What is the SCAT2?1
This tool represents a standardized method of evaluating injured athletes for concussion and can be used in athletes aged from 10 years and older. It supersedes the original SCAT published in 20052. This tool also enables the calculation of the Standardized Assessment of Concussion (SAC)3, 4 score and the Maddocks questions5 for sideline concussion assessment.

Instructions for using the SCAT2
The SCAT2 is designed for the use of medical and health professionals. Preseason baseline testing with the SCAT2 can be helpful for interpreting post-injury test scores. Words in Italics throughout the SCAT2 are the instructions given to the athlete by the tester.

This tool may be freely copied for distribution to individuals, teams, groups and organizations.

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 symptoms (like those listed below) and often does not involve loss of consciousness. 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.

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.

How do you feel?
You should score yourself on the following symptoms, based on how you feel now.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>None</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>“Pressure in head”</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Neck Pain</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Nausea or vomiting</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Dizziness</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Blurred vision</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Balance problems</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sensitivity to light</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sensitivity to noise</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Feeling slowed down</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Feeling like “in a fog”</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>“Don’t feel right”</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Difficulty concentrating</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Difficulty remembering</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Fatigue or low energy</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Confusion</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Drowsiness</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Trouble falling asleep (if applicable)</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>More emotional</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Irritability</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Nervous or Anxious</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>no different</th>
<th>very different</th>
<th>unsure</th>
</tr>
</thead>
</table>
Cognitive & Physical Evaluation

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 N
   If yes, how long? minutes
   Was there a balance problem/unsteadiness? Y N N

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
   Obey commands 6

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

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

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 0 1 0 1 0 1

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.

Immediate memory score of 15

Concentration score of 5

1 This tool has been developed by a group of international experts at the 3rd International Consensus meeting on Concussion in Sport held in Zurich, Switzerland in November 2008. The full details of the conference outcomes and the authors of the tool are published in British Journal of Sports Medicine, 2009, volume 43, supplement 1.


Balance examination

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

Balance testing

“I am going now 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 an 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.

Balance examination score (30 minus total errors)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Total errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Double Leg Stance (feet together)</td>
<td>10</td>
</tr>
<tr>
<td>Single leg stance (non-dominant foot)</td>
<td>10</td>
</tr>
<tr>
<td>Tandem stance (non-dominant foot at back)</td>
<td>10</td>
</tr>
<tr>
<td>Balance examination score</td>
<td>30 minus total errors</td>
</tr>
</tbody>
</table>

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.

Coordinate score

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.

<table>
<thead>
<tr>
<th>List</th>
<th>Alternative word list</th>
</tr>
</thead>
<tbody>
<tr>
<td>elbow</td>
<td>candle</td>
</tr>
<tr>
<td>apple</td>
<td>baby</td>
</tr>
<tr>
<td>carpet</td>
<td>finger</td>
</tr>
<tr>
<td>saddle</td>
<td>penny</td>
</tr>
<tr>
<td>bubble</td>
<td>blanket</td>
</tr>
<tr>
<td>wagon</td>
<td>lemon</td>
</tr>
<tr>
<td>iron</td>
<td>insect</td>
</tr>
</tbody>
</table>

Delayed recall score

Overall score

<table>
<thead>
<tr>
<th>Test domain</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptom score</td>
<td>22</td>
</tr>
<tr>
<td>Physical signs score</td>
<td>2</td>
</tr>
<tr>
<td>Glasgow Coma score (E + V + M)</td>
<td>15</td>
</tr>
<tr>
<td>Balance examination score</td>
<td>30</td>
</tr>
<tr>
<td>Coordination score</td>
<td>1</td>
</tr>
<tr>
<td>Subtotal</td>
<td>70</td>
</tr>
<tr>
<td>Orientation score</td>
<td>5</td>
</tr>
<tr>
<td>Immediate memory score</td>
<td>5</td>
</tr>
<tr>
<td>Concentration score</td>
<td>15</td>
</tr>
<tr>
<td>Delayed recall score</td>
<td>5</td>
</tr>
<tr>
<td>SAC subtotal</td>
<td>30</td>
</tr>
<tr>
<td>SCAT2 total</td>
<td>100</td>
</tr>
<tr>
<td>Maddocks Score</td>
<td>5</td>
</tr>
</tbody>
</table>

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.
This patient 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 patient will need monitoring for a further period by a responsible adult. Your treating physician will provide guidance as to this timeframe.

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

Other important points:
- Rest and avoid strenuous activity for at least 24 hours
- No alcohol
- No sleeping tablets
- Use paracetamol or codeine for headache. Do not use aspirin or anti-inflammatory medication
- Do not drive until medically cleared
- Do not train or play sport until medically cleared

**Concussion injury advice** (To be given to concussed athlete)

This patient 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 patient will need monitoring for a further period by a responsible adult. Your treating physician will provide guidance as to this timeframe.

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

Other important points:
- Rest and avoid strenuous activity for at least 24 hours
- No alcohol
- No sleeping tablets
- Use paracetamol or codeine for headache. Do not use aspirin or anti-inflammatory medication
- Do not drive until medically cleared
- Do not train or play sport until medically cleared

**Return to play**

Athletes should not be returned to play the same day of injury. When returning athletes to play, they should follow a stepwise symptom-limited program, with stages of progression. For example:
1. rest until asymptomatic (physical and mental rest)
2. light aerobic exercise (e.g. stationary cycle)
3. sport-specific exercise
4. non-contact training drills (start light resistance training)
5. full contact training after medical clearance
6. return to competition (game play)

There should be approximately 24 hours (or longer) for each stage and the athlete should return to stage 1 if symptoms recur. Resistance training should only be added in the later stages. **Medical clearance should be given before return to play.**