



ECB

**HEAD INJURY & CONCUSSION
GUIDELINES**

2015



630



SUMMARY

- Concussion is a complex and potentially significant brain injury that must be taken seriously. Failure to do so can cause major consequences both in the immediate and long term
- Care must be taken to identify concussion, which can be difficult to diagnose and may also take time to present
- Any player with a suspected concussion must be removed from the field of play and undergo stepwise assessments
- A player cannot return to a match unless evaluation determines no concussion has occurred
- Any suspected concussion demands a graduated return to play and a player will miss the remainder of a match
- Children and adolescents require special considerations

ECB CONCUSSION GUIDELINES

ecb.co.uk/concussion

ECB health and safety Science and medicine department

The management of concussion forms only a small part of the overall health and safety provision to players and staff in cricket.

These guidelines are to be used by appropriately trained medical practitioners and should be used in conjunction with minimum standards of advanced life support and emergency care as stipulated by the ECB Cricket Science and Medicine Audit guidelines.

These are guidelines only and all players, where uncertainty or a significant concern is raised, should immediately be referred to specialist care.

The following guidelines are based on the Zurich Consensus Statement published in the British Journal of Sports Medicine in November 2013, a number of recent multisport forums, Consensus Panels and direct consultation with World Leaders and research centres in the field of concussion. The ECB medical panel has looked at best practice across sports and consulted documents such as FIFA 'Concussion Guidelines' 2014, BHRA and IRB / RFU 2014 guidelines.

Finally a consultation process was undertaken on 13th May 2015 with the ECB Medical panel, FCCC CMOs and Neurosurgical and Neurosciences concussion research team from NIHR Birmingham. The issues specific to cricket were debated, resulting in these concussion guidelines. The current management pathway helps to define application in the cricket environment. The consensus panel agreed that decisions taken and tools recommended would be supported by existing scientific evidence where available.

The guidelines do not replace or supersede the evaluation by a doctor or appropriately trained medical / healthcare professional. Forms and further information at ecb.co.uk/concussion

CONCUSSION IS A SERIOUS AND COMPLEX CONDITION THAT REQUIRES RESPECT

The management of the condition

Remember:

- Recognise
- Resuscitate
- Remove
- Refer
- Rest
- Recover
- Return

A concussion can be one of the most complex and challenging injuries to diagnose and manage. The immediate care appears increasingly important in light of developing awareness of the relationship between concussive episodes and early onset degenerative brain disease.

Concussion cannot be diagnosed through any one question, sign, symptom or test. It requires multiple modes of assessment that may well need repeating, and then a necessary careful reintroduction to play. Because of this complex process, concussion is not only easily missed and under-diagnosed, but often results in inappropriate early return to play.

Although our understanding of the true pathology of a concussive injury is still far from complete, it is now considered more than a simple functional disturbance.

Instead it should be considered a form of Minor Traumatic Brain Injury (MTBI) +/- Microscopic injury to nerve cells that causes a 'cell crisis', brain dysfunction and the potential for true cell damage.

The management in cricket is no different to any other sport and should still follow the basic premise of the Zurich Consensus 2013.

DEFINITION OF CONCUSSION

Concussion is a brain injury and is defined as a complex pathophysiological process affecting the brain, induced by biomechanical forces. Several common features that incorporate the result of clinical, pathological and biomechanical injury may be utilised in defining the nature of a concussive head injury. These include:

1. Concussion 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. A blow from the ball to the grill and or helmet with no apparent injury may still result in concussion due to multi-directional force transmission, e.g. rotation and brain acceleration / deceleration. Concussion can also occur with collisions both in the field and whilst batting.
2. Concussion typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously. However, in some cases, symptoms and signs may evolve over a number of minutes or hours.
3. Concussion may result in neuropathological changes, but the acute clinical symptoms largely reflect a functional disturbance rather than a structural injury and, as such, no abnormality is seen on standard structural neuroimaging studies.
4. Concussion results in a set of clinical symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course. However, it is important to note that in some cases symptoms may be prolonged.

The risk of concussion in cricket appears relatively low compared to some sports but carries significant risk in that the cricket ball can be projected at a high velocity directly at someone's head within the laws of the game. Although protective headgear is usually worn it is not failsafe, not worn in all situations, and uncommonly by fielders and umpires. Furthermore the design of helmets does not routinely cover the occipital region well, as illustrated by the recent fatality in Australian cricket of Phillip Hughes.

Despite this tragedy, head injuries do not occur frequently. They are most common while in the process of batting and when collisions occur in the act of fielding. All recorded injuries in county cricket over the last 5 years detail relatively few (37) head injuries. Of these only 14 detail any component of concussion. The main reason that the rate appears so low is likely to be related to use of helmets but may also be related to underreporting. This is being further evaluated through injury surveillance, a research pilot and also a retired cricketers survey.

Either way the rate appears to be much lower (approximately 100th less) than that of other contact sports such as rugby. In addition the number of recurrent and extended concussions (i.e. more than 10 days) also appears very low.

CONSEQUENCES OF A CONCUSSION

Short term

Short term consequences can include physical, physiological and mental issues. Patients with a concussion can have headaches, poor cognition, poor coordination, reduced physical performance and alteration of mood (more specifically depression). People who have had a concussion in other sports are 8 times as likely to suffer a significant musculoskeletal injury within that game if they continue to play, and over the next six months have a 40% increased risk of musculoskeletal injury compared to a non-concussed cohort.

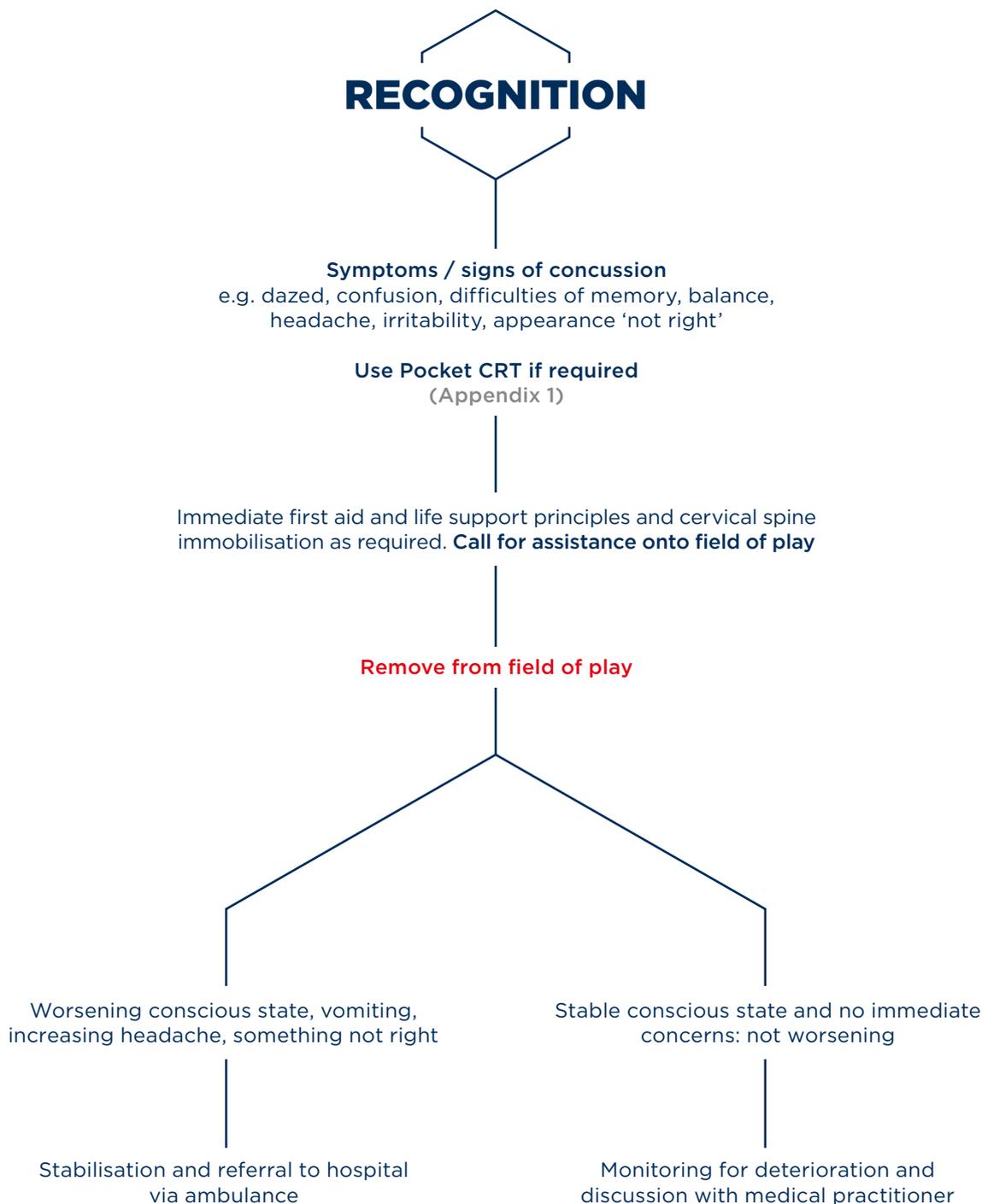
Long term

There is no direct evidence of long term deficits following exposure to concussion in cricket. However, recent research into the long term consequence of Traumatic Brain Injury (TBI) has suggested that profound neurodegenerative changes may be a consequence of repeated moderate TBI such as those seen in boxing and traumatic / contact sports including American Football and Rugby often, referred to as Chronic Traumatic Encephalopathy.

FLOW CHART 1

MANAGEMENT OF SUSPECTED HEAD INJURY / CONCUSSION

Basic first aid principles apply with immediate assessment of level of consciousness AVPU and subsequent ADBCDE, e.g. airways, cervical management, breathing, circulation, cervical neck management and call for assistance.



MATCH DAY MANAGEMENT

The management of a concussion requires well established, immediate care plans, equipment, staffing and training in accordance with ECB guidelines. However, there are key and important steps in the management of concussion. These include:

- 1. Recognise:** Both the immediate and delayed presentation of concussion can be complex and thus a high index of suspicion must be maintained. Symptoms and signs must be used as well as tools such as the Pocket CRT (Appendix 1). If in doubt the player should be removed from the field of play for further assessment. Additional signs and symptoms are outlined in Table 1.
- 2. Resuscitate:** Any immediate concerns regarding conscious levels and severity of injury demands immediate resuscitation with appropriate emergency care and request for assistance.
- 3. Remove:** Any suspected concussion demands removal from the field of play. This allows for a formal assessment using SCAT3 (Appendix 2) and or medical evaluation.
- 4. Refer:** If the situation appears uncertain or worsening, immediate referral to specialist care including hospital emergency departments is necessary. A medical doctor trained in the management of head injuries may make an assessment at the ground.
- 5. Return to Play (RTP):** If a diagnosis of a concussion is made, an appropriate graded return to play in accordance with Zurich consensus and with cricket specific functional testing (Page 13 -Table 2) should be undertaken. Once symptomatic (following the required **Rest / Recovery**) a true concussion is likely to require a minimum of six days to return to play.

As well as a suspected concussion, all trauma and suspected injuries should be managed as per advanced life support training including ECB pitch side trauma management.

If the testing is normal and there are no concerns then the player can stay on, and upon leaving the field another check with a Pocket CRT can be considered.

Modified Maddocks

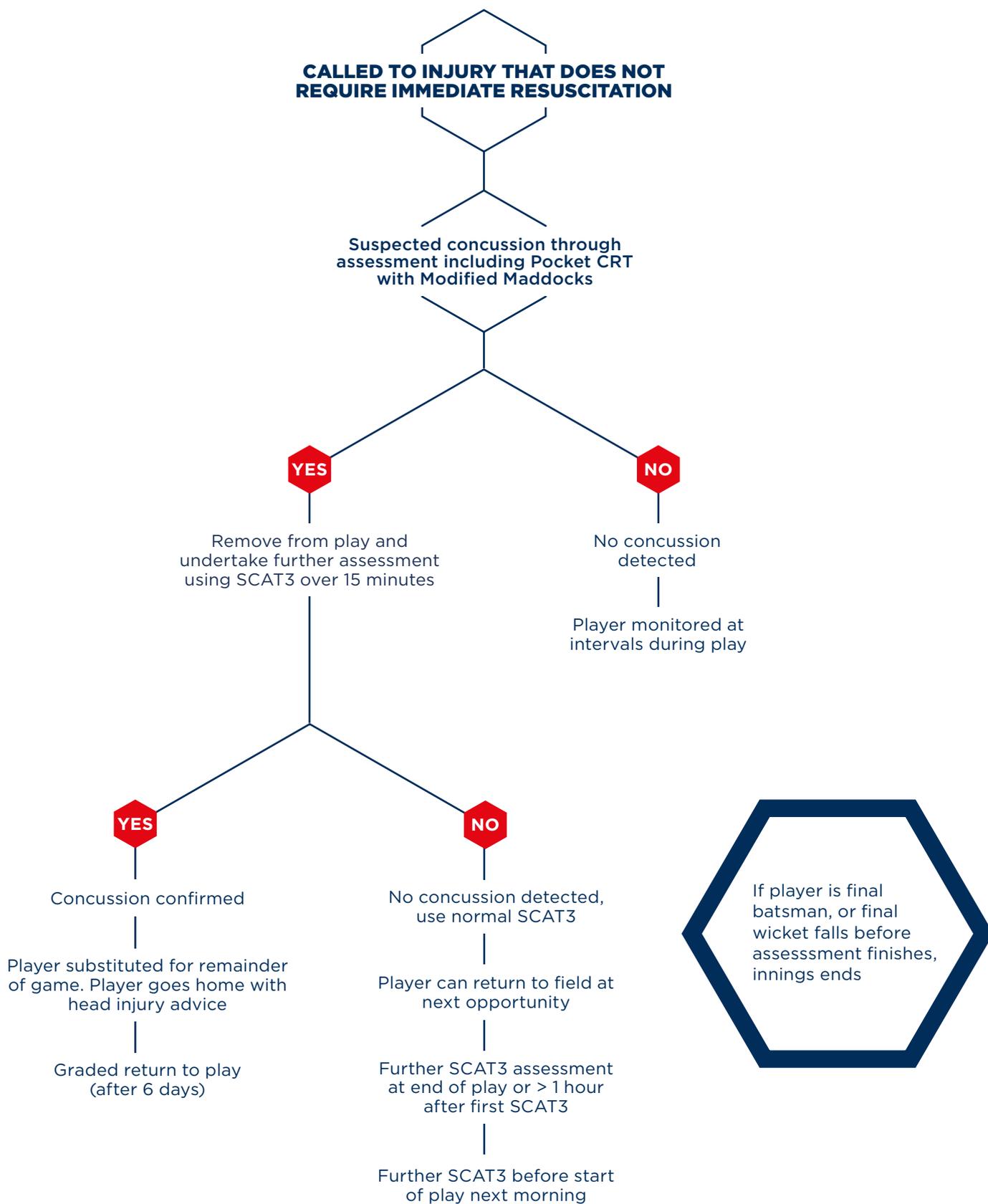
The CRT and SCAT3 questions will need to be modified for cricket:

- “What venue are we at today?”
- “Which session of the game are we in?”
- “Who is bowling / batting at the moment in this game?”
- “What team did you play last week / game?”
- “What was the score / your score in the last game?”

These questions should be used in the same manner as the Pocket CRT or SCAT3 questions they replace.

FLOW CHART 2 MANAGEMENT OF SUSPECTED / POSSIBLE CONCUSSION

Without significant deterioration and possible normal outcome of assessments.



If player is final batsman, or final wicket falls before assessment finishes, innings ends



RECOGNITION OF CONCUSSION

Modified Maddocks

“What venue are we at today?”

“Which session of the game are we in?”

“Who is bowling / batting at the moment in this game?”

“What team did you play last week / game?”

“What was the score / your score in the last game?”

If called to the field, a pocket CRT with amended Maddocks questions should be used if the concussion is not obvious.

Recognising the concussion is perhaps the most important step in immediate management.

Clues to concussion can include:

- Any loss of consciousness / responsiveness
- Slow to get up / lying motionless for any period
- Blank or vacant expression
- Balance / coordination problems: unsteady on feet
- Disorientation / confusion, difficulty answering questions / unaware of situation
- Loss of memory
- Visible facial or head injury

If the player has any features of the above they must be removed from the field for further assessment and or resuscitated and stabilised as appropriate.

TABLE 1
ADDITIONAL SIGNS AND SYMPTOMS OF A CONCUSSION

EMOTIONAL

Nervous or anxious

Irritable

Sad

More emotional

COGNITIVE

Confused

Feeling slowed down

Fatigue or low energy - feeling like "in a fog"

Loss of memory

"Don't feel right"

Sensitive to noise

Difficulty remembering

Difficulty concentrating

PHYSICAL

Loss of consciousness - headache

Seizure or convulsion - dizziness

Balancing problems

Nausea or vomiting

Drowsiness - "pressure in head"

Blurred vision

Sensitive to light

Neck pain

If the testing is normal and there are no concerns, then the player can stay on and upon leaving the field another check with a Pocket CRT can be considered.

SUSPECTED / DETERMINED CONCUSSION

The player will need removal from the field of play and a full head injury assessment should be undertaken using the SCAT3. Cricket allows for a player to be substituted whilst fielding, or when batting to retire hurt. If the subsequent assessment using SCAT3 determines no actual concussion the batsman can return to the field at the next opportunity. A fielder can return at an appropriate moment in play.

All suspected of a concussion must be removed from the field of play and follow ECB / Zurich consensus return to play guidelines.

FOLLOW UP ASSESSMENTS

Any player who fulfils the following criteria needs ongoing head injury assessment on removal from play, at the end of the day's play with a minimum of at least an hour after the initial SCAT3, and the following morning before the start of play. These repeat assessments allow for the subtle or delayed concussion to be more accurately determined.

1. Player is deemed to have a concussion with immediate assessment
2. Player needed to be removed from the field of play for assessment
 - a. In whom the severity of injury raised the possibility of a concussion
 - b. In whom there are any initial or subsequent signs that raise suspicion of a concussion
3. All players who have required a SCAT3 assessment should not be discharged without head injury advice

NEXT DAY ASSESSMENT BEFORE PLAY

Cricket somewhat uniquely continues play for many days and thus the morning after the original injury allows a final SCAT3 to be undertaken to help exclude a delayed diagnosis of concussion. This can include additional subtle signs such as sleep disturbance, feeling "in a fog", emotional changes and memory function. If at this stage the repeat SCAT3 is indicative of a concussion then the management must be as per the 'concussion diagnosed' section (above right).

CONCUSSION DIAGNOSED

When a concussion is diagnosed the player must be removed from the field of play and may not return in that game regardless of duration of the match (limited over, T20, 2-5 days). A concussion must be managed by a healthcare professional who is trained and practised in head injury management. If the practitioner is uncertain then consultation / referral to a doctor with appropriate training must occur.

If there are any concerns regarding the severity of the injury or the potential for deterioration then the player should be transferred to specialist medical care and in the following circumstances needs **urgent transfer to hospital**:

1. Prolonged period of loss of consciousness
 2. Reduced GCS – deterioration in level of consciousness
 3. Seizures
 4. Ongoing confusion
 5. Worsening headaches
 6. Signs of intracranial pressure or intracranial nerve injury
 7. Vomiting
 8. Indication of additional trauma / neck injury / spinal cord injury
- **These concussion guidelines do not replace medical judgment and all uncertainties require assessment by an appropriately trained and skilled doctor.**
 - **Special attention needs to be made for children / adolescents whose recovery is slower; this will be covered separately.**

HEAD INJURY ADVICE

Any player where a suspicion of a head injury / concussion has been raised must be monitored both on and of the field and should not leave the ground without head injury advice.

HEAD INJURY ADVICE

This patient has received an injury to the head and no sign of any serious complications has been found¹.

If you notice any change in behaviour, vomiting, dizziness, worsening headache, double vision or excessive drowsiness, please contact your medical team or the nearest hospital emergency department immediately.

Important points:

- Rest (physically and mentally), including training or playing sports, until symptoms resolve and you are medically cleared
- No alcohol
- No prescription or non-prescription drugs without medical supervision

Specifically:

- No sleeping tablets
- Do not use aspirin, anti-inflammatory medication or sedating painkillers
- Do not drive until medically cleared
- Do not train or play sport until medically cleared

GRADUATED RETURN TO PLAY (GRTP)

The nature of any concussion should be taken on a case-by-case basis.

However, regardless of the extent or nature of the concussion there is a need for immediate cognitive and physical rest.

The understanding of the injury is evolving but it is certain that neurophysiology suggests that the brain does not begin to recover for some days after the initial insult and that there is an increased risk of injury for some time after the initial injury.

A healthcare professional trained in the management of RTP and head injuries must supervise the GRTP. Where there appears to be any delay or complication, the GRTP must be in conjunction with a doctor with specialist training in head injury management and RTP. All concussions must be discussed with the club CMO, appropriate specialist, doctor and a face-to-face review.

All symptoms need to be absent for 24 hours before simple cognitive and physical activities can be undertaken. Graded steps of gradual increase in activity must be accompanied by a 24-hour window to check for further symptoms or signs. To achieve the level 5 / 6 as identified in Table 2, the player needs a 24-hour window for each level and therefore means no further return to a full training situation for six days.

Failed graded return

Under the GRTP programme, the player can proceed to the next stage only if there are no symptoms of concussion during rest and at the level of exercise achieved in the previous GRTP stage. If any symptoms occur while going through the GRTP programme, the player must return to the previous stage and attempt to progress again after a minimum 24-hour period of rest without symptoms.

TABLE 2
GRADED RETURN TO PLAY

Staged Rehabilitation	Functional exercise at each stage of rehabilitation	Objective of each stage
No activity for 24 hours	Complete rest: physical and cognitive Needs minimum 24-hour window of being symptom free	Recovery / rest
Light aerobic exercise	Walking, swimming or stationary cycling, keeping intensity mild to moderate (i.e. not out of breath) <70% maximum permitted heart rate. Duration should not exceed approx. 20-30 min. Avoid resistance exercises	Increase exertion / heart rate / SNS
Sport-specific exercise	Simple fielding (catching / throwing), low key batting. Bowlers bowl to empty net at around 50% avoiding exposure to H.I. risk. Controlled, familiar and predictable batting drills. Increase H.R. activities to closer to maximum	Add movement / coordination
Non-contact training drills	Progression to more complex training drills, e.g. moderately challenging fielding drills. Batting against throws / machine (predictable). Bowling to empty net 75%-100%. May start progressive resistance training. Maximum cardiovascular stress	Exercise, coordination and cognitive load
Full-contact practice	Following medical clearance, participate in normal / match preparation at high intensity, i.e. bowlers bowl to batsmen. Full batting, bowling and fielding	Restore confidence and assess functional skills by coaching staff
Return to play	Normal game play	

CHILDREN AND ADOLESCENTS: ADDITIONAL RISK

Children's / adolescents' (5-19 yrs) brains are still developing and as such, all children and adolescents require additional caution in the management of head injuries. The child and adolescent brain is still improving its learning potential and thus it is imperative that the cognitive function is restored as a priority before any return to sport is considered.

This in addition to other differences in physiological responses and specific risks (e.g. diffuse cerebral swelling related to head impact) demands a more conservative RTP approach. It is appropriate to extend the amount of time of asymptomatic rest and / or the length of the graded exertion in children and adolescents.

All children under the age of 12 should be assessed using the Child SCAT3 (Appendix 3).

The priority in the management of RTP in any child / adolescent must be seen to be a successful return to normal school function before they can return to sport. It is likely that in this case the RTP is 23 days. There are specific additional return-to-school guidelines, which include extra-time for assignments / exams, quiet study areas, increased breaks, rests and reduction in stressful / responsible situations. Any return to play should be signed off by appropriate medical clearance and any worsening symptoms and signs or failure to recover as expected, demands further specialist referral.

ADDITIONAL RISK MODIFIERS

Apply guidelines and RTP advice even more rigorously to this population than adults.

A concussion modifiers list appears on the following page.

TABLE 3
FACTORS THAT MODIFY CONCUSSION PROGRESSION
OF RETURN TO PLAY

Symptoms - number

Duration - (>10 days)

Severity

Signs - prolonged loss of consciousness (LOC) (>1 min)

Loss of memory

Post concussion - new onset convulsion

Temporal frequency - repeated concussions over time

Timing - injuries close together in time

'Recency' - recent concussion or traumatic brain injury (TBI)

Threshold - repeated concussions occurring with progressively less impact force or slower recovery after each successive concussion

Age - child and adolescent (<18 years old)

Comorbidities and premorbidities

Migraine, depression or other mental health, attention deficit hyperactivity disorders (ADHD), learning disabilities (LD) and sleep disorders

Medication - psychoactive drugs, anticoagulants

Behaviour - e.g. dangerous style of play

Sport - high-risk activity, contact and collision sport, high sporting level

FAILED RETURN TO PLAY

Any delay or concern in a return to play demands urgent neurological or neurosurgical consultancy before continuing or progressing. Assessment may also be considered through the research centres and specialist advisers from the ECB.

RESEARCH

The ECB is dedicated to ensuring the game is safe for participants and support staff and that the understanding of the injury of a concussion and relationship with the sport is understood. The ECB is therefore engaged in research with the Neurosurgeon Prof. Toni Belli and team at the NIHR SMRC.

If you wish to contact this group, please contact Dr Nick Peirce CMO on nick.peirce@ecb.co.uk. In addition the NIHR Senior Lecturer Douglas Hammond can be contacted on douglashammond1976@gmail.com. Up-to-date details can be found on ecb.co.uk/concussion.

These guidelines are for use by appropriately trained healthcare professionals. There are additional guidelines for use across the recreational game and educational sector (available from NCPC and ECB website).

ECB PREVENTION OF CONCUSSION PROGRAMME

In order for the true incidence, prevalence, pattern and nature of concussion to be best understood, all head injuries, concussions and 'near misses' must be recorded using the ECB injury surveillance system or reported to the ECB Chief Medical Officer, a member of the ECB medical panel or National Lead for Physiotherapy. All completed SCAT3 forms should be uploaded and a standardised head injury recording sheet will be provided on the ECB online injury surveillance system.

BASELINE TESTING

The ECB recommends all players undertake a baseline SCAT3 assessment which could form part of the off-season player profiling screening. This can then be compared to post injury scores in both the diagnosis of a concussion and the RTP evaluation.

PROTECTIVE EQUIPMENT: HELMET, GRILLS, FACEGUARDS

Helmets have been tested for some time with regards to their ability to attenuate head form impact and appear effective.

There is overwhelming evidence from injury surveillance that wearing an appropriate head protector can significantly reduce the risk of serious injury to cricketers when batting or close-fielding.

The design and manufacture of cricket head protectors is now governed by British Standard **BS7928:2013**, which has been adopted by the ICC as the international standard. The wearing of head protectors that meet this standard is strongly advised for all cricketers, when batting, wicket-keeping up to the stumps, or fielding close to the wicket, whether in matches or practice sessions, and is likely to be mandatory in the near future in many circumstances.

APPENDICES

Appendix I
Pocket Concussion Tool
(Pocket CRT)

Appendix II
SCAT3 - baseline testing

Appendix III
Child SCAT3

References

McCrory P, et al. Br J Sports Med 2013;
47:250-258

Nordstrom, A et al. Br J Sports Med 2014;
48:09:1447-1450

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POCKET CONCUSSION RECOGNITION TOOL™

TO HELP IDENTIFY CONCUSSION IN CHILDREN, YOUTH AND ADULTS



Recognise & remove

Concussion should be suspected **if one or more** of the following visible clues, signs, symptoms or errors in memory questions are present.

1. Visible clues of suspected concussion

Any one or more of the following visual clues can indicate a possible concussion:

- Loss of consciousness or responsiveness
- Lying motionless on ground / slow to get up
- Unsteady on feet / balance problems or falling over / Uncoordination
- Grabbing / clutching of head
- Dazed, blank or vacant look
- Confused / not aware of plays or events

2. Signs and symptoms of suspected concussion

Presence of any **one or more** of the following signs and symptoms may suggest a concussion:

- Loss of consciousness	- Headache
- Seizure or convulsion	- Dizziness
- Balance problems	- Confusion
- Nausea or vomiting	- Feeling slowed down
- Drowsiness	- "Pressure in head"
- More emotional	- Blurred vision
- Irritability	- Sensitivity to light
- Sadness	- Amnesia
- Fatigue or low energy	- Feeling like "in a fog"
- Nervous or anxious	- Neck pain
- "Don't feel right"	- Sensitivity to noise
- Difficulty remembering	- Difficulty concentrating

POCKET CONCUSSION RECOGNITION TOOL™

TO HELP IDENTIFY CONCUSSION IN CHILDREN, YOUTH AND ADULTS

3. Memory function

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

“What venue are we at today?”

“Which half is it now?”

“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 PLAY, and should not be returned to activity until they are assessed medically. Athletes with a suspected concussion should not be left alone and should not drive a motor vehicle.

It is recommended that, in all cases of suspected concussion, the player is referred to a medical professional for diagnosis and guidance as well as return to play decisions, even if the symptoms resolve.

Red flags

If ANY of the following are reported then the player should be safely and immediately removed from the field. If no qualified medical professional is available, consider transporting by ambulance for urgent medical assessment:

- Athlete complains of neck pain
- Increasing confusion or irritability
- Repeated vomiting
- Seizure or convulsion
- Weakness or tingling / burning in arms or legs
- Deteriorating conscious state
- Severe or increasing headache
- Unusual behaviour change
- Double vision

Remember:

- In all cases, the basic principles of first aid (danger, response, airway, breathing, circulation) should be followed
- Do not attempt to move the player (other than required for airway support) unless trained to do so
- Do not remove helmet (if present) unless trained to do so

SCAT3™



FIFA®



FEI

Sport Concussion Assessment Tool – 3rd Edition

For use by medical professionals only

Name

Date/Time of Injury:
Date of Assessment:

Examiner:

What is the SCAT3?¹

The SCAT3 is a standardized tool for evaluating injured athletes for concussion and can be used in athletes aged from 13 years and older. It supersedes the original SCAT and the SCAT2 published in 2005 and 2009, respectively². For younger persons, ages 12 and under, please use the Child SCAT3. The SCAT3 is designed for use by medical professionals. If you are not qualified, please use the Sport Concussion Recognition Tool¹. Preseason baseline testing with the SCAT3 can be helpful for interpreting post-injury test scores.

Specific instructions for use of the SCAT3 are provided on page 3. If you are not familiar with the SCAT3, please read through these instructions carefully. This tool may be freely copied in its current form for distribution to individuals, teams, groups and organizations. Any revision or any reproduction in a digital form requires approval by the Concussion in Sport Group.

NOTE: The diagnosis of a concussion is a clinical judgment, ideally made by a medical professional. The SCAT3 should not be used solely to make, or exclude, the diagnosis of concussion in the absence of clinical judgement. An athlete may have a concussion even if their SCAT3 is "normal".

What is a concussion?

A concussion is a disturbance in brain function caused by a direct or indirect force to the head. It results in a variety of non-specific signs and/or symptoms (some examples listed below) and most often does not involve loss of consciousness. Concussion should be suspected in the presence of **any one or more** of the following:

- Symptoms (e.g., headache), or
- Physical signs (e.g., unsteadiness), or
- Impaired brain function (e.g. confusion) or
- Abnormal behaviour (e.g., change in personality).

SIDELINE ASSESSMENT

Indications for Emergency Management

NOTE: A hit to the head can sometimes be associated with a more serious brain injury. Any of the following warrants consideration of activating emergency procedures and urgent transportation to the nearest hospital:

- Glasgow Coma score less than 15
- Deteriorating mental status
- Potential spinal injury
- Progressive, worsening symptoms or new neurologic signs

Potential signs of concussion?

If any of the following signs are observed after a direct or indirect blow to the head, the athlete should stop participation, be evaluated by a medical professional and **should not be permitted to return to sport the same day** if a concussion is suspected.

- Any loss of consciousness? Y N
 "If so, how long?" _____
- Balance or motor incoordination (stumbles, slow/laboured movements, etc.)? Y N
 Disorientation or confusion (inability to respond appropriately to questions)? Y N
 Loss of memory: Y N
 "If so, how long?" _____
 "Before or after the injury?" _____
- Blank or vacant look: Y N
 Visible facial injury in combination with any of the above: Y N

1 Glasgow coma scale (GCS)

Best eye response (E)

No eye opening	1
Eye opening in response to pain	2
Eye opening to speech	3
Eyes opening spontaneously	4

Best verbal response (V)

No verbal response	1
Incomprehensible sounds	2
Inappropriate words	3
Confused	4
Oriented	5

Best motor response (M)

No motor response	1
Extension to pain	2
Abnormal flexion to pain	3
Flexion/Withdrawal to pain	4
Localizes to pain	5
Obeys commands	6

Glasgow Coma score (E + V + M) of 15

GCS should be recorded for all athletes in case of subsequent deterioration.

2 Maddocks Score³

"I am going to ask you a few questions, please listen carefully and give your best effort."

Modified Maddocks questions (1 point for each correct answer)

What venue are we at today?	0	1
Which half is it now?	0	1
Who scored last in this match?	0	1
What team did you play last week/game?	0	1
Did your team win the last game?	0	1
Maddocks score	of 5	

Maddocks score is validated for sideline diagnosis of concussion only and is not used for serial testing.

Notes: Mechanism of Injury ("tell me what happened?"):

Any athlete with a suspected concussion should be REMOVED FROM PLAY, medically assessed, monitored for deterioration (i.e., should not be left alone) and should not drive a motor vehicle until cleared to do so by a medical professional. No athlete diagnosed with concussion should be returned to sports participation on the day of injury.

BACKGROUND

Name: _____ Date: _____
 Examiner: _____
 Sport/team/school: _____ Date/time of injury: _____
 Age: _____ Gender: M F
 Years of education completed: _____
 Dominant hand: right left neither
 How many concussions do you think you have had in the past? _____
 When was the most recent concussion? _____
 How long was your recovery from the most recent concussion? _____
 Have you ever been hospitalized or had medical imaging done for a head injury? Y N
 Have you ever been diagnosed with headaches or migraines? Y N
 Do you have a learning disability, dyslexia, ADD/ADHD? Y N
 Have you ever been diagnosed with depression, anxiety or other psychiatric disorder? Y N
 Has anyone in your family ever been diagnosed with any of these problems? Y N
 Are you on any medications? If yes, please list: Y N

SCAT3 to be done in resting state. Best done 10 or more minutes post exercise.

SYMPTOM EVALUATION

3 How do you feel?

"You should score yourself on the following symptoms, based on how you feel now".

	none	mild	moderate	severe			
Headache	0	1	2	3	4	5	6
"Pressure in head"	0	1	2	3	4	5	6
Neck Pain	0	1	2	3	4	5	6
Nausea or vomiting	0	1	2	3	4	5	6
Dizziness	0	1	2	3	4	5	6
Blurred vision	0	1	2	3	4	5	6
Balance problems	0	1	2	3	4	5	6
Sensitivity to light	0	1	2	3	4	5	6
Sensitivity to noise	0	1	2	3	4	5	6
Feeling slowed down	0	1	2	3	4	5	6
Feeling like "in a fog"	0	1	2	3	4	5	6
"Don't feel right"	0	1	2	3	4	5	6
Difficulty concentrating	0	1	2	3	4	5	6
Difficulty remembering	0	1	2	3	4	5	6
Fatigue or low energy	0	1	2	3	4	5	6
Confusion	0	1	2	3	4	5	6
Drowsiness	0	1	2	3	4	5	6
Trouble falling asleep	0	1	2	3	4	5	6
More emotional	0	1	2	3	4	5	6
Irritability	0	1	2	3	4	5	6
Sadness	0	1	2	3	4	5	6
Nervous or Anxious	0	1	2	3	4	5	6

Total number of symptoms (Maximum possible 22) _____
Symptom severity score (Maximum possible 132) _____
 Do the symptoms get worse with physical activity? Y N
 Do the symptoms get worse with mental activity? Y N
 self rated self rated and clinician monitored
 clinician interview self rated with parent input
Overall rating: If you know the athlete well prior to the injury, how different is the athlete acting compared to his/her usual self?
 Please circle one response:
 no different very different unsure N/A

Scoring on the SCAT3 should not be used as a stand-alone method to diagnose concussion, measure recovery or make decisions about an athlete's readiness to return to competition after concussion. Since signs and symptoms may evolve over time, it is important to consider repeat evaluation in the acute assessment of concussion.

COGNITIVE & PHYSICAL EVALUATION

4 Cognitive assessment

Standardized Assessment of Concussion (SAC)⁴

Orientation (1 point for each correct answer)

What month is it?	0	1
What is the date today?	0	1
What is the day of the week?	0	1
What year is it?	0	1
What time is it right now? (within 1 hour)	0	1

Orientation score _____ of 5

Immediate memory

List	Trial 1	Trial 2	Trial 3	Alternative word list					
elbow	0	1	0	1	0	1	candle	baby	finger
apple	0	1	0	1	0	1	paper	monkey	penny
carpet	0	1	0	1	0	1	sugar	perfume	blanket
saddle	0	1	0	1	0	1	sandwich	sunset	lemon
bubble	0	1	0	1	0	1	wagon	iron	insect

Total _____

Immediate memory score total _____ of 15

Concentration: Digits Backward

List	Trial 1	Alternative digit list			
4-9-3	0	1	6-2-9	5-2-6	4-1-5
3-8-1-4	0	1	3-2-7-9	1-7-9-5	4-9-6-8
6-2-9-7-1	0	1	1-5-2-8-6	3-8-5-2-7	6-1-8-4-3
7-1-8-4-6-2	0	1	5-3-9-1-4-8	8-3-1-9-6-4	7-2-4-8-5-6

Total of 4 _____

Concentration: Month in Reverse Order (1 pt. for entire sequence correct)

Dec-Nov-Oct-Sept-Aug-Jul-Jun-May-Apr-Mar-Feb-Jan	0	1
--	---	---

Concentration score _____ of 5

5 Neck Examination:

Range of motion _____ Tenderness _____ Upper and lower limb sensation & strength _____
Findings: _____

6 Balance examination

Do one or both of the following tests.
 Footwear (shoes, barefoot, braces, tape, etc.) _____

Modified Balance Error Scoring System (BESS) testing⁵

Which foot was tested (i.e. which is the non-dominant foot) Left Right
 Testing surface (hard floor, field, etc.) _____

Condition	Errors
Double leg stance:	_____ Errors
Single leg stance (non-dominant foot):	_____ Errors
Tandem stance (non-dominant foot at back):	_____ Errors

And/Or

Tandem gait^{6,7}
 Time (best of 4 trials): _____ seconds

7 Coordination examination

Upper limb coordination
 Which arm was tested: Left Right
Coordination score _____ of 1

8 SAC Delayed Recall⁴

Delayed recall score _____ of 5

INSTRUCTIONS

Words in *Italics* throughout the SCAT3 are the instructions given to the athlete by the tester.

Symptom Scale

"You should score yourself on the following symptoms, based on how you feel now".

To be completed by the athlete. In situations where the symptom scale is being completed after exercise, it should still be done in a resting state, at least 10 minutes post exercise.

For total number of symptoms, maximum possible is 22.

For Symptom severity score, add all scores in table, maximum possible is 22x6 = 132.

SAC⁴

Immediate Memory

"I am going to test your memory. I will read you a list of words and when I am done, repeat back as many words as you can remember, in any order."

Trials 2 & 3:

"I am going to repeat the same list again. Repeat back as many words as you can remember in any order, even if you said the word before."

Complete all 3 trials regardless of score on trial 1 & 2. Read the words at a rate of one per second. **Score 1 pt. for each correct response.** Total score equals sum across all 3 trials. Do not inform the athlete that delayed recall will be tested.

Concentration

Digits backward

"I am going to read you a string of numbers and when I am done, you repeat them back to me backwards, in reverse order of how I read them to you. For example, if I say 7-1-9, you would say 9-1-7."

If correct, go to next string length. If incorrect, read trial 2. **One point possible for each string length.** Stop after incorrect on both trials. The digits should be read at the rate of one per second.

Months in reverse order

"Now tell me the months of the year in reverse order. Start with the last month and go backward. So you'll say December, November ... Go ahead"

1 pt. for entire sequence correct

Delayed Recall

The delayed recall should be performed after completion of the Balance and Coordination Examination.

"Do you remember that list of words I read a few times earlier? Tell me as many words from the list as you can remember in any order."

Score 1 pt. for each correct response

Balance Examination

Modified Balance Error Scoring System (BESS) testing⁵

This balance testing is based on a modified version of the Balance Error Scoring System (BESS)⁵. A stopwatch or watch with a second hand is required for this testing.

"I am now going to test your balance. Please take your shoes off, roll up your pant legs above ankle (if applicable), and remove any ankle taping (if applicable). This test will consist of three twenty second tests with different stances."

(a) Double leg stance:

"The first stance is standing with your feet together with your hands on your hips and with your eyes closed. You should try to maintain stability in that position for 20 seconds. I will be counting the number of times you move out of this position. I will start timing when you are set and have closed your eyes."

(b) Single leg stance:

"If you were to kick a ball, which foot would you use? [This will be the dominant foot] Now stand on your non-dominant foot. The dominant leg should be held in approximately 30 degrees of hip flexion and 45 degrees of knee flexion. Again, you should try to maintain stability for 20 seconds with your hands on your hips and your eyes closed. I will be counting the number of times you move out of this position. If you stumble out of this position, open your eyes and return to the start position and continue balancing. I will start timing when you are set and have closed your eyes."

(c) Tandem stance:

"Now stand heel-to-toe with your non-dominant foot in back. Your weight should be evenly distributed across both feet. Again, you should try to maintain stability for 20 seconds with your hands on your hips and your eyes closed. I will be counting the number of times you move out of this position. If you stumble out of this position, open your eyes and return to the start position and continue balancing. I will start timing when you are set and have closed your eyes."

Balance testing – types of errors

1. Hands lifted off iliac crest
2. Opening eyes
3. Step, stumble, or fall
4. Moving hip into > 30 degrees abduction
5. Lifting forefoot or heel
6. Remaining out of test position > 5 sec

Each of the 20-second trials is scored by counting the errors, or deviations from the proper stance, accumulated by the athlete. The examiner will begin counting errors only after the individual has assumed the proper start position. **The modified BESS is calculated by adding one error point for each error during the three 20-second tests. The maximum total number of errors for any single condition is 10.** If a athlete commits multiple errors simultaneously, only one error is recorded but the athlete should quickly return to the testing position, and counting should resume once subject is set. Subjects that are unable to maintain the testing procedure for a minimum of **five seconds** at the start are assigned the highest possible score, ten, for that testing condition.

OPTION: For further assessment, the same 3 stances can be performed on a surface of medium density foam (e.g., approximately 50 cm x 40 cm x 6 cm).

Tandem Gait^{6,7}

Participants are instructed to stand with their feet together behind a starting line (the test is best done with footwear removed). Then, they walk in a forward direction as quickly and as accurately as possible along a 38mm wide (sports tape), 3 meter line with an alternate foot heel-to-toe gait ensuring that they approximate their heel and toe on each step. Once they cross the end of the 3m line, they turn 180 degrees and return to the starting point using the same gait. A total of 4 trials are done and the best time is retained. Athletes should complete the test in 14 seconds. Athletes fail the test if they step off the line, have a separation between their heel and toe, or if they touch or grab the examiner or an object. In this case, the time is not recorded and the trial repeated, if appropriate.

Coordination Examination

Upper limb coordination

Finger-to-nose (FTN) task:

"I am going to test your coordination now. Please sit comfortably on the chair with your eyes open and your arm (either right or left) outstretched (shoulder flexed to 90 degrees and elbow and fingers extended), pointing in front of you. When I give a start signal, I would like you to perform five successive finger to nose repetitions using your index finger to touch the tip of the nose, and then return to the starting position, as quickly and as accurately as possible."

Scoring: 5 correct repetitions in < 4 seconds = 1

Note for testers: Athletes fail the test if they do not touch their nose, do not fully extend their elbow or do not perform five repetitions. **Failure should be scored as 0.**

References & Footnotes

1. This tool has been developed by a group of international experts at the 4th International Consensus meeting on Concussion in Sport held in Zurich, Switzerland in November 2012. The full details of the conference outcomes and the authors of the tool are published in The BJSM Injury Prevention and Health Protection, 2013, Volume 47, Issue 5. The outcome paper will also be simultaneously co-published in other leading biomedical journals with the copyright held by the Concussion in Sport Group, to allow unrestricted distribution, providing no alterations are made.
2. McCrory P et al., Consensus Statement on Concussion in Sport – the 3rd International Conference on Concussion in Sport held in Zurich, November 2008. British Journal of Sports Medicine 2009; 43: i76-89.
3. Maddocks, DL; Dicker, GD; Saling, MM. The assessment of orientation following concussion in athletes. Clinical Journal of Sport Medicine. 1995; 5(1): 32–3.
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5. Guskiewicz KM. Assessment of postural stability following sport-related concussion. Current Sports Medicine Reports. 2003; 2: 24–30.
6. Schneiders, A.G., Sullivan, S.J., Gray, A., Hammond-Tooke, G. & McCrory, P. Normative values for 16-37 year old subjects for three clinical measures of motor performance used in the assessment of sports concussions. Journal of Science and Medicine in Sport. 2010; 13(2): 196–201.
7. Schneiders, A.G., Sullivan, S.J., Kvarnstrom, J.K., Olsson, M., Yden, T. & Marshall, S.W. The effect of footwear and sports-surface on dynamic neurological screening in sport-related concussion. Journal of Science and Medicine in Sport. 2010; 13(4): 382–386

Child-SCAT3™



Sport Concussion Assessment Tool for children ages 5 to 12 years

For use by medical professionals only

What is childSCAT3?¹

The ChildSCAT3 is a standardized tool for evaluating injured children for concussion and can be used in children aged from 5 to 12 years. It supersedes the original SCAT and the SCAT2 published in 2005 and 2009, respectively². For older persons, ages 13 years and over, please use the SCAT3. The ChildSCAT3 is designed for use by medical professionals. If you are not qualified, please use the Sport Concussion Recognition Tool¹. Preseason baseline testing with the ChildSCAT3 can be helpful for interpreting post-injury test scores.

Specific instructions for use of the ChildSCAT3 are provided on page 3. If you are not familiar with the ChildSCAT3, please read through these instructions carefully. This tool may be freely copied in its current form for distribution to individuals, teams, groups and organizations. Any revision and any reproduction in a digital form require approval by the Concussion in Sport Group.

NOTE: The diagnosis of a concussion is a clinical judgment, ideally made by a medical professional. The ChildSCAT3 should not be used solely to make, or exclude, the diagnosis of concussion in the absence of clinical judgement. An athlete may have a concussion even if their ChildSCAT3 is "normal".

What is a concussion?

A concussion is a disturbance in brain function caused by a direct or indirect force to the head. It results in a variety of non-specific signs and/or symptoms (like those listed below) and most often does not involve loss of consciousness. Concussion should be suspected in the presence of any one or more of the following:

- Symptoms (e.g., headache), or
- Physical signs (e.g., unsteadiness), or
- Impaired brain function (e.g. confusion) or
- Abnormal behaviour (e.g., change in personality).

SIDELINE ASSESSMENT

Indications for Emergency Management

NOTE: A hit to the head can sometimes be associated with a more severe brain injury. If the concussed child displays any of the following, then do not proceed with the ChildSCAT3; instead activate emergency procedures and urgent transportation to the nearest hospital:

- Glasgow Coma score less than 15
- Deteriorating mental status
- Potential spinal injury
- Progressive, worsening symptoms or new neurologic signs
- Persistent vomiting
- Evidence of skull fracture
- Post traumatic seizures
- Coagulopathy
- History of Neurosurgery (eg Shunt)
- Multiple injuries

1 Glasgow coma scale (GCS)

Best eye response (E)

No eye opening	1
Eye opening in response to pain	2
Eye opening to speech	3
Eyes opening spontaneously	4

Best verbal response (V)

No verbal response	1
Incomprehensible sounds	2
Inappropriate words	3
Confused	4
Oriented	5

Best motor response (M)

No motor response	1
Extension to pain	2
Abnormal flexion to pain	3
Flexion/Withdrawal to pain	4
Localizes to pain	5
Obeys commands	6

Glasgow Coma score (E + V + M) of 15

GCS should be recorded for all athletes in case of subsequent deterioration.

Potential signs of concussion?

If any of the following signs are observed after a direct or indirect blow to the head, the child should stop participation, be evaluated by a medical professional and **should not be permitted to return to sport the same day** if a concussion is suspected.

- Any loss of consciousness? Y N
 "If so, how long?" _____
 Balance or motor incoordination (stumbles, slow/laboured movements, etc.)? Y N
 Disorientation or confusion (inability to respond appropriately to questions)? Y N
 Loss of memory: Y N
 "If so, how long?" _____
 "Before or after the injury?" _____
 Blank or vacant look: Y N
 Visible facial injury in combination with any of the above: Y N

2 Sideline Assessment – child-Maddocks Score³

"I am going to ask you a few questions, please listen carefully and give your best effort."

Modified Maddocks questions (1 point for each correct answer)

Where are we at now?	0	1
Is it before or after lunch?	0	1
What did you have last lesson/class?	0	1
What is your teacher's name?	0	1
child-Maddocks score	of 4	

Child-Maddocks score is for sideline diagnosis of concussion only and is not used for serial testing.

Any child with a suspected concussion should be REMOVED FROM PLAY, medically assessed and monitored for deterioration (i.e., should not be left alone). No child diagnosed with concussion should be returned to sports participation on the day of Injury.

BACKGROUND

Name: _____ Date/Time of Injury: _____
 Examiner: _____ Date of Assessment: _____
 Sport/team/school: _____
 Age: _____ Gender: M F
 Current school year/grade: _____
 Dominant hand: right left neither
 Mechanism of Injury ("tell me what happened?"): _____

For Parent/carer to complete:

How many concussions has the child had in the past? _____
 When was the most recent concussion? _____
 How long was the recovery from the most recent concussion? _____
 Has the child ever been hospitalized or had medical imaging done (CT or MRI) for a head injury? Y N
 Has the child ever been diagnosed with headaches or migraines? Y N
 Does the child have a learning disability, dyslexia, ADD/ADHD, seizure disorder? Y N
 Has the child ever been diagnosed with depression, anxiety or other psychiatric disorder? Y N
 Has anyone in the family ever been diagnosed with any of these problems? Y N
 Is the child on any medications? If yes, please list: Y N

SYMPTOM EVALUATION

3 Child report

Name: _____	never	rarely	sometimes	often
I have trouble paying attention	0	1	2	3
I get distracted easily	0	1	2	3
I have a hard time concentrating	0	1	2	3
I have problems remembering what people tell me	0	1	2	3
I have problems following directions	0	1	2	3
I daydream too much	0	1	2	3
I get confused	0	1	2	3
I forget things	0	1	2	3
I have problems finishing things	0	1	2	3
I have trouble figuring things out	0	1	2	3
It's hard for me to learn new things	0	1	2	3
I have headaches	0	1	2	3
I feel dizzy	0	1	2	3
I feel like the room is spinning	0	1	2	3
I feel like I'm going to faint	0	1	2	3
Things are blurry when I look at them	0	1	2	3
I see double	0	1	2	3
I feel sick to my stomach	0	1	2	3
I get tired a lot	0	1	2	3
I get tired easily	0	1	2	3

Total number of symptoms (Maximum possible 20) _____

Symptom severity score (Maximum possible 20 x 3 = 60) _____

self rated clinician interview self rated and clinician monitored

4 Parent report

The child	never	rarely	sometimes	often
has trouble sustaining attention	0	1	2	3
Is easily distracted	0	1	2	3
has difficulty concentrating	0	1	2	3
has problems remembering what he/she is told	0	1	2	3
has difficulty following directions	0	1	2	3
tends to daydream	0	1	2	3
gets confused	0	1	2	3
is forgetful	0	1	2	3
has difficulty completing tasks	0	1	2	3
has poor problem solving skills	0	1	2	3
has problems learning	0	1	2	3
has headaches	0	1	2	3
feels dizzy	0	1	2	3
has a feeling that the room is spinning	0	1	2	3
feels faint	0	1	2	3
has blurred vision	0	1	2	3
has double vision	0	1	2	3
experiences nausea	0	1	2	3
gets tired a lot	0	1	2	3
gets tired easily	0	1	2	3

Total number of symptoms (Maximum possible 20) _____

Symptom severity score (Maximum possible 20 x 3 = 60) _____

Do the symptoms get worse with physical activity? Y N

Do the symptoms get worse with mental activity? Y N

parent self rated clinician interview parent self rated and clinician monitored

Overall rating for parent/teacher/coach/carer to answer.
How different is the child acting compared to his/her usual self?

Please circle one response:
 no different very different unsure N/A

Name of person completing Parent-report: _____

Relationship to child of person completing Parent-report: _____

Scoring on the ChildSCAT3 should not be used as a stand-alone method to diagnose concussion, measure recovery or make decisions about an athlete's readiness to return to competition after concussion.

COGNITIVE & PHYSICAL EVALUATION

5 Cognitive assessment

Standardized Assessment of Concussion – Child Version (SAC-C)⁴

Orientation (1 point for each correct answer)

What month is it?	0	1
What is the date today?	0	1
What is the day of the week?	0	1
What year is it?	0	1

Orientation score _____ of 4

Immediate memory

List	Trial 1	Trial 2	Trial 3	Alternative word list					
elbow	0	1	0	1	0	1	candle	baby	finger
apple	0	1	0	1	0	1	paper	monkey	penny
carpet	0	1	0	1	0	1	sugar	perfume	blanket
saddle	0	1	0	1	0	1	sandwich	sunset	lemon
bubble	0	1	0	1	0	1	wagon	iron	insect
Total									

Immediate memory score total _____ of 15

Concentration: Digits Backward

List	Trial 1	Alternative digit list			
6-2	0	1	5-2	4-1	4-9
4-9-3	0	1	6-2-9	5-2-6	4-1-5
3-8-1-4	0	1	3-2-7-9	1-7-9-5	4-9-6-8
6-2-9-7-1	0	1	1-5-2-8-6	3-8-5-2-7	6-1-8-4-3
7-1-8-4-6-2	0	1	5-3-9-1-4-8	8-3-1-9-6-4	7-2-4-8-5-6
Total of 5					

Concentration: Days in Reverse Order (1 pt. for entire sequence correct)

Sunday-Saturday-Friday-Thursday-Wednesday-Tuesday-Monday	0	1
--	---	---

Concentration score _____ of 6

6 Neck Examination:

Range of motion Tenderness Upper and lower limb sensation & strength

Findings: _____

7 Balance examination

Do one or both of the following tests.

Footwear (shoes, barefoot, braces, tape, etc.) _____

Modified Balance Error Scoring System (BESS) testing⁵

Which foot was tested (i.e. which is the **non-dominant** foot) Left Right

Testing surface (hard floor, field, etc.) _____

Condition

Double leg stance: _____ Errors

Tandem stance (non-dominant foot at back): _____ Errors

Tandem gait^{6,7}

Time taken to complete (best of 4 trials): _____ seconds

If child attempted, but unable to complete tandem gait, mark here

8 Coordination examination

Upper limb coordination

Which arm was tested: Left Right

Coordination score _____ of 1

9 SAC Delayed Recall⁴

Delayed recall score _____ of 5

Since signs and symptoms may evolve over time, it is important to consider repeat evaluation in the acute assessment of concussion.

INSTRUCTIONS

Words in *Italics* throughout the ChildSCAT3 are the instructions given to the child by the tester.

Sideline Assessment – child-Maddocks Score

To be completed on the sideline/in the playground, immediately following concussion. There is no requirement to repeat these questions at follow-up.

Symptom Scale⁸

In situations where the symptom scale is being completed after exercise, it should still be done in a resting state, at least 10 minutes post exercise.

On the day of injury

- the child is to complete the Child Report, according to how he/she feels now.

On all subsequent days

- the child is to complete the Child Report, according to how he/she feels today, **and**
- the parent/carer is to complete the Parent Report according to how the child has been over the previous 24 hours.

Standardized Assessment of Concussion – Child Version (SAC-C)⁴

Orientation

Ask each question on the score sheet. A correct answer for **each question scores 1 point**. If the child does not understand the question, gives an incorrect answer, or no answer, then the score for that question is 0 points.

Immediate memory

"I am going to test your memory. I will read you a list of words and when I am done, repeat back as many words as you can remember, in any order."

Trials 2 & 3:

"I am going to repeat the same list again. Repeat back as many words as you can remember in any order, even if you said the word before."

Complete all 3 trials regardless of score on trial 1 & 2. Read the words at a rate of one per second. **Score 1 pt. for each correct response.** Total score equals sum across all 3 trials. Do not inform the child that delayed recall will be tested.

Concentration

Digits Backward:

"I am going to read you a string of numbers and when I am done, you repeat them back to me backwards, in reverse order of how I read them to you. For example, if I say 7-1, you would say 1-7."

If correct, go to next string length. If incorrect, read trial 2. **One point possible for each string length.** Stop after incorrect on both trials. The digits should be read at the rate of one per second.

Days in Reverse Order:

"Now tell me the days of the week in reverse order. Start with Sunday and go backward. So you'll say Sunday, Saturday... Go ahead"

1 pt. for entire sequence correct

Delayed recall

The delayed recall should be performed after completion of the Balance and Coordination Examination.

"Do you remember that list of words I read a few times earlier? Tell me as many words from the list as you can remember in any order."

Circle each word correctly recalled. **Total score equals number of words recalled.**

Balance examination

These instructions are to be read by the person administering the childSCAT3, and each balance task **should be demonstrated to the child**. The child should then be asked to copy what the examiner demonstrated.

Modified Balance Error Scoring System (BESS) testing⁵

This balance testing is based on a modified version of the Balance Error Scoring System (BESS)⁵. A stopwatch or watch with a second hand is required for this testing.

"I am now going to test your balance. Please take your shoes off, roll up your pant legs above ankle (if applicable), and remove any ankle taping (if applicable). This test will consist of two different parts."

(a) Double leg stance:

The first stance is standing with the feet together with hands on hips and with eyes closed. The child should try to maintain stability in that position for 20 seconds. You should inform the child that you will be counting the number of times the child moves out of this position. You should start timing when the child is set and the eyes are closed.

(b) Tandem stance:

Instruct the child to stand heel-to-toe with the non-dominant foot in the back. Weight should be evenly distributed across both feet. Again, the child should try to maintain stability for 20 seconds with hands on hips and eyes closed. You should inform the child that you will be counting the number of times the child moves out of this position. If the child stumbles out of this position, instruct him/her to open the eyes and return to the start position and continue balancing. You should start timing when the child is set and the eyes are closed.

Balance testing – types of errors - Parts (a) and (b)

1. Hands lifted off iliac crest
2. Opening eyes
3. Step, stumble, or fall
4. Moving hip into > 30 degrees abduction
5. Lifting forefoot or heel
6. Remaining out of test position > 5 sec

Each of the 20-second trials is scored by counting the errors, or deviations from the proper stance, accumulated by the child. The examiner will begin counting errors only after the child has assumed the proper start position. **The modified BESS is calculated by adding one error point for each error during the two 20-second tests. The maximum total number of errors for any single condition is 10.** If a child commits multiple errors simultaneously, only one error is recorded but the child should quickly return to the testing position, and counting should resume once subject is set. Children who are unable to maintain the testing procedure for a minimum of **five seconds** at the start are assigned the highest possible score, ten, for that testing condition.

OPTION: For further assessment, the same 2 stances can be performed on a surface of medium density foam (e.g., approximately 50cm x 40cm x 6cm).

Tandem Gait^{6,7}

Use a clock (with a second hand) or stopwatch to measure the time taken to complete this task. Instruction for the examiner – **Demonstrate the following to the child:**

*The child is instructed to stand with their feet together behind a starting line (the test is best done with footwear removed). Then, they walk in a forward direction as quickly and as accurately as possible along a 38mm wide (sports tape), 3 meter line with an alternate foot heel-to-toe gait ensuring that they approximate their heel and toe on each step. Once they cross the end of the 3m line, they turn 180 degrees and return to the starting point using the same gait. **A total of 4 trials are done and the best time is retained.** Children fail the test if they step off the line, have a separation between their heel and toe, or if they touch or grab the examiner or an object. In this case, the time is not recorded and the trial repeated, if appropriate.*

Explain to the child that you will time how long it takes them to walk to the end of the line and back.

Coordination examination

Upper limb coordination

Finger-to-nose (FTN) task:

The tester should **demonstrate it to the child**.

"I am going to test your coordination now. Please sit comfortably on the chair with your eyes open and your arm (either right or left) outstretched (shoulder flexed to 90 degrees and elbow and fingers extended). When I give a start signal, I would like you to perform five successive finger to nose repetitions using your index finger to touch the tip of the nose as quickly and as accurately as possible."

Scoring: 5 correct repetitions in < 4 seconds = 1

Note for testers: Children fail the test if they do not touch their nose, do not fully extend their elbow or do not perform five repetitions. **Failure should be scored as 0.**

References & Footnotes

1. This tool has been developed by a group of international experts at the 4th International Consensus meeting on Concussion in Sport held in Zurich, Switzerland in November 2012. The full details of the conference outcomes and the authors of the tool are published in The BJSM Injury Prevention and Health Protection, 2013, Volume 47, Issue 5. The outcome paper will also be simultaneously co-published in other leading biomedical journals with the copyright held by the Concussion in Sport Group, to allow unrestricted distribution, providing no alterations are made.
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CHILD ATHLETE INFORMATION

Any child suspected of having a concussion should be removed from play, and then seek medical evaluation. The child must NOT return to play or sport on the same day as the suspected concussion.

Signs to watch for

Problems could arise over the first 24–48 hours. The child should not be left alone and must go to a hospital at once if they develop any of the following:

- New Headache, or Headache gets worse
- Persistent or increasing neck pain
- Becomes drowsy or can't be woken up
- Can not recognise people or places
- Has Nausea or Vomiting
- Behaves unusually, seems confused, or is irritable
- Has any seizures (arms and/or legs jerk uncontrollably)
- Has weakness, numbness or tingling (arms, legs or face)
- Is unsteady walking or standing
- Has slurred speech
- Has difficulty understanding speech or directions

Remember, it is better to be safe.

Always consult your doctor after a suspected concussion.

Return to school

Concussion may impact on the child's cognitive ability to learn at school. This must be considered, and medical clearance is required before the child may return to school. **It is reasonable for a child to miss a day or two of school after concussion, but extended absence is uncommon.** In some children, a graduated return to school program will need to be developed for the child. The child will progress through the return to school program provided that there is no worsening of symptoms. If any particular activity worsens symptoms, the child will abstain from that activity until it no longer causes symptom worsening. Use of computers and internet should follow a similar graduated program, provided that it does not worsen symptoms. This program should include communication between the parents, teachers, and health professionals and will vary from child to child. The return to school program should consider:

- Extra time to complete assignments/tests
- Quiet room to complete assignments/tests
- Avoidance of noisy areas such as cafeterias, assembly halls, sporting events, music class, shop class, etc
- Frequent breaks during class, homework, tests
- No more than one exam/day
- Shorter assignments
- Repetition/memory cues
- Use of peer helper/tutor
- Reassurance from teachers that student will be supported through recovery through accommodations, workload reduction, alternate forms of testing
- Later start times, half days, only certain classes

The child is not to return to play or sport until he/she has successfully returned to school/learning, without worsening of symptoms. Medical clearance should be given before return to play.

If there are any doubts, management should be referred to a qualified health practitioner, expert in the management of concussion in children.

Return to sport

There should be no return to play until the child has successfully returned to school/learning, without worsening of symptoms.

Children must not be returned to play the same day of injury.

When returning children to play, they should **medically cleared and then follow a stepwise supervised program**, with stages of progression.

For example:

Rehabilitation stage	Functional exercise at each stage of rehabilitation	Objective of each stage
No activity	Physical and cognitive rest	Recovery
Light aerobic exercise	Walking, swimming or stationary cycling keeping intensity, 70 % maximum predicted heart rate. No resistance training	Increase heart rate
Sport-specific exercise	Skating drills in ice hockey, running drills in soccer. No head impact activities	Add movement
Non-contact training drills	Progression to more complex training drills, eg passing drills in football and ice hockey. May start progressive resistance training	Exercise, coordination, and cognitive load
Full contact practice	Following medical clearance participate in normal training activities	Restore confidence and assess functional skills by coaching staff
Return to play	Normal game play	

There should be approximately 24 hours (or longer) for each stage and the child should drop back to the previous asymptomatic level if any post-concussive symptoms recur. Resistance training should only be added in the later stages.

If the child is symptomatic for more than 10 days, then review by a health practitioner, expert in the management of concussion, is recommended.

Medical clearance should be given before return to play.

Notes:

CONCUSSION INJURY ADVICE FOR THE CHILD AND PARENTS / CARERS

(To be given to the **person monitoring** the concussed child)

This child has received an injury to the head. A careful medical examination has been carried out and no sign of any serious complications has been found. It is expected that recovery will be rapid, but the child will need monitoring for the next 24 hours by a responsible adult.

If you notice any change in behavior, vomiting, dizziness, worsening headache, double vision or excessive drowsiness, please call an ambulance to transport the child to hospital immediately.

Other important points:

- Following concussion, the child should rest for at least 24 hours.
- The child should avoid any computer, internet or electronic gaming activity if these activities make symptoms worse.
- The child should not be given any medications, including pain killers, unless prescribed by a medical practitioner.
- The child must not return to school until medically cleared.
- The child must not return to sport or play until medically cleared.

Patient's name _____

Date/time of injury _____

Date/time of medical review _____

Treating physician _____

Contact details or stamp

Clinic phone number

For more information
please visit:
ecb.co.uk/concussion

