SCAT6™

Supplement: Guidelines to using the Sport Concussion Assessment Tool 6 (SCAT6)™

Detailed Instructions

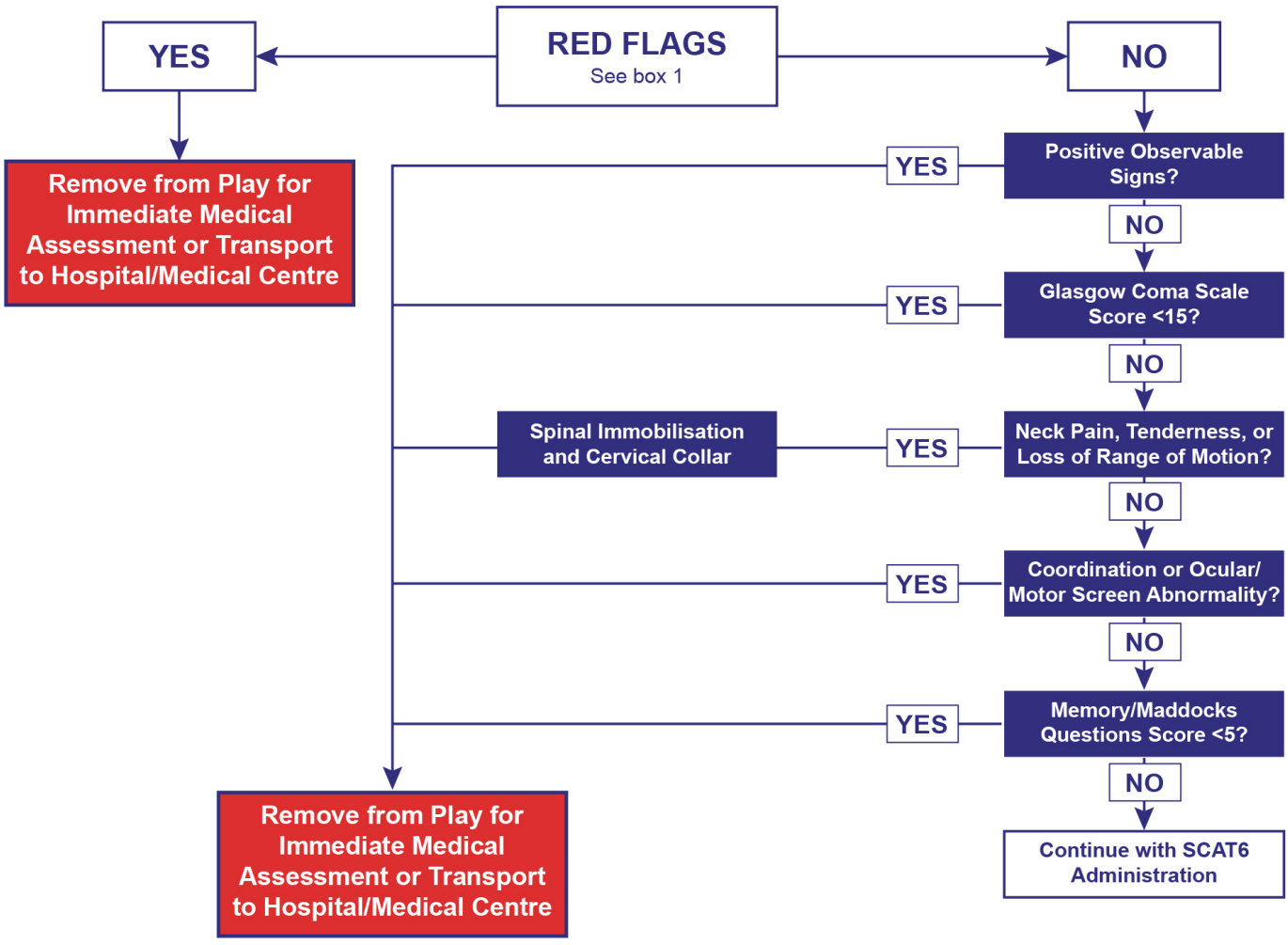
Words in ***blue Italics*** throughout the SCAT6 are the instructions given to the athlete by the clinician.

Words in **red** are informational for the clinician.

Immediate Assessment/Neuro Screen

(Optional during Baseline Exam; Required for suspected injury, acute evaluation)

The neuro screen is a critical component of the SCAT6 that is administered first in any suspected injury/acute injury evaluation and consists of: Step 1 documenting observable signs, Step 2 Glasgow Coma Scale, Step 3 cervical spine assessment (training dependent), Step 4 Maddocks questions, and Step 5 identification of Red Flags. These steps must be completed first in order to determine whether continuing on to the off-field evaluation is clinically indicated/possible given the athlete's status.



Developed by: The Concussion in Sport Group (CISG)

Supported by:

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Coordination & Ocular/Motor Screen (Finger to Nose)

Say ***"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."*** **Repeat with both hands, eyes open and closed.**

Memory Assessment and Maddocks Questions[1]

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

Ask each question with appropriate sport-specific adaptations made to the wording of the question.

One point for each correct answer for a maximum of 5 points.

Step 2: Symptom Evaluation

The instructions for the symptoms scale are based on the type of test being administered. At baseline it is important to assess how an athlete "typically" feels whereas during the acute/post-acute stage the athlete is being asked how they feel at the time of testing.

The symptom scale should be completed by the athlete, not by the examiner. Once the athlete has completed answering all symptom items it is useful for the clinician to revisit the items that were endorsed positively to gather more detail about each symptom. In situations where the symptom scale is being completed after exercise, it should be done in a resting state, generally by approximating the athlete's resting heart rate.

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

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

Step 3: Cognitive Screening (SAC)[2]

Immediate Memory

The Immediate Memory component only uses the 10-word list. The maximum score per trial is 10 with a total trial maximum of 30. **Complete all 3 trials regardless of score on previous trials.**

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

Record the time the 3rd trial was completed. Do NOT inform the athlete that delayed recall will be tested.

Score 1 pt. for each correct response. Total score equals sum across all 3 trials.

When comparing SCAT5/SCAT6 test scores on Immediate Memory please note the SCAT6 word lists and corresponding SCAT5 10-word lists are labeled differently as follows:

SCAT6	**A**	**B**	**C**
SCAT5	**G**	**H**	**I**

Note: Form differences have been found in a large dataset of professional male ice hockey players[4] (Echemendia et al., 2020) suggesting that the word lists may not be equivalent in level of difficulty. It is suggested that individuals using the SCAT6 generate baseline normative data in their local settings to examine whether form differences exist and adjust accordingly.

Concentration

Digits Backward: Choose one column of digits, either A, B, C, and administer the 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. So, if I said 9-6-8 you would say? (8-6-9). "***

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 of 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:

Say ***"Now tell me the months of the year in reverse order as quickly and accurately as possible. Start with the last month and go backward. So, you will say December, November ... Go ahead."***

Record number of Errors and Time to Completion. 1 point if no errors and completion under 30 seconds.

Step 4: Coordination and Balance Examination

If the athlete successfully completes the mBESS then proceed to the Tandem Gait. If the athlete has difficulty or is unable to complete the mBESS successfully, then the Tandem Gait is optional and may be given at a later time along with the Dual Task component as clinically indicated.

Modified Balance Error Scoring System (mBESS)

The mBESS is a modified version of the Balance Error Scoring System (BESS)[3]. A timing device is required for this testing.

- **Each 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 of 10 for that testing condition.**

OPTIONAL (depending on clinical presentation and setting resources): 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) with the same instructions and scoring.

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

Say ***"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:

Say ***"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:

Say ***"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:

Say ***"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[5,6,7]

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 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. A total of 3 trials will be conducted.

Step 4: Coordination and Balance Examination (Continued)

Dual Task Gait (Optional, depending on clinical presentation and setting resources)

The Dual-Task cognitive task should be selected based on the individual participant's math ability. For example, Serial 7s Subtraction may be most appropriate for individuals older than 12 years of age; however, a smaller integer (e.g., 3) may be selected if the participant cannot complete the practice trial by subtracting 7's. If the participant can't complete the practice trial and an integer other than 7 is selected for the test, make note of this change.

Practice Trial

Say ***"Now, while you are walking heel-to-toe, I will ask you to count backwards out loud by 7s. For example, if we started at 100, you would say 100, 93, 86, 79. Let's practice counting. Starting with 93, count backward by 7s until I say "stop"."*** **Note that this practice only involves counting backwards.**

Examination Trials

Say ***"Good. Now I will ask you to walk heel-to-toe and count backwards out loud at the same time. Are you ready? The number to start with is 88. Go!"***

Step 5: Delayed Recall

The delayed recall should be performed after a minimum of 5 minutes has elapsed since the end of the Immediate Memory section.

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

This tool has been developed by an international expert panel as part of the 6th International Consensus Conference on Concussion in Sport held in Amsterdam, Netherlands in October 2022. The full details of the conference outcomes and the authors of the tool are published in the BJSM, 2023, Volume 57, Issue 11.

References

1. Maddocks, DL; Dicker, GD; Saling, MM. The assessment of orientation following concussion in athletes. Clin J Sport Med. 1995;5(1):32–3.
2. McCrea M. Standardized mental status testing of acute concussion. Clinical Journal of Sports Medicine. 2001; 11: 176-181.
3. Guskiewicz KM. Assessment of postural stability following sport-related concussion. Current Sports Medicine Reports. 2003; 2: 24-30.
4. Echemendia RJ, Thelen J, Meeuwisse W, Hutchison MG, Comper P, Rizos J & Bruce JM. Use of the Sport Concussion Assessment Tool 5 (SCAT5) in professional hockey, part 1: cross-cultural normative data. British Journal of Sports Medicine, 2020;0:1-8. Doi:10.1136/bjsports-2020-102071.
5. Oldham, J.R., Howell, D.R., Knight, C.A., Crenshaw, J.R., & Buckley, T.A. Single-Task and Dual-Task Tandem Gait Performance Across Clinical Concussion Milestones in Collegiate Student-Athletes. Clinical Journal of Sport Medicine. 2021, 31(6), e392-397.
6. Wingerson, M.J., Seehusen, C.N., Walker, G.A., Wilson, J.C., Howell, D.R. Clinical feasibility and utility of a dual-task tandem gait protocol for pediatric concussion management. Journal of Athletic Training. 2020. 58(2), 106-111.
7. Howell DR, Osternig LR, Chou LS. Single-task and dual-task tandem gait test performance after concussion. J Sci Med Sport. 2017 Jul;20(7):622-626. doi: 10.1016/j.jsams.2016.11.020. Epub 2017 Jan 24. PMID: 28169147

Additional 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 should be transported to a hospital emergently if they exhibit/experience any of the following:

- A severe headache that gets worse
- Drowsiness or inability to be awakened
- Inability to recognize people or places
- Repeated vomiting
- Unusual behaviour or seeming to be confused or very irritable
- Seizures (arms and legs shake or jerk uncontrollably)
- Episodes of disorientation, staring or limited responsiveness
- Weakness or numbness in arms or legs
- Unsteadiness on their feet
- Slurred speech

Remember, it is better to be safe.

Consult your Health Care Professional after a suspected concussion.

Concussion Injury Advice

(To be given to the person monitoring the 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 complication has been found. Recovery time is variable across individuals and 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, worsening headache, double vision or excessive drowsiness, or other worrisome concerns please seek medical care immediately.

Other important points:

Initial brief period of rest (24-48 hours) rest: Limit physical activity to routine daily activities (avoid exercise, training, sports) and limit activities such as school, work, and screen time to a level that does not worsen symptoms or provoke new symptoms.

- Avoid alcohol.
- Avoid prescription or non-prescription drugs without medical supervision. Specifically:
  - Avoid sleeping tablets.
  - Do not use aspirin, anti-inflammatory medication or stronger pain medications such as opioids.
- Do not drive until cleared by an HCP.
- Return to play/sport requires clearance by an HCP.

Clinic Phone Number:

Patient's Name:

Date/Time of Injury: **Date/Time of Medical Review:**

Health Care Professional: Contact details or stamp

Return to Learn (RTL) Strategy

Facilitating RTL is a vital part of the recovery process for student-athletes. HCPs should work with stakeholders on education and school policies to facilitate academic support, including accommodations/learning adjustments for students with SRC when needed. Academic support should address factors for greater RTL duration (e.g., social determinants of health, higher symptom burden) by adjusting environmental, physical, curricular, and testing factors as needed. Not all athletes will need a RTL strategy or academic support. If symptom exacerbation occurs during cognitive activity or screen time, or difficulties with reading, concentration, or memory or other aspects of learning are reported, clinicians should consider implementation of a RTL strategy at the time of diagnosis and during the recovery process. When the RTL strategy is implemented, it can begin following an initial period of relative rest (Step 1: 24-48 hrs), with an incremental increase in cognitive load (Stages 2 to 4). Progression through the strategy is symptom limited (i.e., no more than a mild exacerbation of current symptoms related to the current concussion) and its course may vary across individuals based on tolerance and symptom resolution. Further, while the RTL and RTS strategies can occur in parallel, student-athletes should complete full RTL before unrestricted RTS.

Step	Mental Activity	Activity at Each Step	Goal
1	Daily activities that do not result in more than a mild exacerbation* of symptoms related to the current concussion.	Typical activities during the day (e.g., reading) while minimizing screen time. Start with 5–15 min at a time and increase gradually.	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 schoolwork. May need to start with a partial school day or with greater access to rest breaks during the day.	Increase academic activities.
4	Return to school full time.	Gradually progress school activities until a full day can be tolerated without more than mild* symptom exacerbation.	Return to full academic activities and catch up on missed work.

NOTE: Following an initial period of relative rest (24-48 hours following injury at Step 1), athletes can begin a gradual and incremental increase in their cognitive load. Progression through the strategy for students should be slowed when there is more than a mild and brief symptom exacerbation.

*Mild and brief exacerbation of symptoms is defined as an increase of no more than 2 points on a 0-10 point scale (with 0 representing no symptoms and 10 the worst symptoms imaginable) for less than an hour when compared with the baseline value reported prior to cognitive activity.

Graduated Return to School Strategy

Concussion may affect the ability to learn at school. The child may need to miss a few days of school after a concussion, but the child's doctor should help them get back to school after a few days. When going back to school, some children may need to go back gradually and may need to have some changes made to their schedule so that concussion symptoms don't get a lot worse. If a particular activity makes symptoms a lot worse, then the child hould stop that activity and rest until symptoms get better. To make sure that the child can get back to school without problems, it is important that the health care provider, parents/caregivers and teachers talk to each other so that everyone knows what the plan is for the child to go back to school.

Note: If mental activity does not cause any symptoms, the child may be able to return to school part-time without doing school activities at home first.

Return to Sport (RTS) Strategy

Return to sport participation after an SRC follows a graduated stepwise strategy, an example of which is outlined in Table 2. RTS occurs in conjunction with return to learn (see RTL strategy) and under the supervision of a qualified HCP. Following an initial period of relative rest (Step 1: approximately 24-48 hours), clinicians can implement Step 2 [i.e., light (Step 2A) and then moderate (Step 2B) aerobic activity] of the RTS strategy as a treatment of acute concussion. The athlete may then advance to steps 3-6 on a time course dictated by symptoms, cognitive function, clinical findings, and clinical judgement. Differentiating early activity (step 1), aerobic exercise (Step 2), and individual sport-specific exercise (Step 3) as part of the treatment of SRC from the remainder of the RTS progression (Steps 4-6) can be useful for the athlete and their support network (e.g., parents, coaches, administrators, agents). Athletes may be moved into the later stages that involve risk of head impact (Steps 4-6 and Step 3 if there is any risk of head impact with sport-specific activity) of the RTS strategy following authorization by the HCP and after resolution of any new symptoms, abnormalities in cognitive function, and clinical findings related to the current concussion. Each step typically takes at least 24 hours. Clinicians and athletes can expect a minimum of 1 week to complete the full rehabilitation strategy, but typical unrestricted RTS can take up to one month post-SRC. The time frame for RTS may vary based on individual characteristics, necessitating an individualized approach to clinical management. Athletes having difficulty progressing through the RTS strategy or with symptoms and signs that are not progressively recovering beyond the first 2-4 weeks may benefit from rehabilitation and/or involvement of a multidisciplinary team of HCP experienced in managing SRC. Medical determination of readiness, including psychological readiness, to return to at-risk activities should occur prior to returning to any activities at risk of contact, collision or fall (e.g. multiplayer training drills), which may be required prior to any of steps 3-6, depending on the nature of the sport or activity that the athlete is returning to and in keeping with local laws/ requirements.

Step	Exercise Strategy	Activity at Each Step	Goal
1	Symptom-limited activity.	Daily activities that do not exacerbate symptoms (e.g., walking).	Gradual reintroduction of work/school.
2	Aerobic exercise **2A – Light** (up to approx. 55% max HR) **then** **2B – Moderate** (up to approximately 70% max HR)	Stationary cycling or walking at slow to medium pace. May start light resistance training that does not result in more than mild and brief exacerbation* of concussion symptoms.	Increase heart rate.
3	Individual sport-specific exercise **NOTE:** if sport-specific exercise involves any risk of head impact, medical determination of readiness should occur prior to step 3.	Sport-specific training away from the team environment (e.g., running, change of direction and/or individual training drills away from the team environment). No activities at risk of head impact.	Add movement, change of direction.
Steps 4-6 should begin after resolution of any symptoms, abnormalities in cognitive function, and any other clinical findings related to the current concussion, including with and after physical exertion.			
4	Non-contact training drills.	Exercise to high intensity including more challenging training drills (e.g., passing drills, multiplayer training). Can integrate into team environment.	Resume usual intensity of exercise, coordination, and increased thinking.
5	Full contact practice.	Participate in normal training activities.	Restore confidence and assess functional skills by coaching staff.
6	Return to sport.	Normal game play.	

maxHR = predicted maximal Heart Rate according to age (i.e., 220-age)

Age Predicted Maximal HR= 220-age	Mild Aerobic Exercise	Moderate Aerobic Exercise
55%	220-age x 0.55= training target HR	
70%		220-age x 0.70= training target HR

NOTE: *Mild and brief exacerbation of symptoms (i.e., an increase of no more than 2 points on a 0-10 point scale for less than an hour when compared with the baseline value reported prior to physical activity). Athletes may begin Step 1 (i.e., symptom-limited activity) within 24 hours of injury, with progression through each subsequent step typically taking a minimum of 24 hours. If more than mild exacerbation of symptoms (i.e., more than 2 points on a 0-10 scale) occurs during Steps 1 -3, the athlete should stop and attempt to exercise the next day. If an athlete experiences concussion-related symptoms during Steps 4-6, they should return to Step 3 to establish full resolution of symptoms with exertion before engaging in at-risk activities. Written determination of readiness to RTS should be provided by an HCP before unrestricted RTS as directed by local laws and/or sporting regulations.