

MINDS MATTER

Concussion and Return to Learn

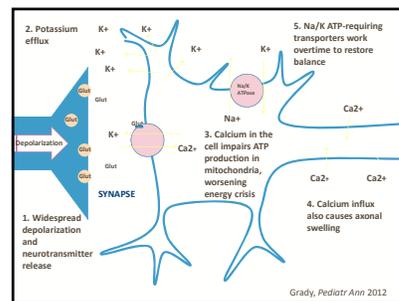
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NO, REALLY, HOW MANY?

Estimated 1.1-1.9 million SRR concussions 0-18 yo annually, including estimate of those not seeking medical care

Estimated 480K-540K concussions in 0-14 yo

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I HAVE NO FINANCIAL RELATIONSHIPS TO DISCLOSE OR CONFLICTS OF INTEREST TO RESOLVE.

BY THE NUMBERS: SPORTS PARTICIPATION

- 1696 players in NFL
- 209,000 HS girls soccer
- 284,400 HS boys soccer
- 460,000 NCAA DI athletes
- 500,000 HS basketball
- 1 million boys HS football
- 35-45 million organized youth sports

Children's Hospital of Philadelphia | Sports and Fitness Industry Association, NCAA, 2014

AFTER THE INJURY: PATHOPHYSIOLOGY

Neurometabolic Cascade

- Glucose is needed to fuel the brain's recovery
- Blood flow/glucose delivery to the brain reduced
- Reduced blood flow may last longer in kids and teens than in adults

Children's Hospital of Philadelphia | Giza, *Neurosurgery*, 2014

HOW MANY KIDS GET CONCUSSIONS?

Langlois et al. 2006 - estimated 1.6-3.8 million sports and recreation-related TB annually

Rosenthal et al. HS RIO - 2005-2006 vs. 2011-2012 increases

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SPORTS CONCUSSIONS BY THE NUMBERS: STUDENT ATHLETES

1. Football
2. Boys ice hockey
3. Boys lacrosse
4. Girls soccer
5. Girls lacrosse
6. Girls basketball
7. Boys soccer
8. Boys wrestling
9. Girls field hockey
10. Boys basketball

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CONCUSSION SYMPTOMS: CAUSES

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CONCUSSION: MANAGEMENT

Dreams Reality



“RETURN TO LEARN as well as RETURN TO PLAY”

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COGNITIVE DYSFUNCTION

- Attention span
- Memory
- Processing Speed
- Abstract reasoning

Not Keeping up with pace of class

Not following directions

Not completing assignments accurately

- Headaches
- Difficulty remembering
- Difficulty concentrating
- Mentally foggy
- Poor school performance

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RECOVERY TIMELINE AFTER CONCUSSION

- Brief initial rest
- Light cognitive and physical activity at home
- Return to school
- Scale back and ramp up slowly
- Frontload academic accommodations
- Gradual advance to full cognitive load

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AUTONOMIC NERVOUS SYSTEM DYSFUNCTION

- Regulate vision
- Regulate hearing
- Regulate blood pressure
- Regulate sleep

- Light sensitivity
- Noise sensitive
- Exercise intolerance
- Orthostatic hypotension
- Sleep disturbance

- Headaches
- Fatigue
- Lightheaded
- Dizzy
- Nausea
- Brain fog
- Poor school performance

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MOOD DYSFUNCTION

- Anxiety
- Depression

- Irritable
- Overwhelmed
- Nervous
- More Emotional
- “Not trying”

- Headaches
- Fatigue
- Nausea
- Poor school performance

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CONCUSSION: ROLE OF MEDICATION



- Straightforward concussions respond to supportive medical care – no medications needed
- Avoid over the counter pain relief (e.g. acetaminophen, ibuprofen)
 - Can mask symptoms
 - Overuse may result in rebound headaches
- Melatonin for sleep disturbance
- Prolonged concussion symptom management may include use of amantadine, amitriptyline, topiramate
 - Medication for attention or depression

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VESTIBULAR OCULOMOTOR VISION DYSFUNCTION

- Convergence
- Divergence
- Accommodation
- Saccades
- Gaze Stability
- Balance (mostly needed for school)
- Motion Sensitivity

- Difficulty reading
- Difficulty taking class notes
- Motion Sickness
- Difficulty walking in crowds, hallways

- Headaches
- Fatigue
- Dizziness
- Poor school performance

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RECOVERY AFTER CONCUSSION

- Most concussions resolve in 10 days
- Adolescents and younger children may take longer
 - 4 weeks or more
- Neurocognitive recovery may follow symptom resolution
- Gradual return to activities
 - Return to Learn
 - Return to Play
- Risk of repeat injury
 - Second Impact Syndrome
 - More significant injury

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CONCUSSION: THE INVISIBLE INJURY

Students/Athletes look normal

Culture amongst adolescents to not admit injury

Expectation to “get over it” or “get back into the game”



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RETURN TO SCHOOL VS. RETURN TO LEARN

- **Physical Plant**
 - Environment challenges with return to school
- **Cognitive Challenges**
 - Thinking, Processing, attention, concentration, executive function issues with return to learning




RETURN TO LEARN: COGNITIVE DEMANDS

- Attention Span- *focus on details* of learning
- Processing Speed- *pace of class*
- Memory: *volume of work*
- Memory: *recall of details*
- Higher Function: *complexity of work*




BARRIERS TO RETURN TO SCHOOL: PRE-EXISTING MEDICAL HISTORY

Medical History

- Stroke
- Seizure
- Headaches
- Migraine
- Vision disorder/therapy
- Strabismus/amblyopia
- Speech therapy
- Autism spectrum disorder
- Previous concussion
- Motion sickness

Mental Health History

- Anxiety/Depression
- PDD/ODD
- Previous suicide attempt
- Drug or Alcohol abuse
- Family history

Learning Issues

- Learning Disorder
- ADD/ADHD
- Medication (side) effects
- Current/previous IEP



RETURN TO SCHOOL: PHYSICAL DEMANDS

- **Motion sickness:** transportation to school (bus/car)
- **Noise:** Morning Bells, Loud hallways, Cafeteria, Music class
- **Lights:** Fluorescent lights, smart boards, computer screens



RETURN TO LEARN: COGNITIVE DEMANDS OF TEST TAKING

- Attention span- *fatigue* in middle of the test
- Processing Speed- *running out of time*
- Memory: unable able to *recall details* without external cue
- Higher Function: *not able to do* difficult problems, esp multiple steps




PROLONGED RECOVERY AFTER CONCUSSION

- Prolonged symptomatology
 - Symptoms lasting more than 10 days in adults
 - Symptoms lasting more than 1 month in children
 - Symptoms lasting more than 3 months
 - Given evidence that most have full neurocognitive recovery at 3 months
- Multiple causes of symptomatology
 - Vestibular/Balance deficits/Oculomotor visual problems/Binocular vision issues
 - Cognitive/Executive function/Memory/Attention problems
 - Mood/Anxiety/Depression
 - Sleep
 - Autonomic dysfunction



RETURN TO SCHOOL: PHYSICAL DEMANDS

- **School Layout:** Standing up quickly to move from class to class, narrow hallways, stairs, distance to classes
- **Classroom Layout:** Note taking from the board, Reading small print on printouts, Working in small groups (science labs, wood shop)



RETURN TO SCHOOL/LEARN EVALUATION: IDENTIFY BARRIERS TO RE-ENTRY

- What are the current symptoms?
- Are there pre-existing problems that will make school re-entry more challenging?
- Which domain(s) are causing symptoms?
- Autonomic problems? Vestibular/Ocular problems? Cognitive problems? Emotional problems?



REHABILITATION STRATEGIES

- Vestibular therapy
 - Habituation
 - Increase motion tolerance
 - Improve balance
- Role of exercise
 - Early is bad
 - Later is good
- Vision therapy
 - Address visual symptoms
- Cognitive/Speech Therapy
 - Memory and executive function
- Psychotherapy/Cognitive Behavioral Therapy
 - Sleep, anxiety, depression



AEROBIC REHABILITATION: EXERCISE TOLERANCE

- Formal testing with Modified Balke Protocol
- Submaximal aerobic exercise challenge test
- Can use treadmill or exercise bike
- Differentiates aerobic intolerance vs. vestibular intolerance (deficits with head motion or eye tracking)



Buffalo Concussion Treadmill Test is safe and reliable
Sividy et al. Clin J Sport Med 2010, 20(3)



COGNITIVE THERAPY



- School work in small increments - with breaks as needed
- Work until symptoms, rest, recover and restart work
- Persistent issues with cognitive deficits:
 - Neuropsychology evaluation
 - Speech-Language therapy
 - Executive function coaching



BEFORE



VESTIBULAR/OCULOMOTOR THERAPY

- Weekly formal therapy with specialist
- Daily home exercise program essential!**
- Can be done with trained Physical or Occupational therapist





COUNSELING

- Cognitive Behavioral Therapy
 - Evidence-based effectiveness for anxiety in children
 - First-line of treatment
 - Develop active coping skills
 - Includes
 - Psychoeducation
 - Cognitive identification and modification
 - Exposure



AFTER



VISION THERAPY

- Specialty expertise
- Voluntary convergence
 - Brock String sequence
- Fusional vergence
- Accommodative therapy
- Saccadic & Pursuit therapy





BEFORE AND AFTER



IMPLICATIONS FOR ACADEMIC PERFORMANCE

Vestibular and vision problems are prevalent after concussion and are often under-appreciated.



“My eyes hurt.”
 “It takes me longer to do the same work.”
 “I can’t read.” “I studied all night, and then the next day, I can’t remember what I studied”
 “My vision is blurry.”
 “I have to read the same thing over and over again to understand it.”



GENERAL LETTERS

This student has vestibular/oculomotor dysfunction (eye tracking and focusing). These deficits can often be barriers to effective learning and the student will get symptomatic with extended periods of quiet reading, note taking, testing and doing homework. The student is getting therapy for this.

The student's environment to manage volumes:

- Eye tracking deficits
- Initially focus on “Return to School”
- Then “Return to Learn”
- Focus on “core content” they need to complete academic year

As the student's symptoms improve, the student will be able to do less and make up work at the same time.



BRAINSTEPS OF PENNSYLVANIA




SCHOOL ACCOMMODATIONS: AUTONOMIC

- **Fatigue:** Short frequent breaks if stamina is a problem, esp in long classes, decrease the number of classes with breaks between classes, decrease overall work volume
- **Light sensitivity:** Sun glasses, Decrease brightness on computer screen
- **Noise:** Ear plugs or testing in quiet environment (not in class), eat in quiet area



ELEMENTARY SCHOOL LETTERS

In general, the younger the student, the longer it takes to recover from a concussion.

- C/o physical/emotional response to cognitive overload
- Scheduled breaks
- Focus on “core content”

Cooperation among school staff, parents and the medical team is especially important in identifying and managing concussion symptoms and academic difficulties.



MULTIDISCIPLINARY SCHOOL-BASED CONCUSSION MANAGEMENT TEAM (CMT)

Academic Staff implement academic accommodations	Medical assessment of student symptoms & accommodations needed
CMT	
Excuse student from PE, sports until appropriate clearance	Notify athletic department & coach



MAINTAINING ACADEMIC PERFORMANCE

- Gradual return to school
- **Marathon** NOT a **sprint** (decrease in stamina)
- Different for each concussion/student
 - Strict Protocols → Do they work?
 - No “cookie-cutter” approach
- **Communication** between school & parent
- Back to school as **quick** as possible
- Back to school as **safe** as possible



COLLEGE-AGED LETTERS

It is recommended that the student contact Disability Services to help during the recovery.

- Disability Services
- Alternate means of notes (video/audio record, power points)
- If the student rests, this can be temporary

If the student rests now, this can be a temporary problem.



SCHOOL-BASED CONCUSSION MANAGEMENT TEAM -CMT

- Monitors student symptoms & academic progress.
- Weekly meetings to review & adjust accommodations.
- Notify relevant staff of any updates.

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    graph LR
      CMT[CMT] --- AM[Academic Monitor Counselor]
      CMT --- SM[Symptom Monitor Nurse]
      AM --- TMT[Team meets with Teachers]
      SM --- MTS[Monitors student symptoms]
    
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KEEPING STUDENTS IN SCHOOL AFTER CONCUSSION

- Include ALL counselors, school nurse, school psychologist, Asst. Principal, AD
- **CMT Supervisor** will ultimately **make decisions** about medical exemptions for marking period/exams
- Routine meeting times
- Standard forms for documentation
- Medical Releases for communication between school/parents
- Don't forget band, shop, technical schools, driving, etc.

Children's Hospital of Philadelphia Source: Ryan Mulford, Asst. Principal, WTHS

IT TAKES A VILLAGE . . .

Perelman School of Medicine
UNIVERSITY OF PENNSYLVANIA

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Concussion Care for Kids: Minds Matter

BrainSTEPS
Supporting Students, Teachers & Parents

HEADS UP
CONCUSSION

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KEEPING STUDENTS IN SCHOOL AFTER CONCUSSION

- Let the student know what they will/will not be responsible for
- Anxiety of the unknown
- School avoidance
- Stress → Anxiety → Changes in Mood

Strategies to Decrease Student Stress:

- Checklists
- Organizers
- Schedules
- Fact sheets
- Use multiple-choice & open-book tests
- Word banks

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CONCUSSION RESOURCES

- **Practical Content**
 - Families
 - Schools
 - Coaches
 - Clinicians
 - Video FAQ
- **Downloads**
 - Infographics
 - Posters
 - Fact sheets

www.chop.edu/concussion

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KEEPING STUDENTS IN SCHOOL AFTER CONCUSSION

Children's Hospital of Philadelphia Source: Ryan Mulford, Asst. Principal, William Tennant HS

THANK YOU!

www.chop.edu/concussion
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