

Irish Hockey Concussion Guidelines 2014

Irish Hockey is aware that there can be serious sequelae for players suffering from concussion. This is not limited to the immediate consequences of acute head injury. The long term effects of head injury and concussion are well recognised and can be minimised with appropriate immediate and longer term care.

Most of the hockey played in Ireland, indeed throughout the world, takes place without formal pitch side medical or first aid cover and it is hoped that these guidelines will help both players and those in charge of players.

Guidelines Summary

- Concussion is a brain injury that needs to be taken seriously to protect the long term welfare of all players.
- Any player suspected of having sustained a concussion, should be safely removed immediately from the field and should not return to play or train on the same day. If there is any doubt as to whether a player has suffered concussion apply the guidelines.
- Where a Team Doctor is present, they must advise the person in charge of the team (i.e. Team Manager/Coach) in this regard and the player must not be allowed to continue their participation in the game.
- Concussion is an evolving injury. It is important to monitor the player after the injury for progressive deterioration.
- They should be advised to seek medical help, especially if they have continuing problems.
- Concussion diagnosis is a clinical judgement – Use of the SCAT 3 can only aid the doctor in their diagnosis.
- Players suspected of having a concussion must have adequate rest of at least 24 hours and then must follow a graduated return to play protocol.
- Players must receive medical clearance (by a doctor) before returning to play.
- Younger athletes require a more conservative approach to protect the developing brain.

What is Concussion?

Concussion is a brain injury and can be caused by a direct or indirect hit to the player's head or body. Concussion typically results in an immediate onset of short lived signs and symptoms. However in some cases, the signs and symptoms of concussion may evolve over a number of minutes or hours. Loss of consciousness occurs in less than 15% of concussion cases and whilst a feature of concussion, loss of consciousness is not a requirement for diagnosing concussion.

Concussion is only one diagnosis that may result from a head injury. Head injuries may result in one or more of the following:

1. Superficial injuries to scalp or face such as lacerations and abrasions
2. Subconcussive event – a head impact event that does not cause a concussion
3. Concussion - an injury resulting in a disturbance of brain function
4. Structural brain injury - an injury resulting in damage to a brain structure for example fractured skull or a bleed into or around the brain.

Structural brain injuries may present mimicking a concussion. In this instance the signs and symptoms of a structural brain injury will usually persist or deteriorate over time e.g. persistent or worsening headache, increased drowsiness, persistent vomiting, increasing confusion and seizures.

Medical assessment of a concussion or a head injury where the diagnosis is not apparent is recommended to exclude a potential structural brain injury. In concussion typically standard neuro-imaging such as MRI or CT scan is normal.

All head injuries should be considered associated with cervical spine injury until proven otherwise. If there is any concern that there is a cervical spine injury the player should not be moved and urgent medical/ambulance help called. (See Appendix 2)

Different ages

It is widely accepted that children and adolescent athletes (18 years and under) with concussion should be managed more conservatively. This is supported by evidence that confirms that children:

1. are more susceptible to concussion
2. take longer to recover
3. have more significant memory and mental processing issues.
4. are more susceptible to rare and dangerous neurological complications, including death caused by a second impact syndrome.

CONCUSSION MUST BE TAKEN EXTREMELY SERIOUSLY

Signs and Symptoms

Contrary to popular belief, most concussion injuries occur without a loss of consciousness and so it is important to recognise the other signs and symptoms of concussion. Concussion must be recognised as an evolving injury in the acute stage. Some symptoms develop immediately while other

symptoms may appear gradually over time (24 hours +). Monitoring of players after the injury is therefore an important aspect of concussion management.

Diagnosis of acute concussion should involve the following:

1. Player's subjective report of their symptoms.
2. Observation of the player for physical signs of concussion.
3. Assessment of the player for cognitive change or decline.
4. Observation of players for behavioural change.
5. Players report of any sleep disturbance.

Table 1: Concussion Assessment Domains

Indicators	What you Would Expect to See
Symptoms	Headaches* Dizziness 'Feeling in a fog.'
Physical Signs	Loss of consciousness Vomiting Vacant Facial Expression Clutching Head Motor Inco-ordination (unsteady on feet, falling, poor balance)
Cognitive Impairment	Loss short term memory Difficulty with concentration Decreased attention Diminished work performance
Behavioural Changes	Irritability Anger Mood Swings Feeling Nervous Anxious
Sleep Disturbance	Drowsiness Difficulty Falling Asleep
* most common symptom	

Pitch Assessment of a Concussion Injury

- ❖ The player should be assessed by a doctor or registered healthcare practitioner (Physiotherapist/ Nurse) on the field using standard emergency management principles. Particular attention should be given to excluding a cervical spine injury.

- ❖ If no healthcare practitioner is available the player should be safely removed from practice or play and urgent referral to a doctor is required.
- ❖ Once the first aid issues are addressed, an assessment of the concussive injury should include clinical judgement and the use of the SCAT 3 (medical or trained personnel only)
- ❖ The player should **NOT** be left alone following the injury and regular observation for deterioration is essential over the initial few hours following injury. They should not drive a car or consume alcohol.

Note: -

*Need to **recognise that the appearance of symptoms might be delayed several hours following a concussive episode**. Example: there may be no forgetfulness (retrograde amnesia) present at 0 minutes post injury, yet forgetfulness (amnesia) may be present at 10 minutes post injury.

*Orientation tests (i.e. name, place, and person) have been shown to be an unreliable cognitive function test in the sporting situation.

Return to Play

- A player with a diagnosed concussion should **NEVER** be allowed to return to play on the day of injury.
- Return to play must follow a medically supervised stepwise approach and a player **MUST NEVER** return to play while symptomatic

The most important aspect of concussion management is physical and cognitive rest until the acute symptoms resolve and then a graded program of exertion prior to medical clearance and graduated return to play (GRTP) completed. (See Table 2 below)

1. There should be an initial period of 24-48 hours physical and mental rest for any player after a concussive injury.
2. GRTP protocols following concussion follow a stepwise approach. With this stepwise progression, the players should continue to proceed to the next level **only** if asymptomatic at the current level.
3. Generally each step should take 24 hours so that the athlete would take approximately one week to proceed to full rehabilitation once they are asymptomatic at rest.
4. If any post concussion symptoms occur while in the GRTP program, then the player should drop back to the previous asymptomatic level and try to progress again after a further 24 hours period of rest has passed. They should be honest to protect themselves.

Medical clearance (medical clearance refers to medical doctors) is required prior to return to full contact sports.

Table 2 Graduated Return to Play Protocol

Rehabilitation Stage	Exercise Allowed	Objective
1. Rest as per minimum rest period prescribed for player's age	Complete physical and cognitive rest without symptoms	Recovery
2. Light aerobic exercise Walking, swimming or stationary cycling keeping intensity, <70% maximum predicted heart rate. No resistance training.	Symptom free during full 24-hour period	Increase heart rate
3. Sport-specific exercise	Running drills. No head impact activities	Add movement
4. Non-contact training drills	Progression to more complex training drills, e.g. passing drills. May start progressive resistance training	Exercise, coordination, and cognitive load
6. Return to play	Player rehabilitated	Recover

Helping your players cope with their concussion injury.

The best medical management for concussion is rest (Cognitive and Physical).

Players often feel tired and may experience difficulties at work or school when carrying at task which require concentration. Players may also encounter mood difficulties and feel depressed, anxious or irritable with family or team mates. Support should be provided to players during this recovery period. Alcohol should be avoided as it may delay recovery and put the player at increased risk for further injury.

When dealing with persistent symptoms, it is essential that players only take medications prescribed by their doctor.

Recovery from concussion should not be rushed nor pressure applied to players to resume playing until recovery is complete. The risk of re injury is high and may lead to recurrent concussion injuries which can cause long term damage.

Remember "better to have missed one game than the whole season, or worse."

Concussion Management in Children 5 years – 18 years

Concussion management is different due to the following factors:
Brain development, variable growth rates, language difficulties, child versus parental reports of symptoms, lack of medical coverage at underage games, physical examination in children is usually normal.

Management in Children:

Rest for minimum time recommended below.

- No sports, exertions, minimal TV, PC Use, Music etc
- Occasionally there is a need for gradual return to school work, increase breaks during school day etc (on medical recommendation)

A summary of the minimum rest periods and different length GRTP stages for different ages is shown below:

Players 15 years and under

- Minimum rest period 2 weeks and symptom free
- GRTP to follow rest, with each stage lasting 48 hours
- Earliest return to play - Day 23 post injury

U/16 - U/19 - Players 16, 17 and 18 years of age

- Minimum rest period 1 week and symptom free
- GRTP to follow rest, with each stage lasting 24 hours
- Earliest return to play - Day 12 post injury

Adult - 19 years and over

- Minimum rest period 24 hours and free of symptoms
- GRTP to follow rest, with each stage lasting 24 hours
- Earliest return to play - Day 6 post injury

A GRTP should only commence if the player:

- has completed the minimum rest period for their age
- is symptom free and off medication that modifies symptoms of concussion.

Medical or approved healthcare professional clearance is required prior to commencing a GRTP.

Recurrent or difficult concussions

Following a concussion a player is at an increased risk of a second concussion within the next 12 months. Irish Hockey recommends that all concussions be taken seriously and that full recovery be achieved prior to re-introduction of exercise.

Players with:

- a second concussion within 12 month

- a history of multiple concussions
- unusual presentations or
- prolonged recovery

should be assessed and managed by health care providers (multi-disciplinary) with experience in sports-related concussions.

If a medical practitioner experienced in concussion management or approved healthcare provider is unavailable the player with a recurrent or difficult concussion history should be managed using the GRTP protocol from the lower age group as a minimum.

Sports Concussion Assessment Tool 3 (SCAT3, Appendix 1)

While the diagnosis of concussion is a clinical judgment ideally made by a medical professional, the SCAT 3 provides a standardized tool assessing an injured player aged from 13 years and older for concussion. SCAT 3 is designed for use by registered medical practitioners and other clinical personnel that have appropriate training to use SCAT 3.

SCAT 3 consists of two parts - the first part is an initial pitch side assessment of injury severity (Concussion signs, Glasgow Coma Scale and Maddocks Score). Any player with a suspected concussion should be REMOVED FROM PLAY, medically assessed, monitored for deterioration and should not drive a motor vehicle until cleared to do so by a registered medical practitioner.

The second part of the SCAT 3 should be carried out after a minimum 15 minute rest period to avoid the influence of exertion and fatigue on the player's performance. This assessment consists of symptom checklist, symptom severity, as well as neuro cognitive and balance functions.

It is recognised that the SCAT3 should not be used solely to make or exclude the diagnosis of concussion in the absence of clinical judgement. An athlete may have a concussion even if their SCAT3 is normal. **The diagnosis of a concussion is a clinical judgement in the end.**

Conclusion

Irish Hockey recommends that the “Gold Standard” concussion management be implemented for all players diagnosed with a concussion or when a player is suspected of having a concussion during a game or training at which there is no approved health care professional present.

This “Gold Standard” includes:

- Assessment by a certified medical practitioner familiar with international concussion protocols;
- Thorough, serial symptom analysis;
- General and neurological examination;
- Balance assessment; and

- Assessment of cognitive function preferably compared to a pre-injury baseline.

Concussion management - 6 "Rs"

Recognise – Learn the signs and symptoms of a concussion so you understand when an athlete might have a potential concussion.

Remove – If an athlete has a concussion or even a potential concussion he or she must be safely removed from play immediately.

Refer – Once removed from play, the player should be referred immediately to a medical practitioner or qualified healthcare professional who is trained in evaluating and treating concussions.

Rest – Players must rest from exercise until symptom-free **and then** start a Graduated Return to Play program.

Irish Hockey recommends minimum rest periods for different ages –

U/6 to U/15 – 2 weeks minimum rest

U/16-U/19 - 1-week minimum rest

Adults - 24 hours minimum rest

Recover – Full recovery from the concussion is required before return to play is authorized. This includes being symptom-free. Rest and specific treatment options are critical for the health of the injured participant.

Return – In order for safe return to play in Hockey, the athlete must be symptom-free and cleared in writing by a medical practitioner or approved healthcare professional who is trained in evaluating and treating concussions.

The athlete must complete a GRTP (Graduated Return to Play) program.

Irish Hockey acknowledges the permission from Dr Mike Rossiter, GB & England Hockey, for permission to quote from his document, Concussion Policy, and from GAA to quote from their Concussion Management Guidelines.

Appendix 1 & 2 are included for information. The Pocket Concussion Recognition Tool – For Use By All persons involved in Sport is recommended as an aide memoir for all involved in supervision of players. [Appendix 2].

Appendix 1: SCAT 3 - Medical Professional Use Only

SCAT3™



Sport Concussion Assessment Tool – 3rd Edition

For use by medical professionals only

Name

Date/Time of Injury:
Date of Assessment:

Examiner:

What is the SCAT3?

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

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

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

What is a concussion?

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

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

SIDELINE ASSESSMENT

Indications for Emergency Management

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

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

Potential signs of concussion?

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

Any loss of consciousness?	<input type="checkbox"/> Y <input type="checkbox"/> N
"If so, how long?"	
Balance or motor incoordination (stumble, loss of head movement, etc)?	<input type="checkbox"/> Y <input type="checkbox"/> N
Disorientation or confusion (ability to respond appropriately to questions)?	<input type="checkbox"/> Y <input type="checkbox"/> N
Loss of memory:	<input type="checkbox"/> Y <input type="checkbox"/> N
"If so, how long?"	
"Before or after the injury?"	
Blank or vacant look	<input type="checkbox"/> Y <input type="checkbox"/> N
Visible facial injury in combination with any of the above	<input type="checkbox"/> Y <input type="checkbox"/> N

1 Glasgow coma scale (GCS)

Best eye response (E)

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

Best verbal response (V)

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

Best motor response (M)

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

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

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

2 Maddocks Score³

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

Maddocks (Maddocks) questions (3 points for each correct answer)

What venue are we at today?	0	1
Which half is it now?	0	1
Who scored last in this match?	0	1
What team did you play last week/game?	0	1
Did your team win the last game?	0	1
Maddocks score	0/3	

Maddocks score is added for sideline diagnosis of concussion only and is not used for re-testing.

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

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

BACKGROUND

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

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

SYMPTOM EVALUATION

30

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 dazed/dumb	0	1	2	3	4	5	6
Feeling like "in a fog"	0	1	2	3	4	5	6
"Don't feel right"	0	1	2	3	4	5	6
Difficulty concentrating	0	1	2	3	4	5	6
Difficulty remembering	0	1	2	3	4	5	6
Fatigue or low energy	0	1	2	3	4	5	6
Confusion	0	1	2	3	4	5	6
Drowsiness	0	1	2	3	4	5	6
Trouble falling asleep	0	1	2	3	4	5	6
Mood emotional	0	1	2	3	4	5	6
Irritability	0	1	2	3	4	5	6
Twitches	0	1	2	3	4	5	6
Nervous or Anxious	0	1	2	3	4	5	6

Total number of symptoms (Maximum possible 22)

Symptom severity score (Maximum possible 132)

Do the symptoms get worse with physical activity? Y NDo the symptoms get worse with mental activity? Y N self rated self rated and clinician monitored clinician interview self rated with parent input

Overall rating: If you know the athlete well prior to the injury, how different is the athlete acting compared to his/her usual self?

Please tick one response
 no different very different unsure N/A

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

COGNITIVE & PHYSICAL EVALUATION

4

Cognitive assessment

Standardized Assessment of Concussion (SAC)

Orientation (3 points 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 15 min)	0	1

Orientation score _____ of 6

Immediate memory

Item	Trail 1	Trail 2	Trail 3	Alternative words					
elbow	0	1	0	1	0	1	candle	baby	finger
apple	0	1	0	1	0	1	paper	monkey	penalty
carpet	0	1	0	1	0	1	sugar	perfume	blanket
scissors	0	1	0	1	0	1	sandwich	sunbat	lemon
bubble	0	1	0	1	0	1	wagon	iron	insect

Immediate memory score total _____ of 15

Concentration: Digits Backward

Item	Trail 1	Alternative digit list			
4-3-3	0	1	0-2-9	5-2-6	4-1-5
3-4-1-4	0	1	3-2-7-9	1-7-9-5	4-9-4-8
6-2-9-2-1	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	6-3-9-1-4-8	8-3-1-9-6-4	7-2-4-8-5-4

Total of 4 _____

Concentration: Month in Reverse Order (3 pts. for entire sequence correct)

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

Concentration score _____ of 6

15

Neck Examination:

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

6

Balance examination

Done on both of the following tests:

Postural sway (Shoes, barefoot, braces, tape, etc.) _____

Modified Balance Error Scoring System (BESS) testing¹Which foot was last tested (ie. which is the non-dominant foot)? Left Right

Testing surface (hard floor, felt, etc.): _____

Condition

Double leg stance: _____ Error

Single leg stance (non-dominant foot): _____ Error

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

And/or

Tandem gait¹

Time (best of 4 trials) _____ seconds

7

Coordination examination

Upper limb coordination

Which arm was tested? Left Right

Coordination score _____ of 1

8

SAC Delayed Recall¹

Delayed recall score _____ of 5

INSTRUCTIONS

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

Symptom Scale

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

To be completed by the athlete. In situations where the symptom scale is being completed after exercise, it should still be done in a resting state, at least 10 minutes post exercise.
For total number of symptoms, maximum possible is 22.
For Symptom severity score, add all scores in table, maximum possible is 22 x 4 = 88.

SAC⁴

Immediate Memory

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

Trials 2&3:

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

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

Concentration

Digits backward

"I am going to read you a string of numbers and when I am done, you repeat them back to me backwards, in reverse order of how I read them to you. For example, if I say 7-4-9, you would say 9-4-7."

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

Months in reverse order

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

1 pt. for entire sequence correct

Delayed Recall

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

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

Score 1 pt. for each correct response

Balance Examination

Modified Balance Error Scoring System (BESS) testing⁴

This balance testing is based on a modified version of the Balance Error Scoring System (BESS).⁴ A stopwatch or watch with a second hand is required for this testing.

"I am now going to test your balance. Please take your shoes off, roll up your pants 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 this 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 feet/crest
2. Opening eyes
3. Step, stumble, or fall
4. Moving hip into > 30-degree 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 18.** If a athlete commits multiple errors simultaneously, only one error is recorded but the athlete should quickly return to the testing position, and counting should resume once subject is set. Subjects that are unable to maintain the testing procedure for a minimum of **five seconds** at the start are assigned the highest possible score, ten, for that testing condition.

OPTION: For further assessment, the same 3 stances can be performed on a surface of medium density foam (e.g., approximately 50cm x 40cm x 10cm).

Tandem Gait⁵

Participants are instructed to stand with their feet together behind a starting line the test is first done with footwear removed. Then, they walk in a forward direction as quickly and as accurately as possible along a 10m wide sports tape. It starts the with an alternate foot heel-to-toe gait ensuring that they approximate their feet and toe on each step. Once they cross the end of the 10m line, they turn 180 degrees and return to the starting point using the same gait. A total of 4 trials are done and the best time is retained. Athletes should complete the test in 14 seconds. Athletes fail the test if they step off the line, have a separation between their feet and toe, or if they touch or grab the examiner or an object. In this case, the time is not recorded and the trial repeated, if appropriate.

Coordination Examination

Upper limb coordination

Finger-to-nose (FTN) test:

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

Scoring: 5 correct repetitions in < 4 seconds = 1

Notes for testers: Allow the test if they do not touch their nose, do not fully extend their elbow or do not perform the repetition. **Failure should be scored as 0.**

References & Footnotes

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

Any athlete suspected of having a concussion should be removed from play, and then 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:

- Have a headache that gets worse
- Are very drowsy or can't be awakened
- Can't recognize people or places
- Have repeated vomiting
- Behave unusually or seem confused, are very irritable
- Have seizures (arms and legs jerk uncontrollably)
- Have weak or numb arms or legs
- Are unsteady on their feet, have slurred speech

Remember, it is better to be safe.

Consult your doctor after a suspected concussion.

Return to play

Athletes should not be returned to play the same day of injury.

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

For example:

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

There should be at least 24 hours (or longer) for each stage and if symptoms recur the athlete should rest until they resolve once again and then resume the program at the previous asymptomatic stage. Resistance training should only be added in the later stages.

If the athlete is symptomatic for more than 10 days, then consultation by a medical practitioner who is expert in the management of concussion, is recommended.

Medical clearance should be given before return to play.

Scoring Summary:

Test Domain	Score		
	Date _____	Date _____	Date _____
Number of Symptoms of 22			
Symptom Severity Score of 132			
Orientation of 5			
Immediate Memory of 15			
Concentration of 5			
Delayed Recall of 5			
SAC Total			
BESS (total errors)			
Tandem Gait (seconds)			
Coordination of 1			

Notes:

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 complications 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, dizziness, worsening headache, double vision or excessive drowsiness, please contact your doctor or the nearest hospital emergency department immediately.

Other important points:

- Rest (physically and mentally), including training or playing sports until symptoms resolve and you are medically cleared
- No alcohol
- No prescription or non-prescription drugs without medical supervision. Specifically:
 - No sleeping tablets
 - Do not use aspirin, anti-inflammatory medication or sedating pain killers
- Do not drive until medically cleared
- Do not train or play sport until medically cleared

Clinic phone number

Patient's name

Date/Time of injury

Date/Time of medical review

Treating physician

Contact details or stamp

Appendix 2: Pocket Concussion Recognition Tool – For Use By All persons involved in Sport

Pocket CONCUSSION RECOGNITION TOOL™

To help identify concussion in children, youth and adults



RECOGNIZE & REMOVE

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

1. Visible clues of suspected concussion

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

- Loss of consciousness or responsiveness
- Lying motionless on ground/slow to get up
- Unsteady on feet / Balance problems or falling over/incoordination
- Grabbing/Clutching of head
- Dazed, blank or vacant look
- Confused/Not aware of plays or events

2. Signs and symptoms of suspected concussion

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

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

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3. Memory function

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

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

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

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

RED FLAGS

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

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

Remember:

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

from McCrory et. al, Consensus Statement on Concussion in Sport. Br J Sports Med 47 (5), 2013

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