Concussion- What's New, Doc?

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The official health care provider of Sporting Kansas City

UMKC School of Medicine

BEST CHILDREN'S HOSPITALS U.S.News & WORLD REPORT RANKED IN 10 SPECIALTIES 2017-18

Conflicts of Interest

- None

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Goals and Objectives

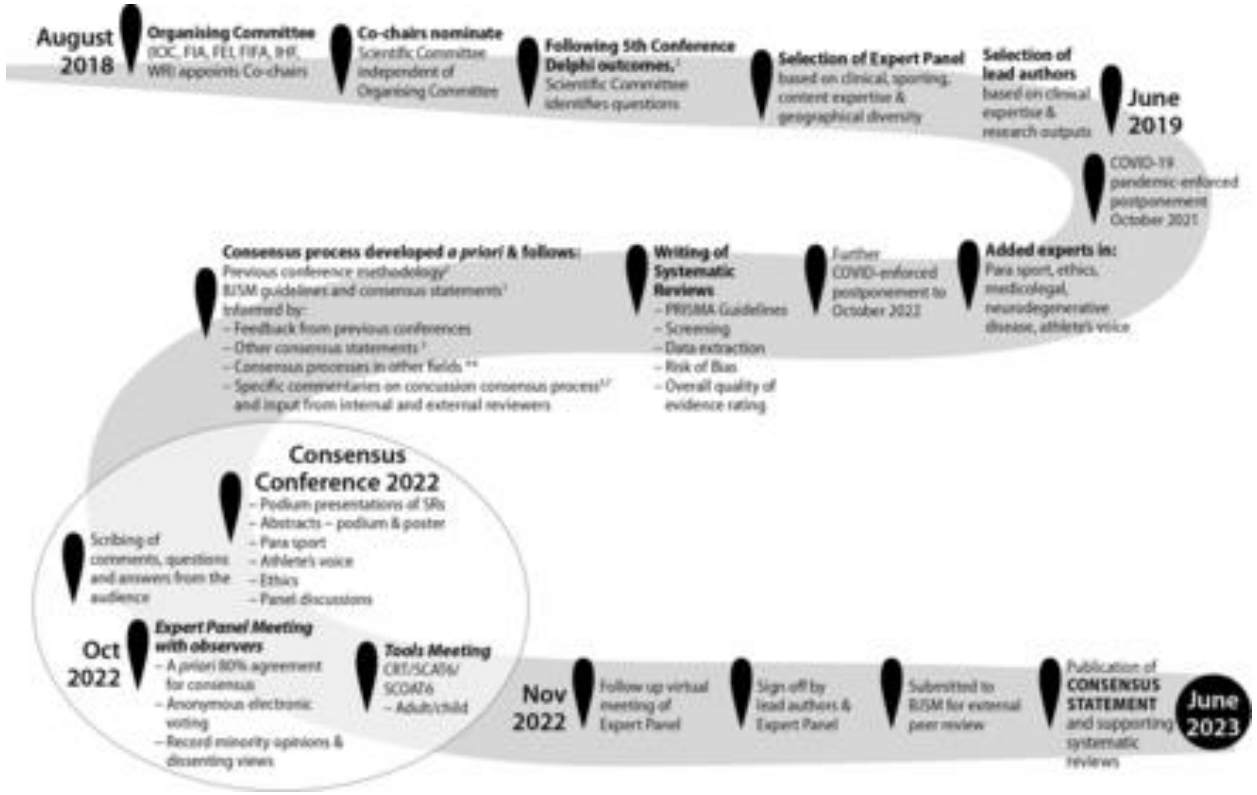
- 1. The learner will get an overview the most recent iteration of the international consensus statement on concussion in sports.
- 2. The learner will understand some of the changes in the most recent consensus statement.
- 3. The learner will become familiar with the new CRT6, SCAT6 and SCOAT6, as well as the Child SCAT6 and Child SCOAT6 forms.

Amsterdam 2022 Consensus Statement

- Meeting in 2022, paper published in June 2023
- General guide for healthcare professionals and “should not be considered a legal standard of care or clinical directive”
- Consensus = 80% expert

Agreement

- 10 systematic reviews



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The 11 (or 13) R's

- RECOGNISE (RECOGNIZE)
- REDUCE
- REMOVE
- REFER
- RE-EVALUATE
- REST
- REHABILITATE
- RECOVERY
- RETURN-TO-LEARN/RETURN-TO-SPORT
- RECONSIDER
- RESIDUAL EFFECTS
- *RETIRE*
- *REFINE*

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Recognise (Recognize)

- **Definition has been refined-**

Sport-related concussion is a traumatic brain injury caused by a direct blow to the head, neck or body resulting in an impulsive force being transmitted to the brain that occurs in sports and exercise-related activities. This initiates a neurotransmitter and metabolic cascade, with possible axonal injury, blood flow change and inflammation affecting the brain. Symptoms and signs may present immediately, or evolve over minutes or hours, and commonly resolve within days, but may be prolonged.

Recognise (Recognize) Con't

- **Def (still going)**

No abnormality is seen on standard structural neuroimaging studies (computed tomography or magnetic resonance imaging T1- and T2-weighted images), but in the research setting, abnormalities may be present on functional, blood flow or metabolic imaging studies. Sport-related concussion results in a range of clinical symptoms and signs that may or may not involve loss of consciousness. The clinical symptoms and signs of concussion cannot be explained solely by (but may occur concomitantly with) drug, alcohol, or medication use, other injuries (such as cervical injuries, peripheral vestibular dysfunction) or other comorbidities (such as psychological factors or coexisting medical conditions).

Reduce- prevention

- Ice Hockey rules to prevent youth body checking- 58% reduction in concussion
- Reducing duration and number of contact practices in Football- 64% reduction in practice related concussion
- Mouthguards in hockey- 28% reduction in concussion
- Neuromuscular training programs- lower rate of rugby concussions
- Optimal concussion management- reduces recurrence of concussion

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Remove- proper sideline eval

- Removal for any suspicion of concussion by coach, official, player, parent, administrator or medical staff
  - LOC (suspected or confirmed)
  - Seizure
  - Tonic posturing
  - Ataxia
  - Poor balance
  - Confusion
  - Behavior change
  - Amnesia
- Do not return the same day unless cleared by healthcare professional (ie. symptoms related to another condition)
- SCAT6 or Child (8-12 y/o) SCAT6 for in depth off-field eval

CRT 6, SCAT 6 and Child SCAT 6

- https://bjsm.bmj.com/content/bjsports/57/11/692.full.pdf
- https://bjsm.bmj.com/content/bjsports/57/11/622.full.pdf
- https://bjsm.bmj.com/content/bjsports/57/11/636.full.pdf

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Re-evaluate- office assessment

- SCOAT 6 and Child (8-12y/o) SCOAT 6 - 72 hours to weeks after injury
- Standardized framework- does not replace clinical suspicion or comfort
  - Increased word recall to 10 (immediate and delayed); reverse numbers
  - Orthostatic vitals
  - C-spine assessment
  - Neuro exam
  - VOMS, BESS and Tandem gait (complex and dual task gait optional)
  - Optional Mental Health questionnaires
  - Parent symptom reports for Child version

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SCOAT 6 and Child SCOAT 6

- https://bjsm.bmj.com/content/bjsports/57/11/651.full.pdf

- https://bjsm.bmj.com/content/bjsports/57/11/672.full.pdf

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Rest - exercise

- Cocoon is bad (has been known for a while)
- Relative rest is good- 24-48 hours limited physical activity and screen time
- Increase exercise intensity based on symptoms severity
  - Mild exacerbation of symptoms is okay (2 points on a 10 point scale for less than an hour)
  - No contact or potential contact

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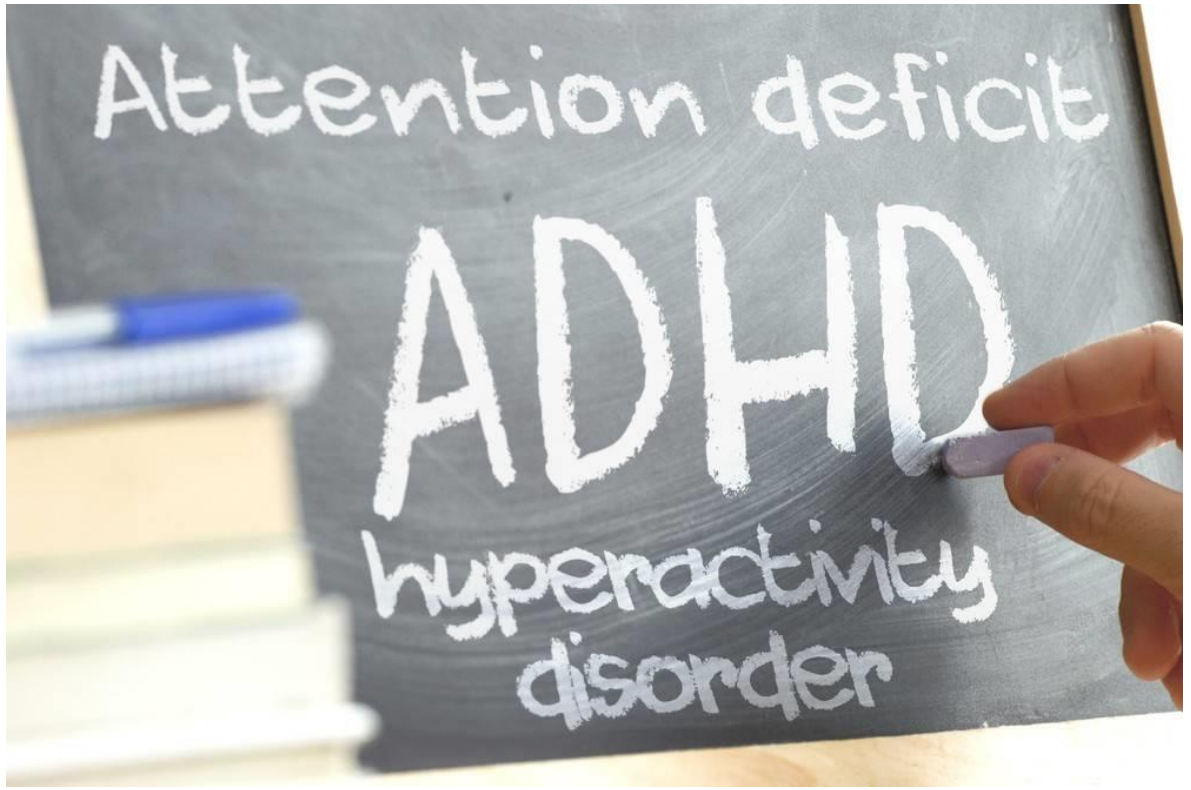
Refer

- Persisting symptoms- greater than 4 weeks post injury
- Overlap with many other conditions
  - Mental health issues
  - Learning/attention difficulties
  - Vestibular and visual problems
  - Headache/migraine issues
  - Sleep issues
  - POTS
  - Pain disorders



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Rehabilitation

- Neck pain, headache or dizziness/balance for over 10 days
  - Cervico-vestibular rehab
- Symptoms over 4 weeks
  - Cervico-vestibular rehab
  - Optimize exercise
  - Referrals
  - Reassurance

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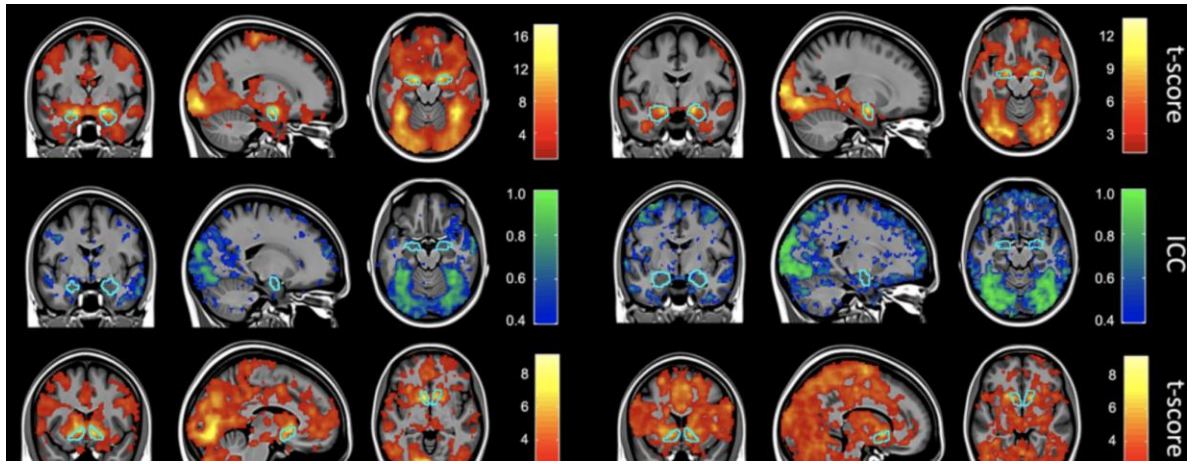
Recovery



- 1. Assessment of symptoms
  - At rest
  - With cognitive activities
  - With physical exertion
- 2. Relation to ongoing symptoms (areas for research questions on specific symptoms)
- 3. Measures of return to learn and return to play

- Research on neuroimaging and biomarkers is on-going

Return-to-Learn and Return-to-Sport- Definitions

- Symptom Resolution at Rest- Self explanatory
- Complete Symptom Resolution- resolution at rest and with cognitive and physical exertion
- Return-to-learn (RTL)- return to pre-injury learning activities with no new academic support, including school accommodations or learning adjustments
- Return-to-sport (RTS)- completion of the RTS strategy with no symptoms and no clinical findings associated with the current concussion at rest or with maximal physical exertion

RTL

- Systematic review found 93% of athletes have full RTL by 10 days
- Avoid complete rest and complete isolation, but accommodations are helpful
  - Environmental adjustments
  - Physical adjustments
  - Curriculum adjustments
  - Testing adjustments

Table 1

Return-to-learn (RTL) strategy

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 (eg, reading) while minimising 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 in 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

- **Following an initial period of relative rest (24–48 hours following an 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.**

RTS

- Graduated and stepwise return to activity
- Split up based on risk of contact to the athlete
- Needs healthcare provider supervision and counselling
  - MO- Athletic trainers can clear for concussion
  - KS- Still need clearance by an “MD or DO”

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Table 2

Return-to-sport (RTS) strategy—each step typically takes a minimum of 24 hours

Step	Exercise strategy	Activity at each step	Goal
1	Symptom-limited activity	Daily activities that do not exacerbate symptoms (eg, walking).	Gradual reintroduction of work/school
2	Aerobic exercise **2A—Light** (up to approximately 55% maxHR) **then** **2B—Moderate** (up to approximately 70% maxHR)	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 training involves any risk of inadvertent head impact, medical clearance should occur prior to Step 3	Sport-specific training away from the team environment (eg, 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

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Steps 4–6 should begin after the 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 (eg, passing drills, multiplayer training) can integrate into a 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.	

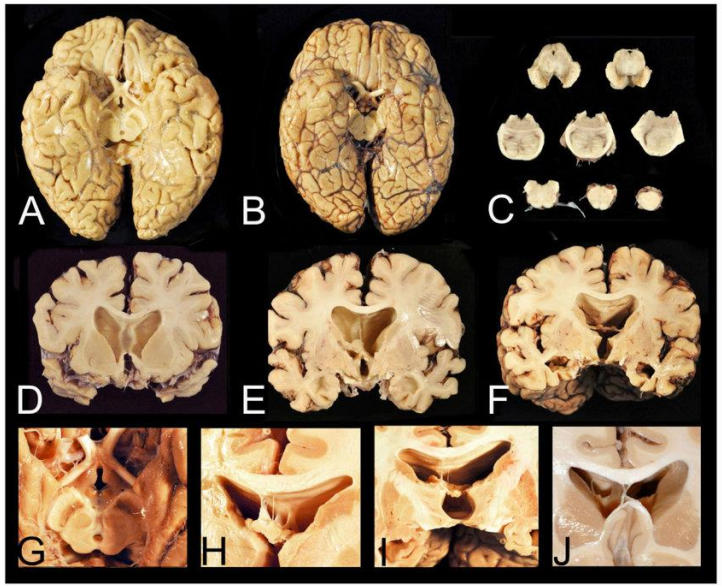
- *Mild and brief exacerbation of symptoms (ie, an increase of no more than 2 points on a 0–10 point scale for less than an hour when compared with the baseline value reported prior to physical activity). Athletes may begin Step 1 (ie, symptom-limited activity) within 24 hours of injury, with progression through each subsequent step typically taking a minimum of 24 hours. If more than mild exacerbation of symptoms (ie, 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. Athletes experiencing concussion-related symptoms during Steps 4–6 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.
- HCP, healthcare professional; maxHR, predicted maximal heart rate according to age (ie, 220-age).

Reconsider- long term effects?

- Mental health outcomes-
  - Amateur football
    - No increased depression, suicide, neurological disease, cognitive impairment or neurodegenerative disease
  - Professional football
    - No increased psychiatric disorders or suicide
    - Increased mortality from dementia, neurological disease and ALS
  - Professional soccer
    - No increase psychiatric hospitalization
    - Increased mortality from dementia, neurological disease and ALS
- Cohort studies, not gold standard

Reconsider- CTE

- Postmortem entity- not a clinical diagnosis
- Traumatic Encephalopathy Syndrome- some clinical and diagnosis criteria developed
- Brain bank reports are likely misleading
  - Biased to players with neurological/mental health problems



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Retire

- Complex
  - Chosen sport
  - Family concern
  - Social and cultural factors
  - Sports Medicine physician or Neurologist should probably be consulted
  - Conflict of Interest should be evaluated for all parties involved
- No contact does not mean no physical activity

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Refine

- Para athletes
  - May have more benefit from baseline testing
  - Central nervous system impairment conditions may require more extended initial rest
  - RTS must make use of the adaptive equipment or other testing parameters
  - More research is needed

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Refine

- Pediatrics
  - 8-12 year-olds different than 13-18 year-olds
  - CRT6 is a nice tool for parent coaches and officials
  - Baseline testing is less helpful due to development, growth and maturation
  - Most concussions are in kids
  - Limited research

Links

- https://bjsm.bmj.com/content/57/11/695

(or google BJSM 6th concussion consensus statement)

- VOMS- https://quicktest.impacttest.com/how-to-check-for-concussion/voms-concussion/
- BESS- https://quicktest.impacttest.com/how-to-check-for-concussion/bess-concussion/

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References

- McCrory P, Meeuwisse W, Dvorak J, *et al*. Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016. *Br J Sports Med* 2018;**51**:838–847.
- Patricios JS, Schneider KJ, Dvorak J*, et al*. Consensus statement on concussion in sport: the 6th International Conference on Concussion in Sport–Amsterdam, October 2022. *British Journal of Sports Medicine* 2023;**57:**695-711.
- The Concussion Recognition Tool 6 (CRT6). *British Journal of Sports Medicine* 2023;**57:**692-694.
- Sport Concussion Assessment Tool 6 (SCAT6). *British Journal of Sports Medicine* 2023;**57:**622-631.
- Child SCAT6. *British Journal of Sports Medicine* 2023;**57:**636-647.
- Sport Concussion Office Assessment Tool 6 (SCOAT6). *British Journal of Sports Medicine* 2023;**57:**651-667.
- Child SCOAT6. *British Journal of Sports Medicine* 2023;**57:**672-688.

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