

Purpose

Sport related concussion (SRC) is becoming increasingly becoming more prevalent across many sporting codes. While the incidence of concussion in Netball is relatively low, Netball at the elite level particularly, is becoming a faster and more physical sport, and the incidence may rise.

SRC can be very difficult to detect. Concussive symptoms and signs can be varied, non-specific and subtle. Recognising SRC is critical to ensure appropriate management and prevention of further injury. The most important priority is the health and wellbeing of the athlete.

The goal of this document is to provide best practice guidelines for the safe management of SRC in elite level netball tournaments officiated by World Netball.

Principles

- Athlete health and wellbeing is the priority
- Head injury and SRC must be taken seriously to safeguard the long-term welfare of athletes
- Athletes who have sustained a head injury or a suspected concussion must be thoroughly assessed and monitored by an appropriate healthcare professional
- Athletes diagnosed with SRC must progress through a graded return to netball protocol as outlined later in this document and only then return to play and study / work.
- Athletes diagnosed with SRC must receive medical clearance before returning to sport.

Scientific knowledge in the area of SRC continues to evolve and as such these guidelines will be continually updated to reflect the change in guidelines and consensus statements produced from the International Consensus conferences on Concussion in Sport (last held in Berlin 2016 and next to be held in late 2022).

What is Sport related concussion (SRC)?

SRC is a traumatic brain injury induced by biomechanical forces. Several common features may be utilised in clinically assessing the presence of a concussive episode:

- SRC may be caused by a direct blow to the head, face or elsewhere on the body with an impulse force transmitted to the head.
- SRC typically results in the rapid onset of short lived impairment of neurological function that resolves spontaneously. In some cases, signs and symptoms evolve over a number of minutes and hours.

- The acute clinical symptoms and signs generally reflect a functional disturbance rather than a structural injury, and as such, no abnormalities are seen on neuroimaging.

Diagnosis in this setting can be challenging for the condition because:

- Clinical symptoms and signs may evolve over time.
- Many of the features are not specific to SRC, and may represent other injuries.
- Brain injury can present with identical clinical features and cannot always be ruled out on initial assessment.
- The athlete may not always be forthcoming with symptom reporting due to a desire to remain on court.

In practical terms, a player with any neurological symptoms or signs, or video signs of SRC (if available), and /or a disturbance of cognitive function or mental disturbance following a trauma (including indirect trauma with the potential for force translation) is considered to have an SRC requiring medical assessment and management. Consideration should always be given to a structural head injury, and the athlete assessed accordingly.

If SRC is diagnosed, clinical management should follow and the return to play protocol outlined in this document should be completed.

Pre-tournament screening

Assessment of players by national doctors prior to the tournament is recommended.

A medical review should cover: the number of concussions, any history of prolonged recovery from concussion; and the player's previous management.

It is also recommended that all players have a pre-tournament neurological assessment and SCAT5. Baseline testing facilitates the education of players and interpretation of post-injury test scores, which ultimately enhances decisions regarding diagnosis and assessment of recovery. Without baseline SCAT5 tests for comparison, a more conservative approach to diagnosis and return to play must be used.

A copy of a player's baseline SCAT5 result should be available at the tournament. It should be accessible to the national team doctor or tournament chief medical officer (CMO) if the team does not have a doctor.

Education

It is important to provide SRC education to players, coaches and staff (e.g. trainers).

Players should be provided with information so that they can recognise the common symptoms of SRC, and know to report them, both during a match and in the

subsequent days. Players, coaches and team physiotherapists also need to understand World Netball protocols including the requirement for removal or assessment if there is any suspicion of SRC from an incident observed directly, observed on video or reported by other players/staff.

Game day management

Observation

A doctor will attend World Netball tournament games. A tournament appointed doctor is present for every game. Some teams will also have a team doctor.

The doctor will be observing play. The doctor can also be notified of a concerning incident by the team physiotherapist or other bench staff. The incident may be reviewed on the video if available. Other medical staff watching the game may also notify the doctor of a possible concussive event.

Initial response

After observing or being notified of a possible SRC, the doctor must decide whether the player requires immediate removal from play for further assessment. This decision can be difficult, as it may involve stopping play, or recommending the player is substituted off.

Removal from play can be considered under the following categories:

A. Clear diagnosis of SRC. Requires immediate removal and no return to game.

- Loss of consciousness – suspected or confirmed.
- No protective action on falling to the ground.
- Impact seizure.
- Motor incoordination.
- Dazed or vacant look or player not her normal self.
- Behaviour change atypical of the player.
- Confusion or disorientation.

B. Possible (likely) diagnosis of SRC. Requires removal from play for further assessment and decision on return to game.

- Lying motionless for >2 seconds.
- Possible tonic posturing or impact seizure.
- Possible motor incoordination.
- Any clinical impression formed by the doctor that the player is not quite right following a trauma.
- Facial injury.

C. Unclear but concerned. Requires assessment at next available opportunity (rotate off or break in game) and decision on return to play.

The doctor should be alert to the other signs that have been validated as correlating with a possible diagnosis of SRC. These signs include:

- Clutching at hand/face.
- Slow to get up.
- Poor decision making/unusual errors on court.

For teams without a doctor:**Incidents of a suspected SRC, or a witnessed suspicious mechanism that could lead to SRC, will be managed as follows:**

- The primary medical carer enters the field of play (FoP) to perform an initial assessment. If indicated the FoP tournament medical team will also attend.
- The player will be taken to the Athlete medical room for review by the FoP tournament medical team.

For teams with a doctor:**Incidents of a suspected SRC, or a witnessed suspicious mechanism that could lead to SRC, will be managed as follows:**

- The primary carer enters the FoP to perform an initial assessment. If indicated the team doctor and/or FoP medical team will also attend.
- The team doctor will decide on whether SRC is a possible diagnosis and, if so, the athlete will be removed from the FoP and taken to the Athlete medical room or team changing room.

If a player requires removal from play, this should be clearly communicated with the team primary carer on the team bench. Coaches should be aware that this may occur in the interests of player welfare.

Assessment and management**A. Where there is a clear diagnosis of SRC:**

- The athlete should be medically evaluated in accordance with standard emergency management principles, with attention given to excluding a cervical spine injury.
- Assessment for a structural head injury should be undertaken, and the athlete transported to hospital via ambulance if there are any abnormal neurological signs or signs of a structural head/neck injury.
- The player must be re-assessed for deterioration.
- The player must not be returned to the court on the day of injury.

B. Possible (likely) diagnosis of SRC:

- The player should be removed from the court.
- Assessment should take place in a quiet, distraction free environment.
- The player should be allowed to rest for a couple of minutes prior to assessment if feasible.
- Video review if available can be undertaken.
- The player should be fully assessed, using the SCAT5 and compared with baseline.
- In the case that a full assessment has taken place (history, full assessment +/- video review where available) and no diagnosis of SRC is made, the doctor can then decide to return the athlete to play.
- The SCAT5 is not in itself diagnostic, but a tool to assist with decision-making. If there is any clinical suspicion by the assessing doctor, but the player has recorded a 'normal' SCAT5 a cautious approach is recommended. The diagnosis of SRC remains a clinical decision based on the serial assessment in a range of domains including symptoms, signs, cognitive impairment and neuro-behavioural changes.

C. Unclear but some concerns:

1. Assess at the next available opportunity.
2. Obtain a history of the incident from the player (symptoms, memory impairment).
3. Apply Maddock's questionnaire: a full assessment is needed if the player cannot answer.
4. Continue to monitor throughout the game, and remove from play for further assessment if clinical concerns evolve regarding a possible SRC.

For teams without a doctor:

- The player will be taken to the Athlete medical room for a full assessment by the FoP tournament medical team – this will include a SCAT 5 assessment.
- If the player is deemed to have SRC then they will not be returned to the field of play and will need to follow the return to play protocol.

For teams with a doctor:

- The team doctor will perform the full medical assessment and SCAT 5 (in the athlete medical room or team changing room) if appropriate. The tournament doctor can perform the SCAT 5 if needed.
- If the player is assessed to have SRC they will not be returned to the field of play and will need to follow the return to play protocol.

Follow up

A. For diagnosed SRC

- Follow-up review by the team doctor or tournament doctors / CMO is required.
- For teams with no doctor follow up arrangements with the tournament doctor should be clearly communicated with the athlete and team primary carer.

B. If SRC not diagnosed and return to play on the day

- Because symptoms can evolve over time, the athlete must be observed and reassessed throughout, after, and in the days following the match for symptoms, with appropriate handover and follow-up with the team doctor or tournament doctor and team primary medical carer.

Return to play

Decisions regarding return to play (training or match play) following SRC rely on a multifaceted clinical approach managed by the team doctor or tournament doctor / CMO.

A player must have:

- Returned to the baseline level of symptoms and cognitive performance if the baseline is known,
- experienced resolution of all neurological symptoms,
- and have completed a graded loading program without recurrence of symptoms or signs of SRC.

Early management following SRC is focused on relative rest to allow the player to recover from the injury. This is followed by a graded loading program which is designed to allow a conservative approach to recovery with incremental increases in physical and cognitive load to ensure that SRC-related symptoms or signs do not recur.

A player with SRC cannot commence a graded loading program without recording a SCAT5 that has returned to baseline and must not be taking pharmacotherapy to treat SRC-related symptoms.

In following these guidelines, the earliest a player can return to play after SRC is 12 days.

For players with SRC related symptoms or clinical signs that persist beyond 48 hours a slow return to play strategy should be adopted (e.g. by extending the number of noncontact, limited contact and full contact training sessions that the player participates in before clearance for unrestricted return to play).

Step	Rest	Recovery	Graded Loading - Individual Program			Graded Loading - Full Team Training					
Components	Rest	Symptom limited activity	Light aerobic exercise	Moderate aerobic exercise	Sport specific exercise	Non-contact training	Recovery	Limited contact training	Recovery	Full contact	Recovery
Goal		Daily activities that do not provoke symptoms	Light aerobic exercise e.g. walking, jogging, cycling at slow to medium pace. No resistance training.	Moderate aerobic exercise i.e. increased heart rate. No resistance training.	Increased intensity and duration of activity. Add sport specific drills e.g. passing, shooting. Commence light resistance training.	Return to full team training sessions - non contact only.	Can participate in other components of the training program e.g. weights.	Full team training and able to participate in drills with incidental contact.	Can participate in other components of the training program e.g. weights.	Full team training.	Can participate in other components of the training program e.g. weights.
Duration	24-48 hours	Minimum of 24 hours	Minimum of 24 hours	Minimum of 24 hours	Minimum of 24 hours	At least one day between sessions to monitor for recurrence of symptoms.		At least one day between sessions to monitor for recurrence of symptoms.		At least one day between sessions to monitor for recurrence of symptoms.	
Requirements to move to next stage		24 hours completely free of concussion related symptoms and medical clearance to enter graded loading program.	Remain completely free of any concussion related symptoms.	Remain completely free of any concussion related symptoms.	Remain completely free of any concussion related symptoms and medical clearance to commence full team training.	Remain completely free of any concussion related symptoms and player confident to participate in training.		Remain completely free of any concussion related symptoms and player confident.		Remain completely free of any concussion related symptoms and player confident to participate in training and medical clearance for unrestricted return to play.	

Table 1: Guideline for Graded Loading after SRC

- Regular monitoring is essential. If symptoms recur, the player should go back to the previous symptom-free step.
- Medical clearance is required before entry into the graded loading program; progression to team training; and return to play.

A more conservative approach is important in cases where the symptoms or clinical features persist beyond 48 hours or if modifying factors apply. Modifying factors include: young players, multiple concussions, learning disabilities and high symptoms burden in the first few days after injury. In these cases, a greater period of initial rest may be required and each stage of the graduated loading program should be conducted over a longer time period by extending the number of days between progression or increasing the number of days held at each stage of the graded return to play.

Difficult or complicated cases

Cases should be managed in a multidisciplinary manner when symptoms or clinical features (e.g. cognitive deficit) persist for more than seven days; it is a complicated case; it is the second or subsequent SRC in one season; or the case involves decisions regarding retirement due to SRC. In any such case, it is strongly recommended that the national doctor involve an independent clinician with expertise in concussion management to assist in management decisions.

Summary

- Player welfare must remain at the centre of decision-making.
- If an SRC has been diagnosed, then the player cannot return to play the same day.
- The SCAT5 is a diagnostic tool and must be assessed along with the mechanism of injury and overall clinical impression to decide on a diagnosis.
- If in doubt, a cautious approach is recommended.
- Video review of the incident, if available, is strongly recommended.
- Follow up with the tournament doctor or team doctor must be arranged for all athletes with a head impact, regardless of whether an SRC was diagnosed.
- A player cannot RTP for a minimum days (12) after a confirmed SRC.
- Following these guidelines, the earliest a player can return to play after SRC is 12 days.

Note

These guidelines apply to adult competition. Children and adolescents (under 18) take longer to recover from SRC. They should be advised to wait a minimum of 14 days from when the symptoms cease before returning to full contact collision activities in line medical advice. There is a Child SCAT5 and specific recovery protocols for children.

Non-medical assessment tool. The Concussion Recognition Tool 5 (CRT5) is recommended to help non-medical practitioners recognise the signs and symptoms of concussion (Concussion Recognition tool 5 bmj.com).

Definitions

Lying motionless

Lying without purposeful movement on the playing surface for more than two seconds. The player does not appear to move or react purposely, respond or reply appropriately to the game situation (e.g. teammates, umpires or medical staff). Concern may be shown by other players or match officials.

Tonic posturing

Involuntary sustained contraction of one or more limbs (typically upper limbs), so that the limb is held stiff despite the influence of gravity or the position of the player. The tonic posturing could involve other muscles such as the cervical, axial, or lower limb muscles. Tonic posturing can be observed whilst the player is on the playing surface, or in the motion of falling.

No protective action

Falls to the playing surface in an unprotected manner without stretching out hands or arms to minimise the impact of the fall, after direct or indirect contact to the head. The player demonstrates loss of motor tone before landing on the playing surface.

Impact seizure

Involuntary clonic movement that comprise periods of asymmetric and irregular rhythmic jerking of axial or limb muscles.

Slow to get up

Remains sitting or lying on the court despite play continuing.

Motor incoordination

Appears unsteady on feet including losing balance, staggering/stumbling, struggling to get up or falling. This may also occur in the upper limbs which will be observed as fumbling. Incoordination can also occur in both the motion of getting up off the court or in the motion of walking or running.

Blank, vacant look

Player exhibits no facial expression or apparent emotion in response to the environment.

Facial injury

Any facial laceration, facial bleeding, blood coming from the mouth, epistaxis or apparent injury.

SCAT5 Adult

Sport Concussion Assessment Tool 5 - <http://bjsm.bmj.com/content/47/5/259.full.pdf>

Attached in appendix.

References.

1. McCrory P, Meeuwisse W et al. Consensus statement on concussion in sport – the 5th international conference and concussion in sport held in Berlin October 2016. Br J Sports Med 2017 doi: 10.1136/bjsports-2017-097699.
2. Patricios J, Fuller GW et al. What are the critical elements of sideline screening that can be used to establish the diagnosis of concussion? A systematic review. Br J Sports Med 2017 doi: 10.1136/bjsports-2016-09744

Acknowledgements

1. Australian netball guidelines for management of sport related concussion. April 2020
2. Vitality Netball World Cup: Concussion Field of play Guidelines. 2019
3. Vitality Netball World Cup: Concussion Guidelines. 2019
4. Netball New Zealand Concussion Guidelines. National Programmes – ANZ Premiership. Dec 2021.

**Approved by the WN Board
13th March 2022**

SCAT5[®]

SPORT CONCUSSION ASSESSMENT TOOL – 5TH EDITION
 DEVELOPED BY THE CONCUSSION IN SPORT GROUP
 FOR USE BY MEDICAL PROFESSIONALS ONLY

supported by



Patient details

Name: _____

DOB: _____

Address: _____

ID number: _____

Examiner: _____

Date of Injury: _____ Time: _____

WHAT IS THE SCAT5?

The SCAT5 is a standardized tool for evaluating concussions designed for use by physicians and licensed healthcare professionals¹. The SCAT5 cannot be performed correctly in less than 10 minutes.

If you are not a physician or licensed healthcare professional, please use the Concussion Recognition Tool 5 (CRT5). The SCAT5 is to be used for evaluating athletes aged 13 years and older. For children aged 12 years or younger, please use the Child SCAT5.

Preseason SCAT5 baseline testing can be useful for interpreting post-injury test scores, but is not required for that purpose. Detailed instructions for use of the SCAT5 are provided on page 7. Please read through these instructions carefully before testing the athlete. Brief verbal instructions for each test are given in italics. The only equipment required for the tester is a watch or timer.

This tool may be freely copied in its current form for distribution to individuals, teams, groups and organizations. It should not be altered in any way, re-branded or sold for commercial gain. Any revision, translation or reproduction in a digital form requires specific approval by the Concussion in Sport Group.

Recognise and Remove

A head impact by either a direct blow or indirect transmission of force can be associated with a serious and potentially fatal brain injury. If there are significant concerns, including any of the red flags listed in Box 1, then activation of emergency procedures and urgent transport to the nearest hospital should be arranged.

Key points

- Any athlete with suspected concussion should be **REMOVED FROM PLAY**, medically assessed and monitored for deterioration. No athlete diagnosed with concussion should be returned to play on the day of injury.
- If an athlete is suspected of having a concussion and medical personnel are not immediately available, the athlete should be referred to a medical facility for urgent assessment.
- Athletes with suspected concussion should not drink alcohol, use recreational drugs and should not drive a motor vehicle until cleared to do so by a medical professional.
- Concussion signs and symptoms evolve over time and it is important to consider repeat evaluation in the assessment of concussion.
- The diagnosis of a concussion is a clinical judgment, made by a medical professional. The SCAT5 should **NOT** be used by itself to make, or exclude, the diagnosis of concussion. An athlete may have a concussion even if their SCAT5 is "normal".

Remember:

- The basic principles of first aid (danger, response, airway, breathing, circulation) should be followed.
- Do not attempt to move the athlete (other than that required for airway management) unless trained to do so.
- Assessment for a spinal cord injury is a critical part of the initial on-field assessment.
- Do not remove a helmet or any other equipment unless trained to do so safely.

IMMEDIATE OR ON-FIELD ASSESSMENT

The following elements should be assessed for all athletes who are suspected of having a concussion prior to proceeding to the neurocognitive assessment and ideally should be done on-field after the first first aid / emergency care priorities are completed.

If any of the "Red Flags" or observable signs are noted after a direct or indirect blow to the head, the athlete should be immediately and safely removed from participation and evaluated by a physician or licensed healthcare professional.

Consideration of transportation to a medical facility should be at the discretion of the physician or licensed healthcare professional.

The GCS is important as a standard measure for all patients and can be done serially if necessary in the event of deterioration in conscious state. The Maddocks questions and cervical spine exam are critical steps of the immediate assessment; however, these do not need to be done serially.

STEP 1: RED FLAGS

RED FLAGS:

- Neck pain or tenderness
- Double vision
- Weakness or tingling/ burning in arms or legs
- Severe or increasing headache
- Seizure or convulsion
- Loss of consciousness
- Deteriorating conscious state
- Vomiting
- Increasingly restless, agitated or combative

STEP 2: OBSERVABLE SIGNS

Witnessed Observed on Video

	Y	N
Lying motionless on the playing surface	Y	N
Balance / gait difficulties / motor incoordination: stumbling, slow / laboured movements	Y	N
Disorientation or confusion, or an inability to respond appropriately to questions	Y	N
Blank or vacant look	Y	N
Facial injury after head trauma	Y	N

STEP 3: MEMORY ASSESSMENT MADDOCKS QUESTIONS²

"I am going to ask you a few questions, please listen carefully and give your best effort. First, tell me what happened?"

Mark Y for correct answer / N for incorrect

	Y	N
What venue are we at today?	Y	N
Which half is it now?	Y	N
Who scored last in this match?	Y	N
What team did you play last week / game?	Y	N
Did your team win the last game?	Y	N

Note: Appropriate sport-specific questions may be substituted.

Name: _____
 DOB: _____
 Address: _____
 ID number: _____
 Examiner: _____
 Date: _____

STEP 4: EXAMINATION

GLASGOW COMA SCALE (GCS)³

Time of assessment			
Date of assessment			
Best eye response (E)			
No eye opening	1	1	1
Eye opening in response to pain	2	2	2
Eye opening to speech	3	3	3
Eyes opening spontaneously	4	4	4
Best verbal response (V)			
No verbal response	1	1	1
Incomprehensible sounds	2	2	2
Inappropriate words	3	3	3
Confused	4	4	4
Oriented	5	5	5
Best motor response (M)			
No motor response	1	1	1
Extension to pain	2	2	2
Abnormal flexion to pain	3	3	3
Flexion / Withdrawal to pain	4	4	4
Localizes to pain	5	5	5
Obeys commands	6	6	6
Glasgow Coma score (E + V + M)			

CERVICAL SPINE ASSESSMENT

Does the athlete report that their neck is pain free at rest?	Y	N
If there is NO neck pain at rest , does the athlete have a full range of ACTIVE pain free movement?	Y	N
Is the limb strength and sensation normal?	Y	N

In a patient who is not lucid or fully conscious, a cervical spine injury should be assumed until proven otherwise.

OFFICE OR OFF-FIELD ASSESSMENT

Please note that the neurocognitive assessment should be done in a distraction-free environment with the athlete in a resting state.

STEP 1: ATHLETE BACKGROUND

Sport / team / school: _____

Date / time of injury: _____

Years of education completed: _____

Age: _____

Gender: M / F / Other

Dominant hand: left / neither / right

How many diagnosed concussions has the athlete had in the past?: _____

When was the most recent concussion?: _____

How long was the recovery (time to being cleared to play) from the most recent concussion?: _____ (days)

Has the athlete ever been:

	Yes	No
Hospitalized for a head injury?		
Diagnosed / treated for headache disorder or migraines?		
Diagnosed with a learning disability / dyslexia?		
Diagnosed with ADD / ADHD?		
Diagnosed with depression, anxiety or other psychiatric disorder?		

Current medications? If yes, please list:

Name: _____

DOB: _____

Address: _____

ID number: _____

Examiner: _____

Date: _____

2

STEP 2: SYMPTOM EVALUATION

The athlete should be given the symptom form and asked to read this instruction paragraph out loud then complete the symptom scale. For the baseline assessment, the athlete should rate his/her symptoms based on how he/she typically feels and for the post injury assessment the athlete should rate their symptoms at this point in time.

Please Check: Baseline Post-Injury

Please hand the form to the athlete

	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
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
Trouble falling asleep (if applicable)	0	1	2	3	4	5	6

Total number of symptoms: _____ of 22

Symptom severity score: _____ of 132

Do your symptoms get worse with physical activity? Y N

Do your symptoms get worse with mental activity? Y N

If 100% is feeling perfectly normal, what percent of normal do you feel?

If not 100%, why?

Please hand form back to examiner

STEP 3: COGNITIVE SCREENING

Standardised Assessment of Concussion (SAC)⁴

ORIENTATION

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

The Immediate Memory component can be completed using the traditional 5-word per trial list or optionally using 10-words per trial to minimise any ceiling effect. All 3 trials must be administered irrespective of the number correct on the first trial. Administer at the rate of one word per second.

Please choose EITHER the 5 or 10 word list groups and circle the specific word list chosen for this test.

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. For 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.

List	Alternate 5 word lists					Score (of 5)		
						Trial 1	Trial 2	Trial 3
A	Finger	Penny	Blanket	Lemon	Insect			
B	Candle	Paper	Sugar	Sandwich	Wagon			
C	Baby	Monkey	Perfume	Sunset	Iron			
D	Elbow	Apple	Carpet	Saddle	Bubble			
E	Jacket	Arrow	Pepper	Cotton	Movie			
F	Dollar	Honey	Mirror	Saddle	Anchor			
Immediate Memory Score						of 15		
Time that last trial was completed								

List	Alternate 10 word lists					Score (of 10)		
						Trial 1	Trial 2	Trial 3
G	Finger	Penny	Blanket	Lemon	Insect			
	Candle	Paper	Sugar	Sandwich	Wagon			
H	Baby	Monkey	Perfume	Sunset	Iron			
	Elbow	Apple	Carpet	Saddle	Bubble			
I	Jacket	Arrow	Pepper	Cotton	Movie			
	Dollar	Honey	Mirror	Saddle	Anchor			
Immediate Memory Score						of 30		
Time that last trial was completed								

Name: _____
 DOB: _____
 Address: _____
 ID number: _____
 Examiner: _____
 Date: _____

CONCENTRATION

DIGITS BACKWARDS

Please circle the Digit list chosen (A, B, C, D, E, F). Administer at the rate of one digit per second reading DOWN the selected column.

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

Concentration Number Lists (circle one)					
List A	List B	List C			
4-9-3	5-2-6	1-4-2	Y	N	0
6-2-9	4-1-5	6-5-8	Y	N	1
3-8-1-4	1-7-9-5	6-8-3-1	Y	N	0
3-2-7-9	4-9-6-8	3-4-8-1	Y	N	1
6-2-9-7-1	4-8-5-2-7	4-9-1-5-3	Y	N	0
1-5-2-8-6	6-1-8-4-3	6-8-2-5-1	Y	N	1
7-1-8-4-6-2	8-3-1-9-6-4	3-7-6-5-1-9	Y	N	0
5-3-9-1-4-8	7-2-4-8-5-6	9-2-6-5-1-4	Y	N	1
List D	List E	List F			
7-8-2	3-8-2	2-7-1	Y	N	0
9-2-6	5-1-8	4-7-9	Y	N	1
4-1-8-3	2-7-9-3	1-6-8-3	Y	N	0
9-7-2-3	2-1-6-9	3-9-2-4	Y	N	1
1-7-9-2-6	4-1-8-6-9	2-4-7-5-8	Y	N	0
4-1-7-5-2	9-4-1-7-5	8-3-9-6-4	Y	N	1
2-6-4-8-1-7	6-9-7-3-8-2	5-8-6-2-4-9	Y	N	0
8-4-1-9-3-5	4-2-7-9-3-8	3-1-7-8-2-6	Y	N	1
Digits Score:					of 4

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.

Dec - Nov - Oct - Sept - Aug - Jul - Jun - May - Apr - Mar - Feb - Jan	0	1
Months Score	of 1	
Concentration Total Score (Digits + Months)	of 5	

4

STEP 4: NEUROLOGICAL SCREEN

See the instruction sheet (page 7) for details of test administration and scoring of the tests.

Can the patient read aloud (e.g. symptom check-list) and follow instructions without difficulty?	Y	N
Does the patient have a full range of pain-free PASSIVE cervical spine movement?	Y	N
Without moving their head or neck, can the patient look side-to-side and up-and-down without double vision?	Y	N
Can the patient perform the finger nose coordination test normally?	Y	N
Can the patient perform tandem gait normally?	Y	N

BALANCE EXAMINATION

Modified Balance Error Scoring System (mBESS) testing⁵

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

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

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

Condition	Errors
Double leg stance	_____ of 10
Single leg stance (non-dominant foot)	_____ of 10
Tandem stance (non-dominant foot at the back)	_____ of 10
Total Errors	_____ of 30

Name: _____

DOB: _____

Address: _____

ID number: _____

Examiner: _____

Date: _____

5

STEP 5: DELAYED RECALL:

The delayed recall should be performed after 5 minutes have elapsed since the end of the Immediate Recall section. Score 1 pt. for each correct response.

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.

Time Started

Please record each word correctly recalled. Total score equals number of words recalled.

Total number of words recalled accurately: of 5 or of 10

6

STEP 6: DECISION

Domain	Date & time of assessment:		
Symptom number (of 22)			
Symptom severity score (of 132)			
Orientation (of 5)			
Immediate memory	_____ of 15 _____ of 30	_____ of 15 _____ of 30	_____ of 15 _____ of 30
Concentration (of 5)			
Neuro exam	Normal Abnormal	Normal Abnormal	Normal Abnormal
Balance errors (of 30)			
Delayed Recall	_____ of 5 _____ of 10	_____ of 5 _____ of 10	_____ of 5 _____ of 10

Date and time of injury: _____

If the athlete is known to you prior to their injury, are they different from their usual self?

Yes No Unsure Not Applicable

(If different, describe why in the clinical notes section)

Concussion Diagnosed?

Yes No Unsure Not Applicable

If re-testing, has the athlete improved?

Yes No Unsure Not Applicable

I am a physician or licensed healthcare professional and I have personally administered or supervised the administration of this SCAT5.

Signature: _____

Name: _____

Title: _____

Registration number (if applicable): _____

Date: _____

SCORING ON THE SCAT5 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.

INSTRUCTIONS

Words in *Italics* throughout the SCAT5 are the instructions given to the athlete by the clinician

Symptom Scale

The time frame for symptoms should be based on the type of test being administered. At baseline it is advantageous to assess how an athlete "typically" feels whereas during the acute/post-acute stage it is best to ask how the athlete feels at the time of testing.

The symptom scale should be completed by the athlete, not by the examiner. In situations where the symptom scale is being completed after exercise, it should be done in a resting state, generally by approximating his/her resting heart rate.

For total number of symptoms, maximum possible is 22 except immediately post injury, if sleep item is omitted, which then creates a maximum of 21.

For Symptom severity score, add all scores in table, maximum possible is 22 x 6 = 132, except immediately post injury if sleep item is omitted, which then creates a maximum of 21x6=126.

Immediate Memory

The Immediate Memory component can be completed using the traditional 5-word per trial list or, optionally, using 10-words per trial. The literature suggests that the Immediate Memory has a notable ceiling effect when a 5-word list is used. In settings where this ceiling is prominent, the examiner may wish to make the task more difficult by incorporating two 5-word groups for a total of 10 words per trial. In this case, the maximum score per trial is 10 with a total trial maximum of 30.

Choose one of the word lists (either 5 or 10). Then perform 3 trials of immediate memory using this list.

Complete all 3 trials regardless of score on previous trials.

"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." The words must be read at a rate of one word per second.

Trials 2 & 3 MUST be completed regardless of score on trial 1 & 2.

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."

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

Choose one column of digits from lists A, B, C, D, E or F and administer those digits as follows:

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

Begin with first 3 digit string.

If correct, circle "Y" for correct and go to next string length. If incorrect, circle "N" for the first string length and read trial 2 in the same string length. One point possible for each string length. Stop after incorrect on both trials (2 N's) in a string length. 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 5 minutes have elapsed since the end of the Immediate Recall section.

"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

Modified Balance Error Scoring System (mBESS)⁵ testing

This balance testing is based on a modified version of the Balance Error Scoring System (BESS)⁵. A timing device is required for this testing.

Each of 20-second trial/stance is scored by counting the number of errors. The examiner will begin counting errors only after the athlete 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 number of errors for any single condition is 10. If the 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 the athlete is set. Athletes 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 50cm x 40cm x 6cm).

Balance testing – types of errors

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

"I am now going to test your balance. Please take your shoes off (if applicable), 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."

Tandem Gait

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 metre 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. 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.

Finger to Nose

"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."

References

1. McCrory et al. Consensus Statement On Concussion In Sport – The 5th International Conference On Concussion In Sport Held In Berlin, October 2016. British Journal of Sports Medicine 2017 (available at www.bjsm.bmj.com)
2. Maddocks, DL; Dicker, GD; Saling, MM. The assessment of orientation following concussion in athletes. Clinical Journal of Sport Medicine 1995; 5: 32-33
3. Jennett, B., Bond, M. Assessment of outcome after severe brain damage: a practical scale. Lancet 1975; i: 480-484
4. McCrea M. Standardized mental status testing of acute concussion. Clinical Journal of Sport Medicine. 2001; 11: 176-181
5. Guskiewicz KM. Assessment of postural stability following sport-related concussion. Current Sports Medicine Reports. 2003; 2: 24-30

CONCUSSION INFORMATION

Any athlete suspected of having a concussion should be removed from play and seek medical evaluation.

Signs to watch for

Problems could arise over the first 24-48 hours. The athlete should not be left alone and must go to a hospital at once if they experience:

- Worsening headache
- Drowsiness or inability to be awakened
- Inability to recognize people or places
- Repeated vomiting
- Unusual behaviour or confusion or irritable
- Seizures (arms and legs jerk uncontrollably)
- Weakness or numbness in arms or legs
- Unsteadiness on their feet.
- Slurred speech

Consult your physician or licensed healthcare professional after a suspected concussion. Remember, it is better to be safe.

Rest & Rehabilitation

After a concussion, the athlete should have physical rest and relative cognitive rest for a few days to allow their symptoms to improve. In most cases, after no more than a few days of rest, the athlete should gradually increase their daily activity level as long as their symptoms do not worsen. Once the athlete is able to complete their usual daily activities without concussion-related symptoms, the second step of the return to play/sport progression can be started. The athlete should not return to play/sport until their concussion-related symptoms have resolved and the athlete has successfully returned to full school/learning activities.

When returning to play/sport, the athlete should follow a stepwise, **medically managed exercise progression, with increasing amounts of exercise.** For example:

Graduated Return to Sport Strategy

Exercise step	Functional exercise at each step	Goal of each step
1. Symptom-limited activity	Daily activities that do not provoke symptoms.	Gradual reintroduction of work/school activities.
2. Light aerobic exercise	Walking or stationary cycling at slow to medium pace. No resistance training.	Increase heart rate.
3. Sport-specific exercise	Running or skating drills. No head impact activities.	Add movement.
4. Non-contact training drills	Harder training drills, e.g., passing drills. May start progressive resistance training.	Exercise, coordination, and increased thinking.
5. Full contact practice	Following medical clearance, participate in normal training activities.	Restore confidence and assess functional skills by coaching staff.
6. Return to play/sport	Normal game play.	

In this example, it would be typical to have 24 hours (or longer) for each step of the progression. If any symptoms worsen while exercising, the athlete should go back to the previous step. Resistance training should be added only in the later stages (Stage 3 or 4 at the earliest).

Written clearance should be provided by a healthcare professional before return to play/sport as directed by local laws and regulations.

Graduated Return to School Strategy

Concussion may affect the ability to learn at school. The athlete may need to miss a few days of school after a concussion. When going back to school, some athletes may need to go back gradually and may need to have some changes made to their schedule so that concussion symptoms do not get worse. If a particular activity makes symptoms worse, then the athlete should stop that activity and rest until symptoms get better. To make sure that the athlete can get back to school without problems, it is important that the healthcare provider, parents, caregivers and teachers talk to each other so that everyone knows what the plan is for the athlete to go back to school.

Note: If mental activity does not cause any symptoms, the athlete may be able to skip step 2 and return to school part-time before doing school activities at home first.

Mental Activity	Activity at each step	Goal of each step
1. Daily activities that do not give the athlete symptoms	Typical activities that the athlete does during the day as long as they do not increase symptoms (e.g. reading, texting, screen time). Start with 5-15 minutes at a time and gradually build up.	Gradual return to typical activities.
2. School activities	Homework, reading or other cognitive activities outside of the classroom.	Increase tolerance to cognitive work.
3. Return to school part-time	Gradual introduction of school-work. May need to start with a partial school day or with increased breaks during the day.	Increase academic activities.
4. Return to school full-time	Gradually progress school activities until a full day can be tolerated.	Return to full academic activities and catch up on missed work.

If the athlete continues to have symptoms with mental activity, some other accommodations that can help with return to school may include:

- Starting school later, only going for half days, or going only to certain classes
- More time to finish assignments/tests
- Quiet room to finish assignments/tests
- Not going to noisy areas like the cafeteria, assembly halls, sporting events, music class, shop class, etc.
- Taking lots of breaks during class, homework, tests
- No more than one exam/day
- Shorter assignments
- Repetition/memory cues
- Use of a student helper/tutor
- Reassurance from teachers that the child will be supported while getting better

The athlete should not go back to sports until they are back to school/learning, without symptoms getting significantly worse and no longer needing any changes to their schedule.