Consensus Statement on Concussion in Sport

3rd International Conference on Concussion in Sport
held in Zurich, November 2008

What's New?

- Sport Concussion Assessment Tool revision (SCAT2)
- Pocket SCAT2
- Abandon simple vs. complex terminology
- Emphasis on balance assessment
- Modifiers influencing investigation and management
- Elite vs non elite approaches (based on resources)
- Paediatric management strategy

OUTLINE

1. Process
2. Definitions
3. Evaluation
4. Management
5. Modifying Factors
6. Special Populations
7. Other Issues
8. SCAT 2

1. Process


3rd International Conference on
Concussion in Sport
30 October 2008
FIFA
VAIO
FIFA ™

Process

- 1st Vienna in 2001, 2nd Prague 2004
- 3rd meeting in Zurich 2008
  - NIH consensus development conference format
    - Pre-defined group of questions
    - Body of literature identified
    - Presentation by experts in open session day 1
    - Discussion / debate closed session with consensus panel on day 2
    - Document drafted by authors and circulated to panel
    - Knowledge translation

Authors and Panel Members

- Paul McCrory
- Willem Meeuwisse
- Karen Johnston
- Jiri Dvorak
- Mark Aubry
- Mick Malloy
- Robert Cantu

(listed in alphabetical order)

- Steve Broglio
- Gavin Davis
- Randall Dick
- Ruben Echemendia
- Gerry Gioia
- Kevin Guskiewicz
- Stan Herring
- Grant Iverson
- Jim Kelly
- Jamie Kissick
- Michael Makdissi
- Michael McCrea
- Alain Ptito
- Laura Purcell
- Margot Putukian

Invited but unable to attend: Roald Bahr, Lars Engebretsen, Peter Hamlyn, Barry Jordan, Patrick Schamasch.

Outputs:

- Simultaneous co-publication in May, 2009:
  1. **American Journal of Sports Medicine**
  2. **British Journal of Sports Medicine (with review papers)**
  3. **Clinical Journal of Sport Medicine**
  4. **Journal of Athletic Training**
  5. **Journal of Clinical Neuroscience**
  6. **Journal of Clinical Sports Medicine**
  7. **Journal of Science and Medicine in Sport**
  8. **Physician and Sportsmedicine**
  9. **Physical Medicine & Rehabilitation**
  10. **Neurosurgery**
  11. **Scandinavian Journal of Science & Medicine in Sport**
  12. **South African Journal of Sports Medicine**
- Powerpoint presentation

Sport Concussion Assessment Tool version 2 (SCAT2)

Pocket SCAT2

Pocket SCAT2

Concussion should be suspected in the presence of **any one or more** of the following: symptoms (such as headache), or physical signs (such as unsteadiness), or impaired brain function (e.g. confusion) or abnormal behaviour.

1. Symptoms

Presence of any of the following signs & symptoms may suggest a concussion.

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

2. Memory function

Failure to answer all questions correctly may suggest a concussion.

"At 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?"

3. Balance testing

Instructions for tandem stance

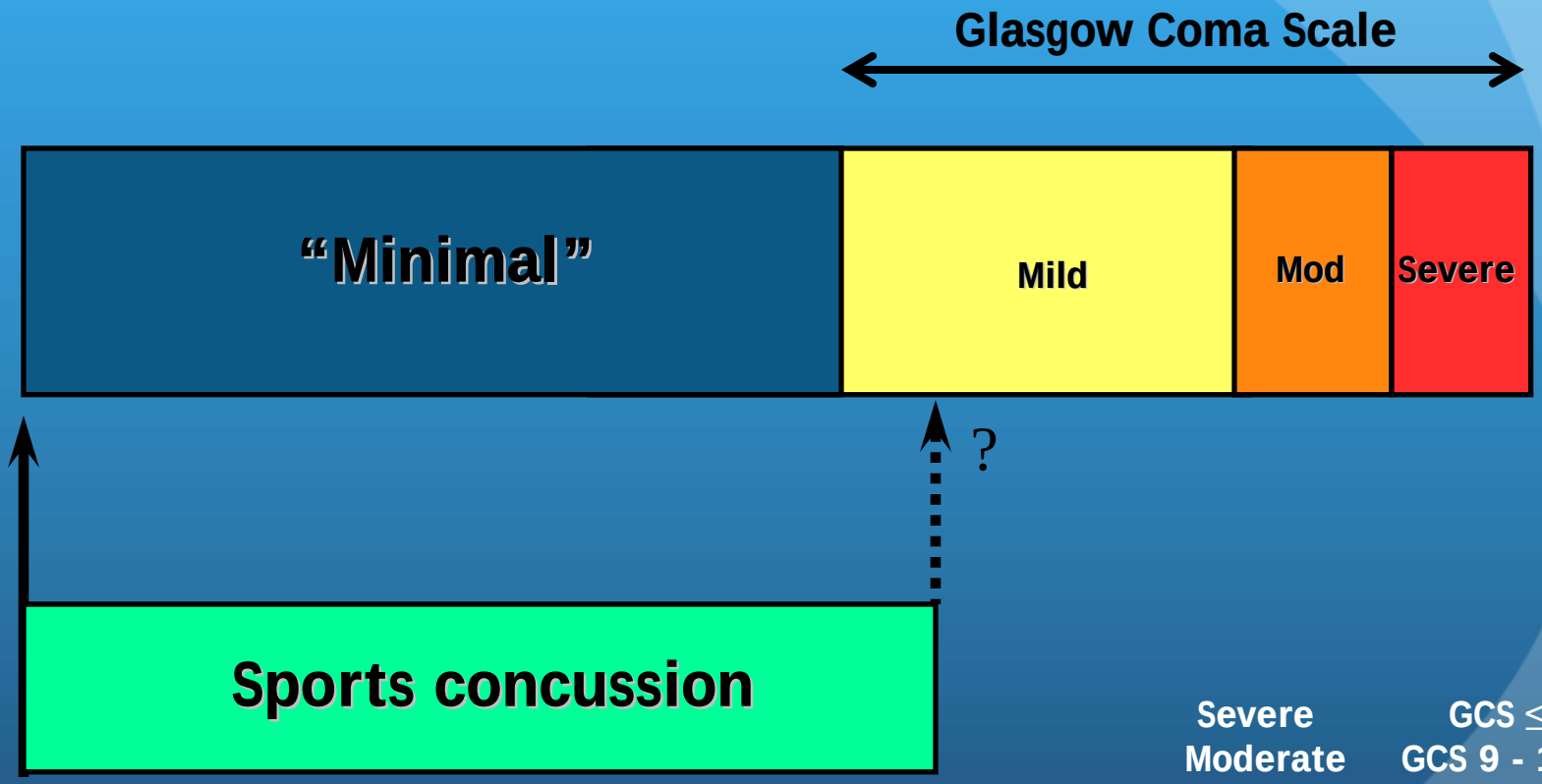
"Now stand heel-to-toe with your non-dominant foot in back. Your weight should be evenly distributed across both feet. You should try to maintain stability for 20 seconds with your hands on your hips and your eyes closed. I will be counting the number of times you move out of this position. If you stumble 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."

Observe the athlete for 20 seconds. If they make more than 5 errors (such as lift their hands off their hips; open their eyes; lift their forefoot or heel; step, stumble, or fall; or remain out of the start position for more that 5 seconds) then this may suggest a concussion.

Any athlete with a suspected concussion should be IMMEDIATELY REMOVED FROM PLAY, urgently assessed medically, should not be left alone and should not drive a motor vehicle.

2. Definitions

Traumatic Brain Injury



Severe	GCS ≤ 8
Moderate	GCS 9 - 12
Mild	GCS 13 - 15

Teasdale et al Lancet 1974; ii: 81-4

Injury Definition: Sports concussion

- *"Concussion is defined as a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces. Several common features that incorporate clinical, pathologic and biomechanical injury constructs that may be utilized in defining the nature of a concussive head injury include…"*

Aubry et. al. Br J Sports Med 36(1): 6-10, 2002

Definition

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.*

2. *Concussion typically results in the rapid onset of short- lived impairment of neurologic function that resolves spontaneously.*

3. *Concussion may result in neuropathological changes but the acute clinical symptoms largely reflect a functional disturbance rather than a structural injury.*

Aubry et. al., Br J Sports Med 36(1): 6-10, 2002

Definition

4. *Concussion results in a graded 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 a small percentage of cases, post-concussive symptoms may be prolonged.*
5. *No abnormality on standard structural neuroimaging studies is seen in concussion.*

Classification

- Abandoned the Simple vs Complex terminology
- Retained the concept that the majority (80-90%) of concussions resolve in a short (7-10 day) period
  - May be longer in children and adolescents

3. Evaluation

Signs and Symptoms

a) Symptoms - somatic (e.g. headache), cognitive (e.g. feeling like in a fog) and/or emotional symptoms (e.g. lability)

b) Physical signs (e.g. loss of consciousness, amnesia)

c) Behavioural changes (e.g. irritablity)

d) Cognitive impairment (e.g. slowed reaction times)

e) Sleep disturbance (e.g. drowsiness)

On-field or sideline evaluation of acute concussion

- The player should be medically evaluated onsite using standard emergency management principles and particular attention should be given to excluding a cervical spine injury.
- The appropriate disposition of the player must be determined by the treating healthcare provider in a timely manner.
- An assessment of the concussive injury should be made using the SCAT2 or other similar tool.
- The player should not be left alone following the injury and serial monitoring for deterioration is essential over the initial few hours following injury.
- A player with diagnosed concussion should not be allowed to return to play on the day of injury (see management section).

Evaluation in emergency room or office by medical personnel

- A medical assessment including a comprehensive history and detailed neurological examination including a thorough assessment of mental status, cognitive functioning and gait and balance.
- A determination of the clinical status of the patient including whether there has been improvement or deterioration since the time of injury. This may involve seeking additional information from parents, coaches, teammates and eyewitness to the injury.
- A determination of the need for emergent neuroimaging in order to exclude a more severe brain injury involving a structural abnormality

Essentially, these points are included in the SCAT2 assessment

Investigations

- Neuroimaging (CT, MRI)
  - Contributes little to concussion evaluation
  - Use when suspicion of intracerebral structural lesion exists:
    - prolonged loss of consciousness
    - focal neurologic deficit
    - worsening symptoms
    - Deterioration in conscious state
- Newer structural and functional imaging modalities are still at early stage of development in concussion

Investigations

- Balance assessment
  - Balance error scoring system (BESS)
- Neuropsychological assessment
  - Best done after symptom resolution
  - Most sensitive when compared to baseline
- Genetic Testing
  - Significance unknown for Apolipoprotein (Apo) E4, ApoE promotor gene, Tau polymerase, other genetic and cytokine factors

4. Management

Management

- CORNERSTONE = rest until asymptomatic
  - Rest from activity
    - No training, playing, exercise, weights
    - Beware of exertion with activities of daily living
  - Cognitive rest
    - No television, extensive reading, video games?
    - Caution re: daytime sleep

REST = ABSOLUTE REST!

Sports concussion
Follow-up Management

- Rest
- Rest
- Rest
- Expect gradual resolution in 7-10 days
- Start graded exercise rehabilitation when asymptomatic at rest and post-exercise challenge

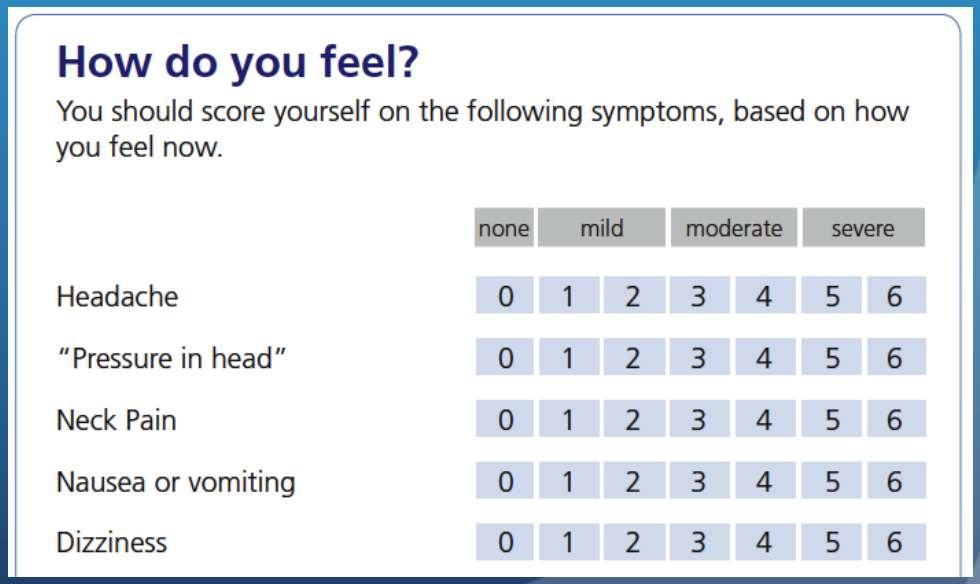
Recovery

- How long asymptomatic before exercise?
  - If rapid and full recovery, then 24-48 hours
  - One approach is to require that they remain asymptomatic (before starting exertion) for the same amount of time as it took for them to become asymptomatic.

Symptoms in Sports concussion

- Everyone "*feels fine*"
- Always ask:

1. "*On a scale of 0 to 100%, how do you feel?*"
2. "*what makes you not 100%?*"
3. Checklist – SCAT2



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

Graded Exertion Protocol

Rehabilitation stage	Functional exercise at each stage of rehabilitation	Objective of each stage
1. No activity	Complete physical and cognitive rest.	Recovery
2.Light aerobic exercise	Walking, swimming or stationary cycling keeping intensity < 70% MPHR No resistance training.	Increase HR
3.Sport-specific exercise	Skating drills in ice hockey, running drills in soccer. No head impact activities.	Add movement
4.Non-contact training drills	Progression to more complex training drills e,g. passing drills in football and ice hockey. May start progressive resistance training)	Exercise, coordination, and cognitive load
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	Normal game play	

- **24 hours per step**
- **If there is recurrence of symptoms at any stage, return to previous step**

Same day return to play?

- Return to play must follow same basic management with full clinical and cognitive recovery before RPT
- Same Day?
  - Not in young (<18 years)
  - Collegiate and high school athletes show deficits with same day RTP
  - With adult athletes, in some settings, where there are team physicians experienced in concussion management and sufficient resources as well as access to immediate (i.e. sideline) neuro-cognitive assessment, return to play management may be more rapid.

Return to Play / Sport

- Must pass graded exertion first
  =remain asymptomatic
- Is the athlete confident to go back?
- New helmet/head gear?
- Other “protective” equipment / behaviors / factors?
- Consider implications of multiple/recent injury

Management Issues

- Consider role for psychological approaches
- Pharmacotherapy
  - Prolonged symptoms (sleep disturbance, anxiety)
  - Modify underlying pathophysiology
- Upon return to play should not be on medication that could mask symptoms
  - Antidepressants?

Management Issues

- Preparticipation Evaluation History:
  - Type of sport?
  - Number of prior concussions?
  - Prior facial, dental injuries?
  - Non-sporting head injuries?
  - Type of player (“physical”?)
  - Ability to “take a hit”
  - Protective equipment (helmet age)

5. Modifying Factors

FACTORS	MODIFIER
Symptoms	Number Duration Severity
Signs	Prolonged LOC (>1min) Amnesia
Sequelae	Concussive convulsions
Temporal	Frequency –repeated concussion over time Timing – injuries close together “Recency” – recent concussion or TBI
Threshold	Repeated concussions occurring with progressively less impact force or slower recovery after each successive concussion
Age	Child and adolescent (< 18 years old)
Co and Pre-morbidities	Migraine, depression or other mental health disorders, attention deficit hyperactivity disorder (ADHD), learning disabilities (LD), sleep disorders
Medication	Psychoactive drugs Anticoagulants
Behaviour	Dangerous style of play
Sport	High risk activity Contact and collision sport High sporting level

Modifiers

- May influence investigation and management
- May predict potential for prolonged or persistent symptoms
- Multidisciplinary approach coordinated by a physician with specific expertise in management of concussion.

6. Special Populations

Child and Adolescent Athlete

- Adult recommendations can apply down to age 10
- Below 10 require age appropriate symptom checklists
- Include both patient and parent, teacher, etc.
- Possibly use neuropsych testing before symptoms resolve to assist planning school management

NOTE:
Pediatric subcommittee is developing age-specific SCAT for <10 years of age (Purcell, Gioia, Davis)

Child and Adolescent Athlete

- Consider age specific physical and cognitive rest issues
- Symptom resolution may take longer
- Consider extending symptom free period before starting return to play protocol
- Consider extending length of the graded exertion protocol
- Do not return to play same day

Elite vs non-elite

- All athletes should be managed the same regardless of level of participation
- However, available resources and expertise may facilitate a more aggressive management approach

7. Other Issues

Prevention

- Protective equipment
  - Mouthguards have benefit in prevention oral injury, but no evidence of concussion reduction
  - Head gear and helmets show reduction in biomechanical forces, but have not translated to a reduction in concussion incidence
  - Helmets reduce head and facial injury in skiing and snowboarding
  - Helmets reduce other forms of head injury (e.g. fracture) in cycling, equestrian, motor sports

Other Issues

- Rule changes
  - Consider where clear cut mechanism is implicated
- Risk compensation
  - Use of protective equipment may change behavior
- Aggression vs violence
  - Violent behavior that increases concussion risk should be eliminated
  - Promote fair play and respect

Knowledge Transfer

- Education of athletes, parents, coaches
- Awareness of concussion symptoms and signs
- Fair play and respect

Future Directions

- Validation of the SCAT2
- On-field injury severity predictors
- Gender effects on injury risk, severity and outcome
- Pediatric injury and management paradigms
- Virtual reality tools in the assessment of injury
- Rehabilitation strategies (e.g. exercise therapy)
- Novel Imaging modalities and their role in clinical assessment
- Concussion surveillance using consistent definitions and outcome measures
- Clinical assessment where no baseline assessment has been performed
- ‘Best-practice’ neuropsychological testing
- Long term outcomes

Consensus Statement on Concussion in Sport

THANK YOU!

SCAT 2

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 (if applicable)	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
(Add all scores in table, maximum possible: 22 x 6 = 132)

Do the symptoms get worse with physical activity? Y N

Do the symptoms get worse with mental activity? Y N

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

1 **Symptom score** (from page 1)

22 **minus** number of symptoms ____ of 22

2 Physical signs score

Was there loss of consciousness or unresponsiveness? ☐ Y ☐ N

If yes, how long? ☐ minutes

Was there a balance problem/unsteadiness? ☐ Y ☐ N

Physical signs score (1 point for each negative response) ☐ of 2

3

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.

4

Sideline Assessment – Maddocks Score

"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)

At 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 included in SCAT 2 summary score for serial testing.

5

Cognitive assessment

Standardized Assessment of Concussion (SAC)

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

"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.

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 of 15

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.

			Alternative digit lists		
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

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

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

Concentration score _____ of 5

6 Balance examination

This balance testing is based on a modified version of the Balance Error Scoring System (BESS)[6]. A stopwatch or watch with a second hand is required for this testing.

Balance 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.

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

Condition	**Total errors**
Double Leg Stance (feet together)	of 10
Single leg stance (non-dominant foot)	of 10
Tandem stance (non-dominant foot at back)	of 10
Balance examination score (30 **minus** total errors)	of 30

7 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). 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."*

Which arm was tested: ☐ Left ☐ Right

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.

Coordination score ____ of 1

8

Cognitive assessment

Standardized Assessment of Concussion (SAC)

Delayed recall

"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.

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

Delayed recall score _____ of 5

Overall score

Test domain	Score
Symptom score	of 22
Physical signs score	of 2
Glasgow Coma score (E + V + M)	of 15
Balance examination score	of 30
Coordination score	of 1
Subtotal	**of 70**
Orientation score	of 5
Immediate memory score	of 5
Concentration score	of 15
Delayed recall score	of 5
SAC subtotal	**of 30**
SCAT2 total	**of 100**
Maddocks Score	**of 5**

Definitive normative data for a SCAT2 "cut-off" score is not available at this time and will be developed in prospective studies. Embedded within the SCAT2 is the SAC score that can be utilized separately in concussion management. The scoring system also takes on particular clinical significance during serial assessment where it can be used to document either a decline or an improvement in neurological functioning.

Scoring data from the SCAT2 or SAC 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.

Pocket SCAT2

Pocket SCAT2

Pocket SCAT2

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- Amnesia
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- Neck Pain
- Nausea or vomiting
- Dizziness
- Blurred vision
- Balance problems
- Sensitivity to light
- Sensitivity to noise
- Feeling slowed down
- Feeling like "in a fog"
- "Don't feel right"
- Difficulty concentrating
- Difficulty remembering
- Fatigue or low energy
- Confusion
- Drowsiness
- More emotional
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- Nervous or anxious

2. Memory function

Failure to answer all questions correctly may suggest a concussion.

"At what venue are we at today?"
"Which half is it now?"
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3. Balance testing

Instructions for tandem stance

"Now stand heel-to-toe with your non-dominant foot in back. Your weight should be evenly distributed across both feet. 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."

Observe the athlete for 20 seconds. If they make more than 5 errors (such as lift their hands off their hips; open their eyes; lift their forefoot or heel; step, stumble, or fall; or remain out of the start position for more that 5 seconds) then this may suggest a concussion.

Any athlete with a suspected concussion should be IMMEDIATELY REMOVED FROM PLAY, urgently assessed medically, should not be left alone and should not drive a motor vehicle.