participation.

### **How to help your cognitive recovery**

At home:

- Keep stressful brain activities to the more essential ones such as homework and reading
- Avoid texting, non-academic computer work, video games and television
- Read and study in a quiet and dimly lit area
- Take regular breaks (every 20 minutes) when doing homework or assignments
- Organise your day by creating a list of tasks to be completed
- Report symptom patterns following learning exposure to your doctor

At school / tertiary education:

- Consider returning to school or tertiary education when you can tolerate 30-45 minutes of reading or studying without worsening symptoms
- Discuss your injury with your teachers, head teacher, lecturers, school or tertiary education nurse and/or psychologist
- Discuss attending fewer classes – prioritise the important ones
- Schedule academic “time outs” during the school or tertiary education day during which you can rest
- Avoid brightly lit and noisy areas
- Ask a fellow student to take notes for you
- Request more time for assignments and tests
- Ask your doctor to provide feedback to your teachers or lecturers and your coaches regarding your progress

### **Finally – A Team Approach Works Best**

Many young rugby players suffering a suspected or confirmed concussion are in a learning environment that stresses the injured brain. Recognising this fact helps the recovery process. The most comprehensive evaluation and successful recovery from any concussion occurs when players, coaches, parents, teachers/lecturers and medical staff cooperate to completely evaluate and correctly manage the injured player. This process should involve a carefully monitored and safer progression to full academic activities and sports participation.

*Document Compiled by Dr Jon Patricios*

### **Additional References and Resources for Students, Parents and Educators**

1. Halstead M et al. Returning to learning following concussion. *Pediatrics* 2013;132:948-957.
2. BokSmart YouTube links: [www.Youtube.com/BokSmartSA](http://www.Youtube.com/BokSmartSA) or go to [www.BokSmart.com](http://www.BokSmart.com)
3. Dr.MikeEvans:  
<http://www.evanshealthlab.com/concussion-management-and-return-to-learn/>
4. Rocky Mountain Youth Sports Medicine Institute, Center for Concussion. REAP Guidelines. Available at:  
<http://rockymountainhospitalforchildren.com/service/concussion-management-reap-guidelines> .
5. Centers for Disease Control and Prevention: Fact Sheet for School Professionals on Returning to School after a Concussion:  
[http://www.cdc.gov/concussion/pdf/TBI\\_Returning\\_to\\_School-a.pdf](http://www.cdc.gov/concussion/pdf/TBI_Returning_to_School-a.pdf)
6. Centers for Disease Control and Prevention: Heads Up for Schools:  
<http://www.cdc.gov/concussion/HeadsUp/schools.html>
7. Centers for Disease Control and Prevention: Online Coaches Training:  
[http://www.cdc.gov/concussion/HeadsUp/online\\_training.html](http://www.cdc.gov/concussion/HeadsUp/online_training.html)
8. Frequently Asked Questions about 504 Plans:  
<http://www2.ed.gov/about/offices/list/ocr/504faq.html>
9. Sample Return to Learning Note for Physicians: <http://www.aap.org/en-us/>
10. McAbee GN. Pediatric Concussion, Cognitive Rest and Position Statements, Practice Parameters, and Clinical Practice Guidelines. *J Child Neurol* published online 7 October 2014 DOI: 10.1177/0883073814551794



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## How Can Concussion Be Prevented?

### **Why is prevention important?**

Concussion is a brain injury which should be identified, treated and managed correctly. Failure to do so can potentially have **serious short and long-term consequences**. Reducing the incidence or rate of concussion is important for rugby players' health, well-being and ongoing participation in the game.

### **Can all concussions be prevented?**

Concussion is a brain injury that occurs as a result of a direct or indirect blow to the brain.

Rugby is a collision sport with many high speed, high impact contact events between the players! Considering there are 2 teams of 15 players on the field, having frequent anticipated and unexpected collisions, within a dynamic ever-changing environment, it becomes very difficult to control the safety aspects of ALL contact situations between players. As a result, concussions will never be completely prevented.

However a number of important intervention strategies may help reduce the probability (chance) and incidence (rate) of concussions.

Equally important is a secondary prevention strategy to **avoid further concussions** in a player who has already suffered a concussive head injury. That is why **"Recognising and Removing"** is so essential for player well-being. It is also important to follow the most appropriate best practice concussion management protocols and individualised rehabilitation return to play guidelines before returning to full match play (details available here: [www.BokSmart.com/Concussion](http://www.BokSmart.com/Concussion) and here:

<https://my.boksmart.com/Documents/BokSmart#ConcussionManagement>).

## Five “E’s” of Concussion Prevention – Educate, Enforce, Enhance, Equip and Evaluate

### **Educate**

- The more you know about concussion, the more you can do to prevent concussions!
- Understand the impact and significance of concussion.
- Learn how to identify a concussed player and what YOU can do.
- Identify those situations which may place players at potential risk of concussion and be aware.
- Follow best practice principles in managing concussions in your players.
- Use the freely available BokSmart Concussion Guides, Concussion Recognition Tool 6 (CRT6), and BokSmart Concussion Resources in your club or school.
  - [www.BokSmart.com/Concussion](http://www.BokSmart.com/Concussion) and <https://my.boksmart.com/Documents/BokSmart#ConcussionManagement>
- Go online to the World Rugby *Player Welfare* site for their Concussion education modules:
  - <https://www.world.rugby//the-game/player-welfare/medical/concussion/>

### **Enforce**

- Play strictly by the laws of the game of rugby union.
- Forbid dangerous tackles and players flying in or diving recklessly into rucks.
- Ensure that ALL coaches and referees are BokSmart Certified at all times, carry their BokSmart Concussion Guides or Concussion Recognition Tool 6 (CRT6) with them (on their mobile phones) while working with players, and understand the principles of concussion prevention, identification, treatment, and management.
- Enforce the mandated ‘Individualised rehabilitation’ return to play protocol and stand down periods away from contact-rugby on all of your players who have suspected or confirmed concussions:
  - [www.BokSmart.com/Concussion](http://www.BokSmart.com/Concussion) and <https://my.boksmart.com/Documents/BokSmart#ConcussionManagement>

### **Enhance**

- Improve and work only on safe and effective tackling techniques. Do this often!
  - <https://www.youtube.com/watch?v=yqyTsHatXZY>
- The tackle phase contributes to around 61% of all concussions.
- The tackler is almost four times more susceptible to concussion than the ball carrier, and alone contributes to about 49% of all concussions, so perfecting tackle technique is crucial for preventing concussions.

- Tackle technique is often not good in younger developing rugby players, and still requires a lot of coaching and individual practice; this makes younger players more susceptible to getting it wrong on match day and getting concussed!
- Good tackling technique takes time to perfect; regular practicing of safe and effective tackling techniques should therefore start at a young age so that it eventually becomes instinctive.
- Local research has shown that concussion rates also increase as game time progresses in a match. This could be due to fatigue, as fatigue reduces tackle technique proficiency.
- So essentially, the fitter you are for rugby, the easier it is to maintain good tackle technique and reduce the risk of getting concussed!
- Therefore, make sure that you are well conditioned and are fit enough for the game of rugby to be able to compete safely in contact situations with good technique up until the final whistle!
  - <https://www.springboks.rugby/media/taifea1z/aspects-of-physical-conditioning-for-rugby.pdf>
  - <https://www.springboks.rugby/media/ewvborcf/physical-conditioning-for-rugby-players.pdf>
- It is also important to occasionally practice tackling under fatigued conditions to reinforce safer tackling techniques under these circumstances!
- Specifically strengthen the neck by referring to BokSmart’s guidelines! This should be done throughout the year!
  - <https://www.springboks.rugby/media/4afpkbof/practical-guidelines-neck-injury-prevention.pdf>
  - <https://www.springboks.rugby/media/utrmbkhz/safe-necks-exercises-infographic.pdf>
- Practice and coach safe rucking techniques, practices, and principles, especially for those players already in the ruck. These players are potentially more vulnerable and exposed to concussions than the players entering the ruck.

## **Equip**

- Although mouth guards do not always reduce the incidence of concussion, players should use them to prevent injuries to teeth, gums, and the tongue. It is preferable to have a mouth guard fitted by a dentist.
- The use of rugby headgear may help reduce friction injuries to the ears (“cauliflower ears”) as well as cuts to the scalp but do not prevent concussions.
- In other sports such as cycling, cricket and horse-riding hard helmets are useful in preventing concussion.

## **Evaluate**

- Ensure that your school or club has a concussion policy and action plan in place for suspecting, identifying, treating, and managing concussions.
- Reassess this policy at the end of every season and align it with the updated BokSmart protocols.
- For SARU's Concussion Regulation go to the following links:
  - <https://www.springboks.rugby/general/boksmart-legislation/> or on MyBokSmart at <https://my.boksmart.com/Documents/BokSmart#ImportantRegulations>
- Send all players with a **suspected concussion** for medical evaluation before allowing them to participate again.
- Ensure that all **suspected and diagnosed** concussions undergo the complete graduated '*individualised rehabilitation*' return to play protocol before returning to rugby.

## **Conclusion**

Concussions occur in many sporting and non-sporting situations. Preventing all concussions is impossible. However, adequate conditioning, all-year round neck strengthening, good tackle and ruck techniques, abiding by the laws of the game, appropriate use of equipment and a concussion policy that players, coaches, referees and supporters understand, will significantly help reduce the risks.

## **References and Useful Resources**

Tator C. *Sport Concussion Education and Prevention. Journal of Clinical Sport Psychology*, 2012, 6, 293-301


How can concussion be prevented? [www.cdc.gov/concussion/sports](http://www.cdc.gov/concussion/sports)

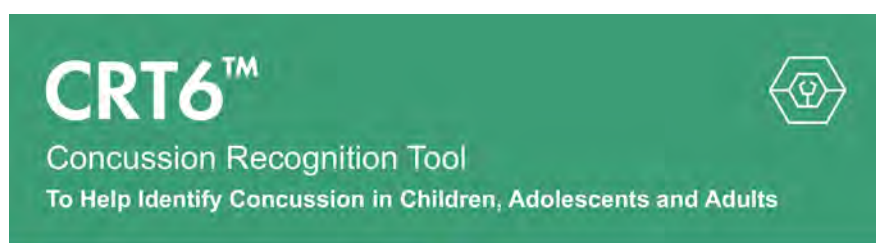
Heads-Up factsheet. [www.cdc.gov/concussion/headsup/youth.html](http://www.cdc.gov/concussion/headsup/youth.html)

BokSmart, unpublished data McFie et al. 2014



# The Concussion Recognition Tool 6 (CRT6)

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## What is the Concussion Recognition Tool?

A concussion is a brain injury. The Concussion Recognition Tool 6 (CRT6) is to be used by non-medically trained individuals for the identification and immediate management of suspected concussion. It is not designed to diagnose concussion.

## Recognise and Remove

### Red Flags: CALL AN AMBULANCE

If **ANY** of the following signs are observed or complaints are reported after an impact to the head or body the athlete should be immediately removed from play/game/activity and transported for urgent medical care by a healthcare professional (HCP):

- Neck pain or tenderness
- Seizure, 'fits', or convulsion
- Loss of vision or double vision
- Loss of consciousness
- Increased confusion or deteriorating conscious state (becoming less responsive, drowsy)
- Weakness or numbness/tingling in more than one arm or leg
- Repeated Vomiting
- Severe or increasing headache
- Increasingly restless, agitated or combative
- Visible deformity of the skull

## Remember

- In all cases, the basic principles of first aid should be followed: assess danger at the scene, check airway, breathing, circulation; look for reduced awareness of surroundings or slowness or difficulty answering questions.
- Do not attempt to move the athlete (other than required for airway support) unless trained to do so.
- Do not remove helmet (if present) or other equipment.
- Assume a possible spinal cord injury in all cases of head injury.
- Athletes with known physical or developmental disabilities should have a lower threshold for removal from play.

## If there are no Red Flags, identification of possible concussion should proceed as follows:

Concussion should be suspected after an impact to the head or body when the athlete seems different than usual. Such changes include the presence of **any one or more** of the following: visible clues of concussion, signs and symptoms (such as headache or unsteadiness), impaired brain function (e.g. confusion), or unusual behaviour.

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# CRT6

## Concussion Recognition Tool To Help Identify Concussion in Children, Adolescents and Adults

### 1: Visible Clues of Suspected Concussion

Visible clues that suggest concussion include:

- Loss of consciousness or responsiveness
- Lying motionless on the playing surface
- Falling unprotected to the playing surface
- Disorientation or confusion, staring or limited responsiveness, or an inability to respond appropriately to questions
- Dazed, blank, or vacant look
- Seizure, fits, or convulsions
- Slow to get up after a direct or indirect hit to the head
- Unsteady on feet / balance problems or falling over / poor coordination / wobbly
- Facial injury

### 2: Symptoms of Suspected Concussion

#### Physical Symptoms

- Headache
- "Pressure in head"
- Balance problems
- Nausea or vomiting
- Drowsiness
- Dizziness
- Blurred vision
- More sensitive to light
- More sensitive to noise
- Fatigue or low energy
- "Don't feel right"
- Neck Pain

#### Changes in Emotions

- More emotional
- More Irritable
- Sadness
- Nervous or anxious

#### Changes in Thinking

- Difficulty concentrating
- Difficulty remembering
- Feeling slowed down
- Feeling like "in a fog"

**Remember**, symptoms may develop over minutes or hours following a head injury.

### 3: Awareness

(Modify each question appropriately for each sport and age of athlete)

Failure to answer any of these questions correctly may suggest a concussion:

- "Where are we today?"
- "What event were you doing?"
- "Who scored last in this game?"
- "What team did you play last week/game?"
- "Did your team win the last game?"

**Any athlete with a suspected concussion should be - IMMEDIATELY REMOVED FROM PRACTICE OR PLAY and should NOT RETURN TO ANY ACTIVITY WITH RISK OF HEAD CONTACT, FALL OR COLLISION, including SPORT ACTIVITY until ASSESSED MEDICALLY, even if the symptoms resolve.**

Athletes with suspected concussion should **NOT**:

- Be left alone initially (at least for the first 3 hours). Worsening of symptoms should lead to immediate medical attention.
- Be sent home by themselves. They need to be with a responsible adult.
- Drink alcohol, use recreational drugs or drugs not prescribed by their HCP
- Drive a motor vehicle until cleared to do so by a healthcare professional



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**Contributors** RJE served as the primary author and responsible for all aspects of the project, including initial preparation, coordination, review, editing and final preparation of the manuscript and CRT6 tool. All co-authors contributed to the development and critical review of the manuscript and CRT6 tool, and approved the final version of the manuscript and tool.

**Competing interests** OHA reports employment from University Hospitals Dorset NHS Foundation Trust (England) as a Senior Physiotherapist, and paid employment from the Football Association (England) as Para Football Physiotherapy Lead, Para Football Classification Lead, and Physiotherapist to the England

Cerebral Palsy Football squad. Unpaid roles/voluntary roles: University of Portsmouth (England) as Visiting Senior Lecturer; Para Football Foundation as Medical Unit Co-Lead; the International Federation of Cerebral Palsy Football as Medical and Sports Science Director; the International Blind Sports Association as a Medical Committee member; British Journal of Sports Medicine as Associate Editor; BMJ Open Sports & Exercise Medicine as Associate Editor; World Rugby as Institutional Ethics Committee external member; and the Concussion in Para Sport Group as co-chair; and the Concussion in Sport Group as board member. CMB reports affiliations with the Cleveland Browns (National Football League) and Cleveland Monsters (American Hockey League), a board position in the Sports Neuropsychology Society, and occasional expert consulting fees. JMB reports being a part-time employee of the NHL. JMB's institution has received funding from Genzyme, and EyeGuide supporting his work, and he has served as a paid consultant to Med-IQ and Sporting KC. JSB reports receiving methods author funding for this review and Alexander Graham Bell Canada Graduate Scholarships-Doctoral Program. GAD is a member of the Scientific Committee of the 6th International Consensus Conference on Concussion in Sport; an honorary member of the AFL Concussion Scientific Committee; Section Editor, Sport and Rehabilitation, NEUROSURGERY; and has attended meetings organised by sporting organisations including the NFL, NRL, IIHF, IOC and FIFA; however has not received any payment, research funding, or other monies from these groups other than for travel costs. RJE is a paid consultant for the National Hockey League and co-chair of the National Hockey League /National Hockey League Players' Association Concussion Subcommittee, Major League Soccer's Concussion Committee and the US Soccer Federation, provides testimony in matters related to mTBI and reports a grant from Boston Children's Hospital (subaward from the National Football League) and travel support for the CIS conference and other professional conferences, an unpaid board member of CISG and leadership roles (unpaid) in professional organizations. GG Reports grant funding from CDC TEAM and OnTRACK grants, NIMH APNA grant, royalties from PAR, consulting fees from NFL Baltimore Ravens, Zogenix International, and Global Pharma Consultancy, and travel support for professional meetings. He is a member of USA Football Medical Advisory Panel. DH reports research support from the Eunice Kennedy Shriver National Institute of Child Health & Human Development, the National Institute of Neurological Disorders And Stroke, the National Institute of Arthritis and Musculoskeletal and Skin Diseases, 59th Medical Wing Department of the Air Force, MINDSOURCE Brain Injury Network, the Tai Foundation, and the Colorado Clinical and Translational Sciences Institute (UL1 TR002535-05) and he serves on the Scientific/Medical Advisory Board of Synaptek, LLC. GF is a member of the BJSM editorial board. CM reports no financial COI. She holds leadership positions with several organizations American College of Sports Medicine, American Medical Society for Sports Medicine, Pediatric Research in Sports Medicine, Council on Sports Medicine and Fitness, American Academy of Pediatrics, Untold Foundation, Pink Concussions, Headway Foundation, and the editorial boards of Journal of Adolescent Health, Frontiers in Neuroergonomics, Exercise, Sport, and Movement. JP reports travel support for the CIS conference and other professional meetings, consulting fees and grant funding from World Rugby, and an unpaid board member of CISG and EyeGuide. He is a member of the BJSM editorial board. KJS has received grant funding from the Canadian Institutes of Health Research (CIHR), NFL Scientific Advisory Board, International

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