Head Injuries in the Young Athlete: Who Plays? Who Sits?

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Speaker Disclosure

- Dr. Calmbach has disclosed that he has no actual or potential conflict of interest in relation to this topic.

Objectives

- Be aware of criteria for diagnosing sports-related concussion
- Be familiar with common tools for assessing and evaluating athletes with concussion
- Be aware of guidelines for managing the young athlete with concussion
- Be aware of return-to-play recommendations and controversies

Audience Response Question 1

After a sports-related concussion, the athlete can return to play:

1. When he/she feels better
2. After one week
3. When asymptomatic at rest
4. When asymptomatic at rest and with exertion x 1 week
5. None of the above

Audience Response Question 2

Which of the following is a good evaluation instrument for sports-related concussion?

1. SAC (Standardized Assessment of Concussion)
2. SCAT2 (Sport Concussion Assessment Tool 2, 2010)
3. BESS (Balance Error Scoring System)
4. ImPACT (Immediate Post-concussion Assessment and Cognitive Testing)
5. All of the above

Audience Response Question 3

Appropriate indications for neuroimaging in the athlete with suspected concussion include:

1. Severe headache
2. Focal neurological findings
3. Repeated vomiting
4. Significant drowsiness/difficulty awakening, Slurred speech
5. All of the above

Audience Response Question 4

Cases of second impact syndrome have been reported for which of the following sports?

1. Hockey
2. Skiing
3. Boxing
4. Contact/collision sports
5. All of the above

Concussions are Big News

- Pop Warner
  - New rules to limit practices and return to play
  - “When in doubt, sit them out!”
- UIL
  - House Bill 2038, changes to TEC section 38
  - http://www.uiltexas.org/health/info/concussions
- NFL
  - Multimillion-dollar-settlement to Rx players for concussions
  - New rules on helmet-to-helmet tackles, etc.

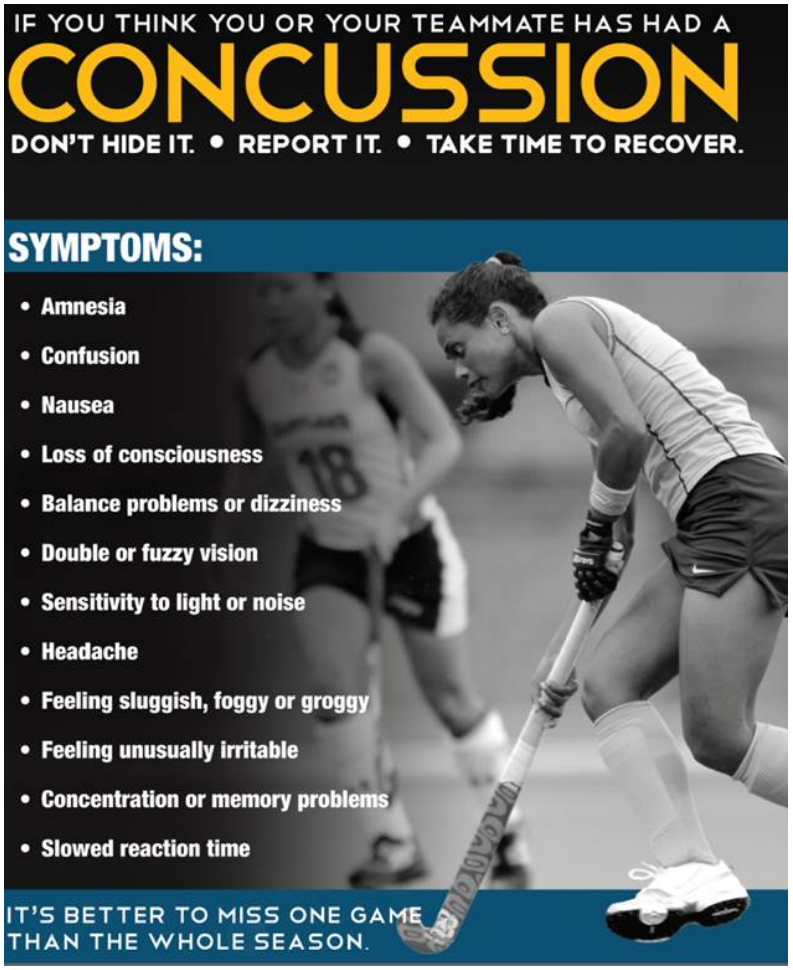
Concussions are Big News

- NCAA
  - Lawsuit: NCAA failed to take meaningful steps to prevent student athletes from sustaining concussions
  - CDC Website: “Attention College Sports Fans: CDC and NCAA Team Up on Concussion Safety”
    - Fact sheets for coaches and athletes
    - http://www.cdc.gov/concussion/sports/cdc_ncaa.html
    - Sample concussion mgmt plans for team medical staff
    - http://www.ncaa.org/wps/wcm/connect/public/ncaa/health+and+safety/concussion+homepage/concussion+landing+page
- “When in doubt get checked out.”

Concussion and Women's Sports

- High School Sports: Girls have a higher rate of sports-related concussions than boys
- Women's Sports: Highest incidence of concussions #1 soccer, #2 basketball
- NCAA: "It's better to miss one game than the whole season"

www.womenssportsfoundation.org



Concussion Definition, 3rd International Conference on Concussion In Sport, Zurich 2008

- Concussion is “a complex pathophysiological process affecting the brain caused by traumatic biomechanical forces.”

McCrory P, Clin J Sports Med 2009; 19(3): 185-200.

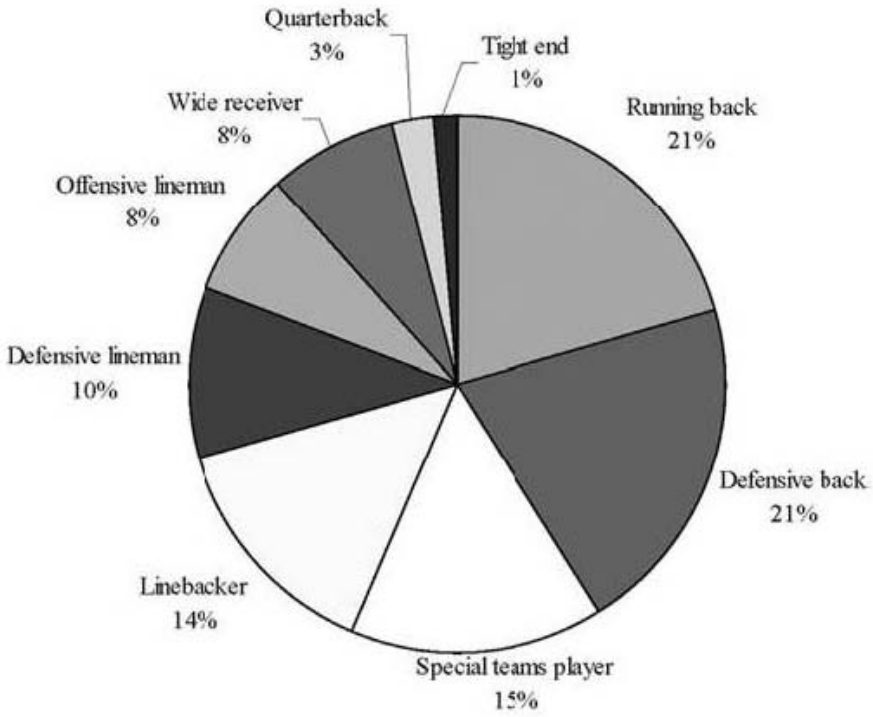
Common Features

- Rapid onset of usually short-lived neurological impairment, typically resolve spontaneously
- Acute clinical symptoms usually reflect a functional disturbance rather than structural injury
- Range of clinical symptoms (may or may not involve loss of consciousness)
- Neuroimaging studies are typically normal

Am Coll Sport Med Consensus Statement, Med Sci Sports Exerc 2006; 38(2): 395-399.

Epidemiology

- Head injury twice as common as neck injury
- 20% of athletes affected each year
- Underreported:
  - Player not aware of significance of symptoms
  - Wants to avoid disqualification



Boden BP. Am J Spots Med 2007; 35(7): 1075-1081.

Epidemiology of Concussion

- 30 million children and adolescents participate in organized sports in the US each year
- Concussion occurs in 1.6M-3.6 M young athletes each year
- High school:
  - 53% report history of at least one concussion
- College:
  - 36% report history of multiple concussions

Lovell MR. Curr Sports Med Rep 2008; 7(1): 12-15.

Pathophysiology of Concussion

- Children seem to be more vulnerable to the effects of brain injury than adults
- Specific changes at the cellular level
- “Metabolic mismatch”
  - Increased glucose utilization
  - Reduced cerebral blood flow
- Increased vulnerability to injury during the recovery period, 7-14 days

Lovell MR. Curr Sports Med Rep 2008; 7(1): 12-15.

Pathophysiological Cascade After Concussion Injury

- Concussion d/t rotational and angular forces to brain
- Shear forces disrupt neural membranes
- => K+ efflux to extracellular space
- Increases in Ca++ and excitatory amino acids
- => further K+ efflux
- => suppresses neuron activity
- Na+/K+ pumps work to restore balance
- => increased energy requirement
- But, paradoxical decrease in cerebral blood flow
- Disruption of autonomic regulation persist for several weeks
- => brain vulnerable to additional injury

Scorza KA, et. al. Am Fam Phys 2012; 85(2): 123-132.

Guidelines (Historical Review)

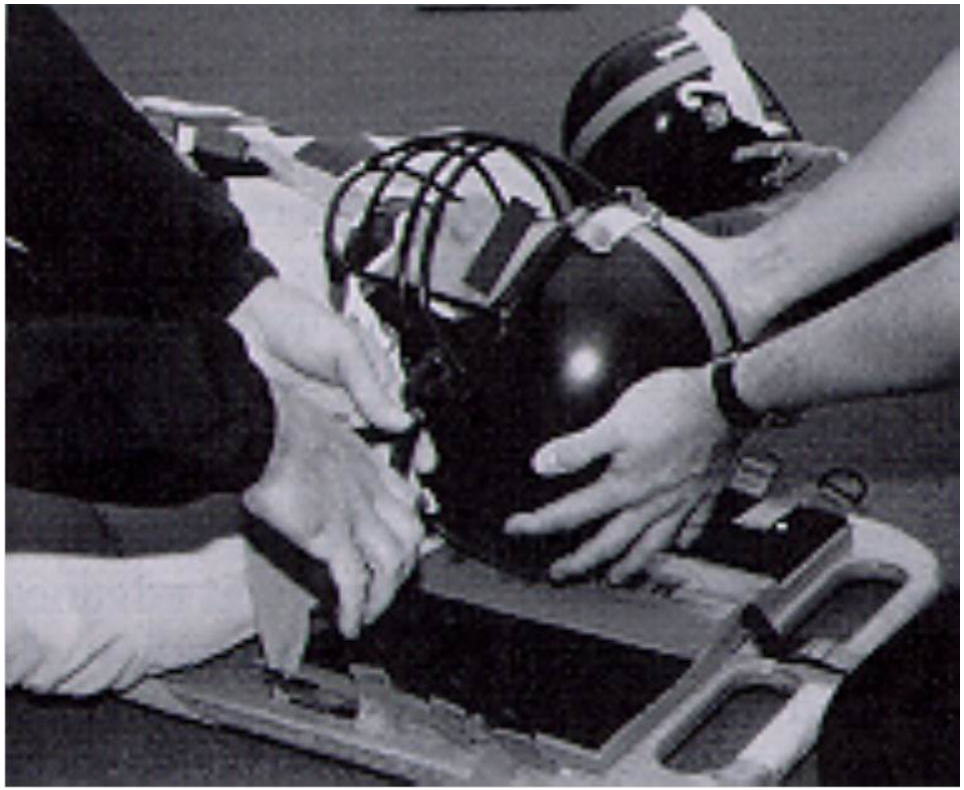
- Overreliance on published guidelines
  - Nonuniformity
  - Lack of prospective validation
  - Use LOC as marker of severity
  - Individual variation in presentation and recovery after concussion
- Useful as starting point when evaluating athletes
- Rec: individualized management based on signs & symptoms and standardized assessment tools

On-Field Assessment

- Rule out serious injury
- Indications for emergency transport
- Sidelines assessment

Initial Assessment

- Athlete unconscious
  - Assume cervical spine injury
  - Immobilize appropriately
    - Do not remove helmet or shoulder pads
    - Sandbags, Philadelphia collar



Initial Assessment

- Athlete unconscious
  - Check **DR ABC's**:
  - Remove from Danger
  - Check Responsiveness (AVPU)
    - Alert
    - Responds to Verbal stimuli
    - Responds to Painful stimuli
    - Unresponsive

Initial Assessment

- Athlete unconscious
  - Airway
  - Breathing
  - Circulation
  - Disability
  - Exposure

Initial Assessment

- Athlete conscious
  - Evaluate alertness, orientation
  - Post-traumatic amnesia
  - Ability to retain new information:
  - Standardized Assessment of Concussion form

Injury Assessment

- Neurological symptoms
  - Headache
  - Light-headedness
  - Balance
  - Coordination
  - Sensation
  - Motor function
  - Reflexes

Injury Assessment

- Stress importance of mental status
  - Concentration
  - Short-term memory
  - Orientation

Selected Signs and Symptoms

Cognitive

- Confusion
- Post-traumatic amnesia
- Retrograde amnesia
- Loss of consciousness
- Disorientation
- Feeling “zoned out”
- Vacant stare
- Inability to focus
- Excessive drowsiness

Somatic

- Headache
- Fatigue
- Disequilibrium
- Dizziness
- Nausea/vomiting
- Visual disturbances
- Photophobia
- Phonophobia
- Emotional lability, irritability

Standaert CJ. Arch Phys Med Rehab 2007; 88: 107-1079.

Transport to Emergency Facility

- Repeated vomiting
- Severe or progressively worsening headache
- Seizure activity
- Unsteady gait
- Slurred speech
- Weakness or numbness in the extremities
- Signs of basilar skull fracture
- Altered mental status
- Glasgow coma scale <15

Halstead ME, Pediatrics 2010; 126(3): 597-615.

Indication for Neuroimaging (CT is the Test of Choice)

- Severe headache
- Seizures
- Focal neurological findings
- Repeated emesis
- Significant drowsiness/difficulty awakening
- Slurred speech
- Poor orientation to person/place/time
- Neck pain
- Significant irritability
- Hx LOC > 30 seconds

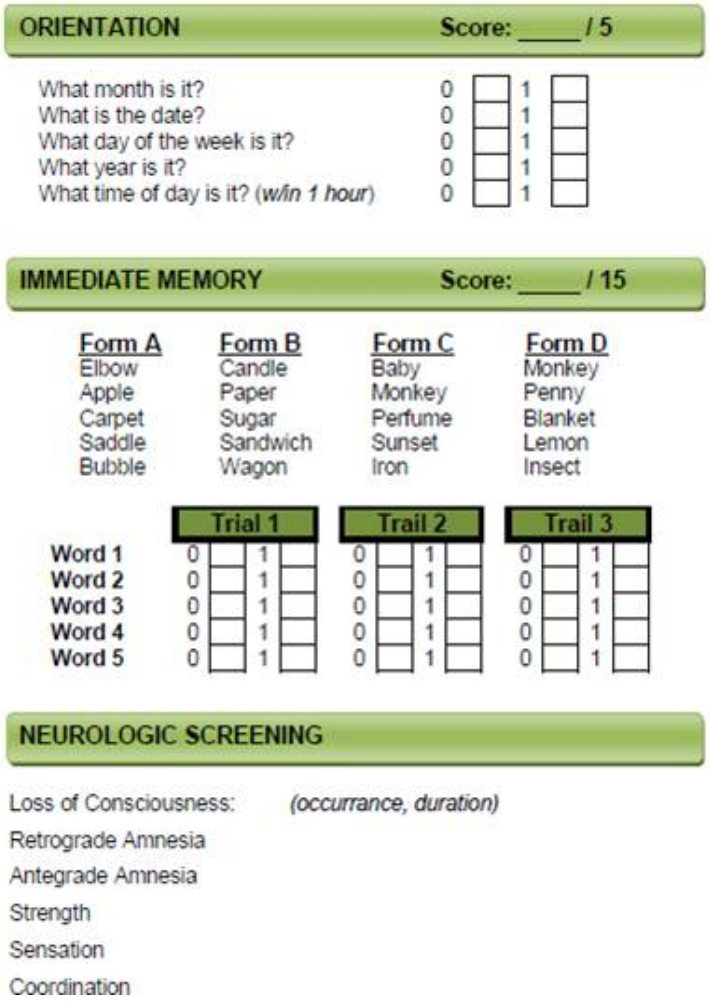
Halstead ME, Pediatrics 2010; 126(3): 597-615.

Common Assessment Tools

- Standardized Assessment of Concussion (SAC)
- Sports Concussion Assessment Tool v2 (SCAT2)
- Balance Error Scoring System (BESS)
- Immediate Post-concussion Assessment and Cognitive Testing (ImPACT)

Standardized Assessment of Concussion (SAC), pt 1

- Orientation
- Immediate Recall
- Neurologic Screening



ORIENTATION Score: ____ / 5

What month is it?	0 ☐	1 ☐
What is the date?	0 ☐	1 ☐
What day of the week is it?	0 ☐	1 ☐
What year is it?	0 ☐	1 ☐
What time of day is it? (*w/in 1 hour*)	0 ☐	1 ☐

IMMEDIATE MEMORY Score: ____ / 15

Form A	Form B	Form C	Form D
Elbow	Candle	Baby	Monkey
Apple	Paper	Monkey	Penny
Carpet	Sugar	Perfume	Blanket
Saddle	Sandwich	Sunset	Lemon
Bubble	Wagon	Iron	Insect

	Trial 1	Trail 2	Trail 3
Word 1	0 ☐ 1 ☐	0 ☐ 1 ☐	0 ☐ 1 ☐
Word 2	0 ☐ 1 ☐	0 ☐ 1 ☐	0 ☐ 1 ☐
Word 3	0 ☐ 1 ☐	0 ☐ 1 ☐	0 ☐ 1 ☐
Word 4	0 ☐ 1 ☐	0 ☐ 1 ☐	0 ☐ 1 ☐
Word 5	0 ☐ 1 ☐	0 ☐ 1 ☐	0 ☐ 1 ☐

NEUROLOGIC SCREENING

Loss of Consciousness: *(occurrance, duration)*

Retrograde Amnesia

Antegrade Amnesia

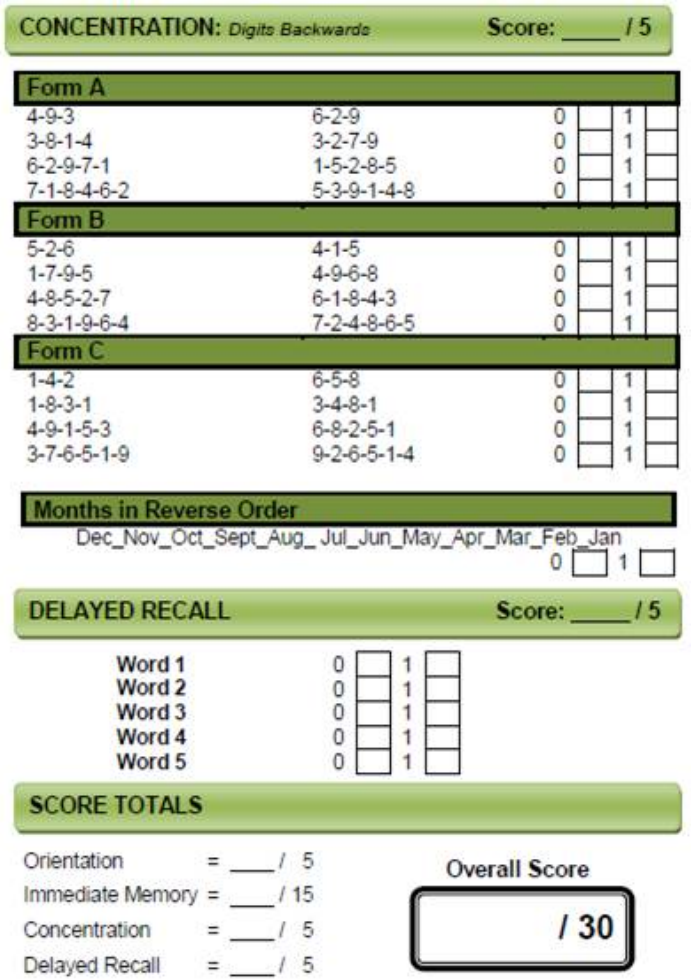
Strength

Sensation

Coordination

Standardized Assessment of Concussion (SAC), pt 2

- Concentration
  - Digits
  - Months
- Delayed Recall
- Score Total



CONCENTRATION: *Digits Backwards* **Score: ____ / 5**

Form A			
4-9-3	6-2-9	0 ☐	1 ☐
3-8-1-4	3-2-7-9	0 ☐	1 ☐
6-2-9-7-1	1-5-2-8-5	0 ☐	1 ☐
7-1-8-4-6-2	5-3-9-1-4-8	0 ☐	1 ☐
Form B			
5-2-6	4-1-5	0 ☐	1 ☐
1-7-9-5	4-9-6-8	0 ☐	1 ☐
4-8-5-2-7	6-1-8-4-3	0 ☐	1 ☐
8-3-1-9-6-4	7-2-4-8-6-5	0 ☐	1 ☐
Form C			
1-4-2	6-5-8	0 ☐	1 ☐
1-8-3-1	3-4-8-1	0 ☐	1 ☐
4-9-1-5-3	6-8-2-5-1	0 ☐	1 ☐
3-7-6-5-1-9	9-2-6-5-1-4	0 ☐	1 ☐

Months in Reverse Order

Dec_Nov_Oct_Sept_Aug_ Jul_Jun_May_Apr_Mar_Feb_Jan

0 ☐ 1 ☐

DELAYED RECALL **Score: ____ / 5**

Word 1	0 ☐	1 ☐
Word 2	0 ☐	1 ☐
Word 3	0 ☐	1 ☐
Word 4	0 ☐	1 ☐
Word 5	0 ☐	1 ☐

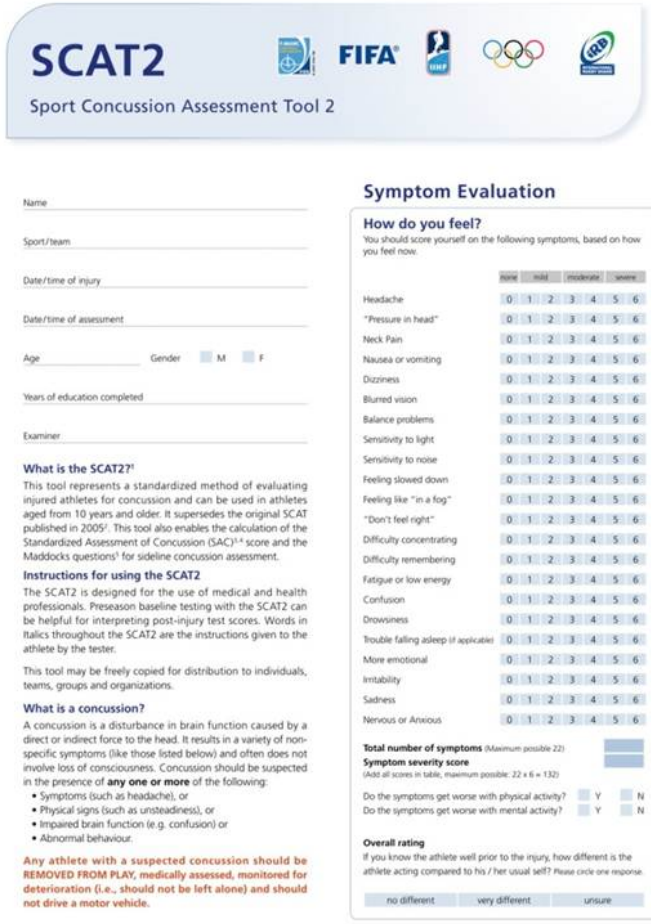
SCORE TOTALS

Orientation	= ____ /	5
Immediate Memory	= ____ /	15
Concentration	= ____ /	5
Delayed Recall	= ____ /	5

Overall Score

/ 30

Sports Concussion Assessment Tool v2 (SCAT2)



SCAT2

Sport Concussion Assessment Tool 2

Name

Sport/team

Date/time of injury

Date/time of assessment

Age Gender M F

Years of education completed

Examiner

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 2005[2]. This tool also enables the calculation of the Standardized Assessment of Concussion (SAC)[3,4] score and the Maddocks questions[5] 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.

Symptom Evaluation

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

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
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

[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.
The outcome paper will also be simultaneously co-published in the May 2009 issues of Clinical Journal of Sports Medicine, Physical Medicine & Rehabilitation, Journal of Athletic Training, Journal of Clinical Neuroscience, Journal of Science & Medicine in Sport, Neurosurgery, Scandinavian Journal of Science & Medicine in Sport and the Journal of Clinical Sports Medicine.

[2] McCrory P et al. Summary and agreement statement of the 2nd International Conference on Concussion in Sport, Prague 2004. British Journal of Sports Medicine. 2005; 39: 196-204.

[3] McCrea M. Standardized mental status testing of acute concussion. Clinical Journal of Sports Medicine. 2001; 11: 176-181

[4] McCrea M, Randolph C, Kelly J. Standardized Assessment of Concussion: Manual for administration, scoring and interpretation. Waukesha, Wisconsin, USA.

[5] Maddocks, DL, Dicker, GD, Saling, MM. The assessment of orientation following concussion in athletes. Clin J Sport Med. 1995;5(1):32–3

[6] Guskiewicz KM. Assessment of postural stability following sport-related concussion. Current Sports Medicine Reports. 2003; 2: 24-30

SCAT2 Pocket Card, pt 1

- Symptoms
  - Loss of Consciousness
  - Seizure or Convulsion
  - Headache, etc.

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

SCAT2 Pocket Card, pt 2

- Memory Function
  - Venue, half, score, etc.
- Balance Testing
- Remove from Play warning

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.

Balance Error Scoring System

Double Leg Stance
Foam Surface

Single Leg Stance
Foam Surface

Tandem Stance
Foam Surface

B.E.S.S. SCORECARD		
Count Number of Errors max of 10 each stance/surface	FIRM Surface	FOAM Surface
Double Leg Stance (feet together)		
Single Leg Stance (non-dominant foot)		
Tandem Stance (non-dominant foot in back)		
TOTAL SCORES: total each column		

Neurocognitive Testing (ImPACT)

- ImPACT (Immediate Post-concussion Assessment and Cognitive Testing): computerized neurocognitive assessment
- Objectively evaluate post-injury status, track recovery for safe return to play, esp. if baseline testing is present
- Can be administered by: athletic trainer, school nurse, athletic director, coach, team physician, or trained layperson

ImPACT Test Features

- Measures athlete symptoms, verbal/visual memory, processing speed, reaction time
- Reliable baseline test information
- Stores data from repeat testing
- Administered online for individuals or groups
- Test items varies to minimize practice effects
- Cost: 300 athletes $500, 600 athletes $750, 1000 athletes $1000

“Minor” Head Injury

- No such thing as a “minor head injury”
- Decreased ability to process new information
- Degree of impairment proportional to severity of injury
- Symptoms worsen with repeated injury
  - “Cumulative concussion”
- “No head injury is minor; all need prompt evaluation before return to play”

Considerations in Concussion Management

- Previous concussion history
- # of concussions
- Proximity
- Severity of concussions
- Neurological examination
  - Cognition, balance testing, neuropsychological testing
- CT/MRI as indicated

Cantu RC. Curr Sports Med Rep 2009; 8(1): 6-7.

Return-to-Play (RTP) Decisions

- Difficult, controversial
- Special circumstances of the young athletes
  - More at-risk,
    Slower recovery,
    Greater long-term consequences,
    Greater risk of catastrophic re-injury (SIS)
- “When in doubt, sit them out”

Same-day RTP

- Athletes with persisting signs and symptoms or any duration of amnesia should not RTP
- All signs and symptoms must be cleared at rest and with exertion before the athlete is returned to play

RTP After Removal From Sport

- High likelihood that HS athlete removed from play will not play again next Friday night!

- McCrea, collegiate athletes
  - Symptom resolution 7 days
  - Cognitive function 5-7 days
  - Balance deficit 3-5 days
  - 10% had sxs > 7 days

NCAA Concussion Mgmt Guidelines: “Have a Game Plan”

- Student-athletes should not return to play until all symptoms have resolved, both at rest and during exertion. Many times, that means they will be out for the remainder of that day.
- As concussion management continues to evolve with new science, care is becoming more conservative and return-to-play time frames are getting longer.
- Coaches should have a game plan that accounts for this change.

Progressive Structured RTP Protocol

- Complete rest (physical and cognitive)
- Gradual progression of activity *after symptoms are resolved*
  - Low-level activities
  - Progress to higher level and sport-specific skills and noncontact drills
  - Controlled contact

NFSHA's Progressive Physical Activity Program

- 1. Light aerobic exercise, 5 to 10 minutes on an exercise bike or light jog; no weight lifting, resistance training, or any other exercises.
- 2. Moderate aerobic exercise, 15 to 20 minutes of running at moderate intensity in the gym or on the field without a helmet or other equipment.
- Step 3: Non-contact training drills in full uniform. May begin weightlifting, resistance training, & other exercises.
- Step 4: Full contact practice or training.
- Step 5: Full game play.

Repeated Concussions in the Same Season

- 1st concussion
  - Out for 1-2 weeks (if sxs resolve)
- 2nd concussion
  - Out for 4 weeks
- 3rd concussion
  - Out for the season
- Risk of cumulative injury, esp. in the young athlete (high school or younger)

NCAA Concussion video

- "**Don't hide it. Report it. Take time to recover.**"
- Aimed at athletes, parents and coaches
- Wide range of sports, both genders, real-life experiences
- No loss of consciousness (neg. LOC)
- Sideline evaluation, remove from play
- Time to heal varies with each athlete
  - ~90% within one week, but 10% not
- Physical rest and academic rest
- Return to Play => no longer having symptoms
  - Danger of persistent symptoms if athlete returns too soon
- Noted concussion researchers: K Guskiewicz, M Putukian, R Cantu

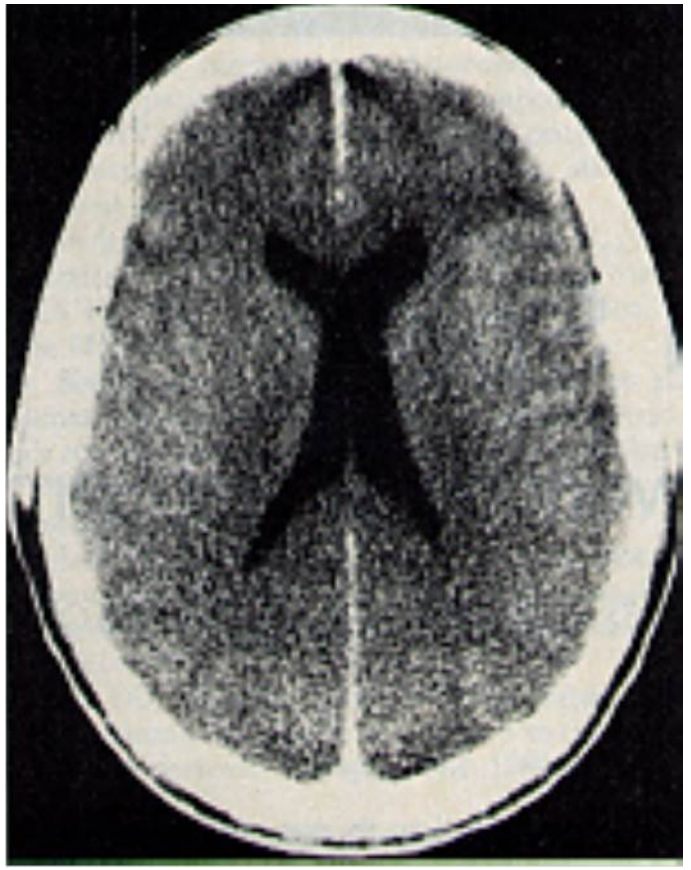
NCAA Concussion Video

Second Impact Syndrome (SIS)

- Catastrophic injury when young athlete resumes contact sports while still symptomatic from recent concussion
- Cases reported in:
  - Hockey, skiing, boxing, contact/collision sports
- All cases [except boxing] involved athletes <= 19 y/o

Second Impact Syndrome (SIS)

- Loss of autoregulation brain vascularity
- => vascular engorgement
- Incr'd intracranial pressure
- Herniation thru foramen magnum
  - Coma, loss of eye movement
  - Respiratory arrest
- Time from 2nd impact to brainstem failure: 2-5 min.



Clinical Presentation

- Second blow to head may be trivial
- Athlete stunned, no loss of consciousness
- Athlete remains standing 15-60 sec.
- Catastrophic injury
  - Precipitous collapse
  - Semicomatose
  - Rapidly dilating pupils, loss of eye movement
  - Respiratory arrest

Prevention

- Concussions cannot be completely prevented
- Concussion history during preparticipation evaluation
- Helmet use decreases the incidence of skull fracture and major head trauma, but does not prevent, and may actually increase, the incidence of concussion
- Enforce rules to limit concussion (e.g., spearing, head-to-head contact, leading with the head)

Am Coll Sport Med Consensus Statement, Med Sci Sports Exerc 2006; 38(2): 395-399.

UIL Website

- NFHS Concussion Management Guidelines
- Return to Play Form – Concussion Management Protocol
- Texas Education Code, Section 38.159, Immunity Provisions
- Requirement for Supervision of the Concussion Management Protocol Program
- Concussion Acknowledgement Form

UIL Return to Play Form

- Designated school official verifies:
- -The student has been evaluated by a treating physician selected by the student, their parent or other person with legal authority to make medical decisions for the student.
- -The student has completed the Return to Play protocol established by the school district Concussion Oversight Team.
- -The school has received a written statement from the treating physician indicating, that in the physician's professional judgment, it is safe for the student to return to play.

UIL cont'd

- Concussion Training Requirements of Texas Education Code, Section 38.158
- HB 2038 [includes] training requirements for coaches, athletic trainers and potential members of a Concussion Oversight Team in the subject matter of concussions, including evaluation, prevention, symptoms, risks, and long-term effects.

UIL Protocols

- Concussion oversight team
  - MD, nurse, athletic trainer, neuropsychologist, PA
- Removed from competition immediately
  - Coach, MD, trainer, parent, legal guardian
- Concussion Acknowledgement form
  - Signed by parent
- Concussion Mgmt Return to Play form
  - Signed by school official and parent
- Concussion Mgmt Guidelines from NFSHA's

Be Prepared...

- Know your athlete
- Baseline cognitive assessment helpful
- Effective communication with coaches, trainers, athletes, parents
- Be prepared to manage an acute injury
- System in place for sidelines evaluation and post-game supervision
- Structured ongoing follow-up and evaluation
- Know the literature...

Standaert CJ. Arch Phys Med Rehab 2007; 88: 107-1079.

Mark Hutchens MD, Tx Family & Sports Med.

- 1. When in doubt, sit them out
- 2. If no sign of concussion at first exam, sit the athlete for 10-15 minutes and recheck
- 3. Loss of balance is a sensitive objective sign

Karl “Bert” Fields MD
Moses Cone Sp Med Fel’ship

- 1. Return to play guidelines have mostly been based on experience with older adolescents and young adults. In children slower progression is generally warranted
- 2. Static neurologic exams often fail to elicit symptoms that arise when dynamic testing or exertional testing are used
- 3. In children, screen time and harder cognitive tasks should be limited until no symptoms of concussion remain

Summary

- Sports-related concussion is common,
  - Accounting for 5.5% of all injures
- Special circumstances of the young athlete
  - Greater risk of injury, slower recovery
- Preseason baseline assessment (ImPaCT)
- Structured Follow-up
- Responsibility to protect young athletes
  - “When in doubt, sit them out”

If you only have time to read one article on concussions:

Halstead ME, Kevin D. Walter KD, et. al. Sport-related concussion in children and adolescents. Pediatrics 2010; 126(3): 597-615.

Resources

- NCAA: www.ncaa.org/health-and-safety/concussion-guidelines
- CDC: www.cdc.gov/concussion
- UIL: www.uiltexas.org/health/concussions
- ImPACT (Immed. Post-concussion Assessment & Cognitive Testing) www.impacttest.com/
- Axon sports, Cogstate: www.axonsports.com/index.cfm?pid=2&pageTitle=About-Cogstate