



Texas Health

Ben Hogan Sports Medicine

Healing Hands. Caring Hearts.™

**Sports Concussion St Marks School of
Texas**

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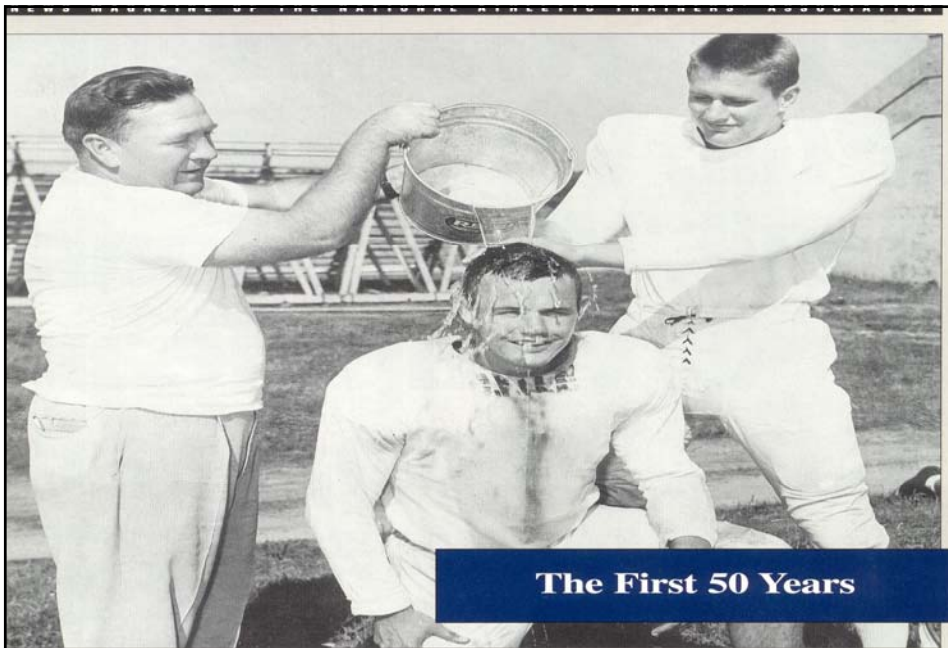
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1



The First 50 Years



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The “Eye” in the Sky



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Prevention: “Reducing the Risk”

Violent behavior that increases concussion risk should be eliminated

Promote fair play and respect

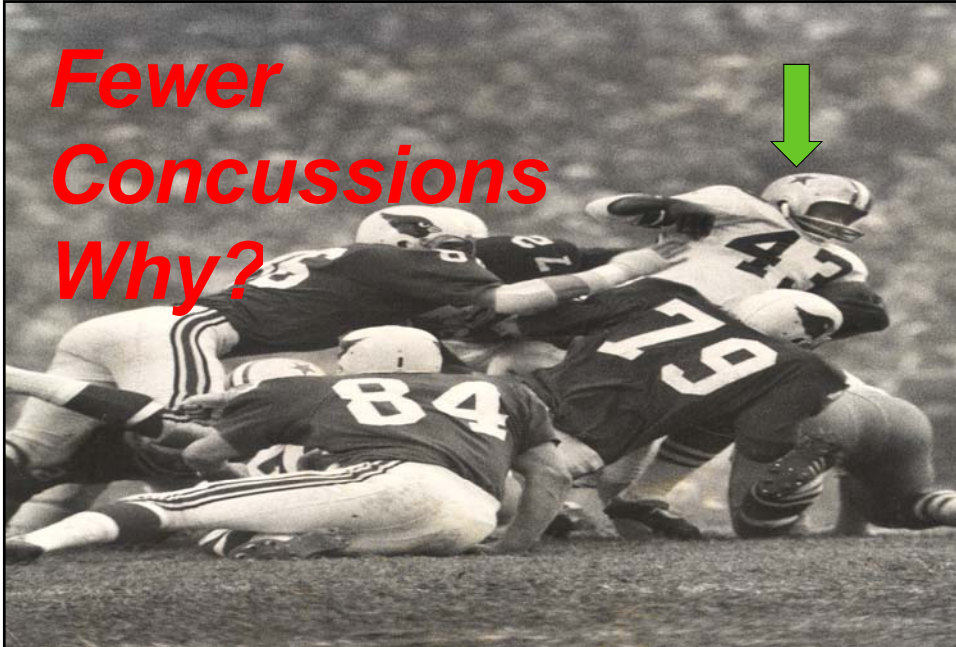
**Cannot condition the brain;
however you can strengthen the
neck***

** University of Memphis study used isometric exercises on football players. reduced number of reported concussions by 50% over 2 years.*



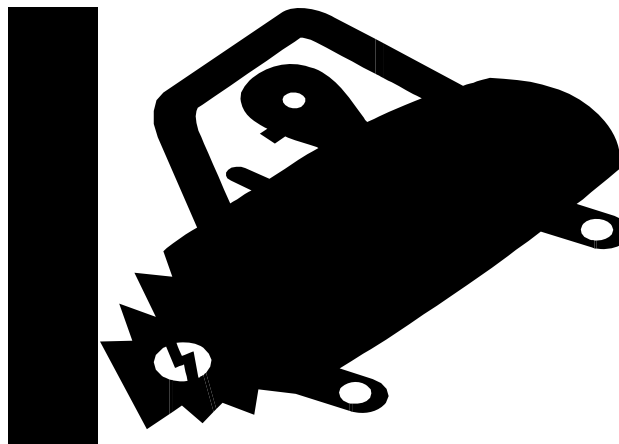
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**Fewer
Concussions
Why?**



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Players think the newer helmets are
like having an airbag in your car



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Prevention: “Reducing the Risk”

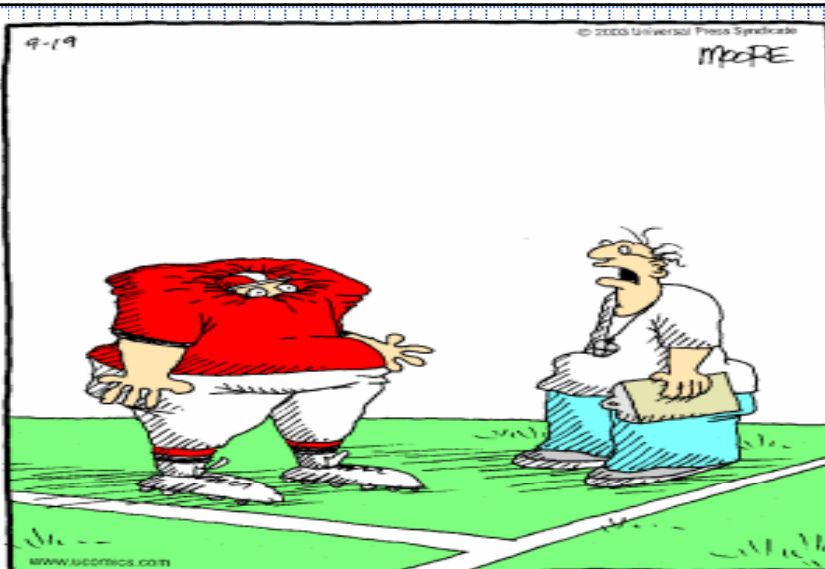
Helmets decrease risk of skull fracture and intracranial hemorrhage

Mouth guards decrease risk of dental and oral trauma

Role of protective equipment in prevention of concussion not established



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“Well, OK. Go check with the athletic trainer. ... But you’d better not be faking it just to avoid practice.”

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Pressure to Play in Sports: Can We Trust What the Athlete Tells Us?



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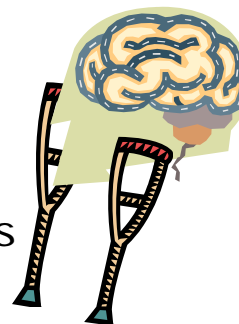
Athletic Trainers, Coaches and Physicians Cannot See the Brain Limp!

It's a **BRAIN** injury. A concussed brain does not learn as well and can create cognitive deficiencies.

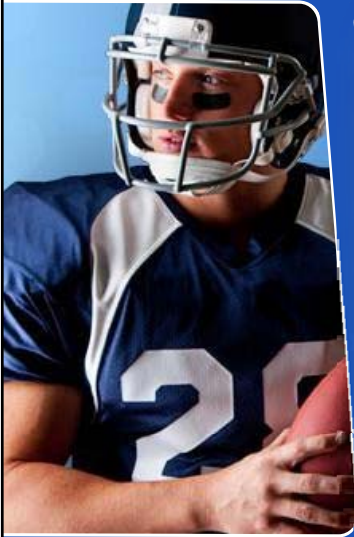
ImPACT* measures how much the brain limps

Athletics is important; academics are life long tools


They are called "**student athletes**" for a reason



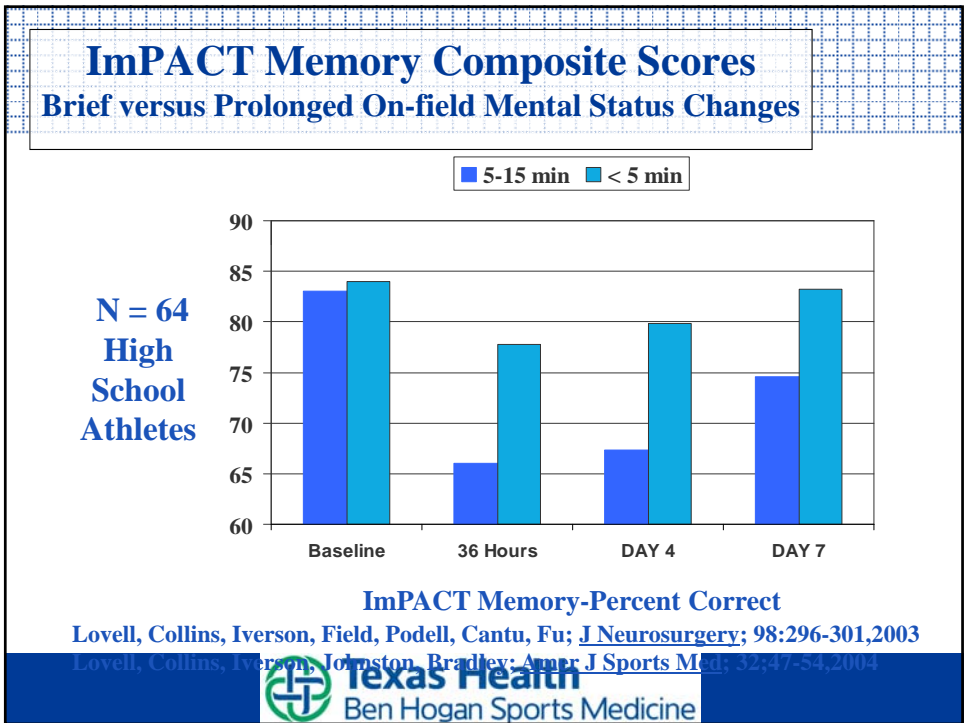
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VALID | RELIABLE | SAFE

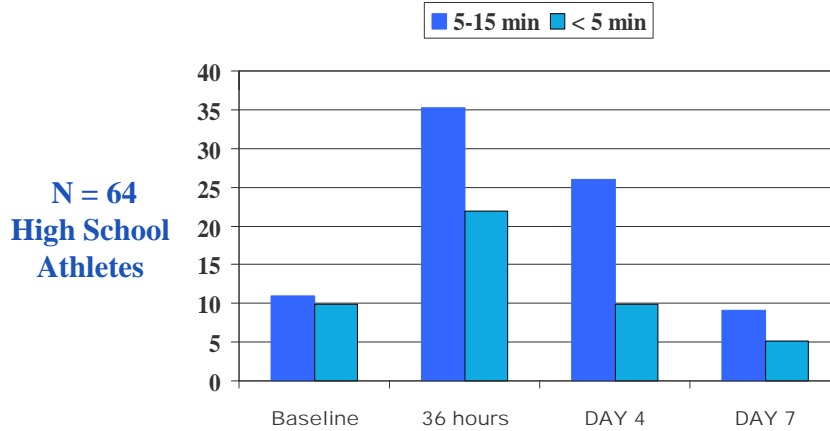


Management of Sports Concussion and The ImPACT Program



ImPACT Symptom Scale Scores

Brief versus Prolonged On-field Mental Status Changes

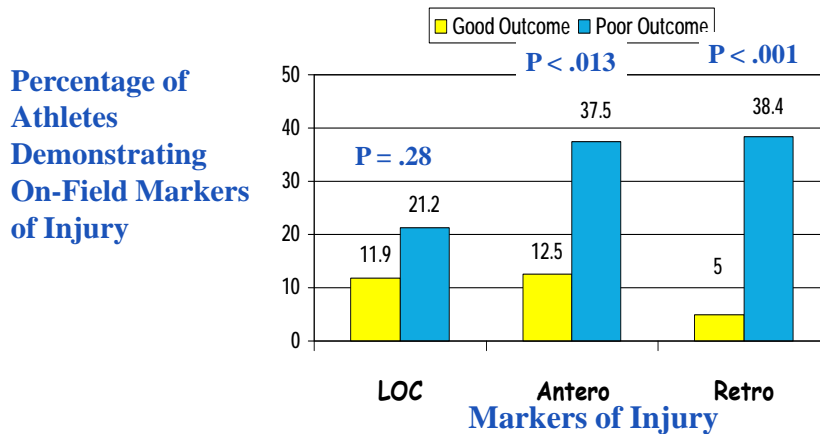


Lovell, Collins, Iverson, Field, Podell, Cantu, Fu; J Neurosurgery; 98:296-301,2003

Lovell, Collins, Iverson, Johnston, Bradley, Ann; J Sports Med; 32:47-54, 2004



On-Field Concussion Severity Markers by Outcome Group



Collins, Iverson, Lovell, et al.; *Clinical J Sport Med*, 2003

Computer Lab Baseline Testing

What is required for baseline testing?

Baseline testing link

Name / Date of birth (no SS# required)

Every 2 years age 13- 19

– *Younger = yearly*

– *1 time during college, once during pros*

Who can supervise / proctor the exam?

Taken test twice themselves

Understand the basic process

Interpretation is done by MD or PhD.

Computer Lab Baseline Testing



Test Lab before going live
EXTERNAL MOUSE (invalid without)

Control the testing environment

Empty terminal between athletes

10-15 athletes per administrator

Lower the lights

Use the baseline testing link.





Computer Lab Baseline Testing

- **Prior to testing, educate staff / parents**
 - **www.impacttest.com has downloadable videos, handouts, and presentations.**
 - *Have all the coaches test first.*
 - *Have coach present for testing.*
- **Eliminate the mad rush when possible.**
 - **End of school year testing**



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SAFE

Baseline Testing Recommendations

45 minute blocks (first year).

Explain the test

Not an intelligence test.

Want to complete as fast and accurately as possible.

Difficult - not going to get everything right

*Read directions twice before starting each subtest –
raise hand with questions.*

*Take questions in a quiet place so no others are
disturbed during testing.*

Baseline Testing Recommendations



Take demographic section as a group

- *Type the link together.*
- *Use baseline demographics sheet to get accurate information on medical/educational histories.*
- *Stop at end of demo section.*

Symptom inventory– also taken as a group.

- *Start together, completing at own pace.*
- *Stop and wait before beginning test.*

Cognitive Test

- *Begin as a group*
- *When finished, athletes should stay in seat and work quietly until group is finished.*



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Baseline Interpretation Guidelines

- **Review athletes' baselines to determine validity.**
 - *Check validity index*
 - *Compare to expectations/academic status*
- **Discuss invalid tests with athlete.**
- **Explain test/ clear up confusion.**
 - *Repeat invalid baseline tests.*
 - *If invalid test is missed, simply use normative data during post-concussion evaluation.*

EVALUATING BASELINE RESULTS

Screen for invalid tests

Main Page | Test Lookup | Test Administration | **Organization Reporting** | Injury Report | Corrections and Transfers | Your Information | Sign Out

Please Pick the Organization You Want to Manage: ImPACT High School

Choose Report Fields: [Help](#)

Name Sport
 Date of Birth Test Date
 Test Type Organization

Starting Date: 1 Mar 2008 Ending Date: 21 May 2008 Search

Number of Tests: 57

Name	Date of Birth	Sport	Test	Test Date	Organization
Plandor, Brannon	02/02/1989	Basketball	Baseline	04/10/2008	ImPACT High School
Ster, Lynn	12/10/1966	Basketball	Baseline	05/9/2008	ImPACT High School
College, Haverford	02/06/1976	Basketball	Baseline	05/15/2008	ImPACT High School
Zidron, Jeff	01/01/1990	Boxing	Baseline ++	03/5/2008	ImPACT High School
Nurse, Linda	03/05/1956	Boxing	Baseline	03/7/2008	ImPACT High School
Douglas, Aaron	09/10/1978	Cheerleading	Baseline	03/27/2008	ImPACT High School
Doe, Jane	02/17/1961	Cheerleading	Baseline	05/5/2008	ImPACT High School
Sela, Amber	02/11/1982	Cheerleading	Baseline	04/16/2008	ImPACT High School
Doe, John	10/05/1971	Football	Baseline	04/6/2008	ImPACT High School
Csonka, Larry	01/01/1990	Football – Freshman	Baseline ++	05/1/2008	ImPACT High School
Eddie, Davis	03/01/1950	Football – Varsity	Baseline	03/25/2008	ImPACT High School
Pic, Rob	08/18/1974	Football – Varsity	Baseline	04/11/2008	ImPACT High School
Knoop, Brett	08/28/1973	Football – Varsity	Baseline	03/19/2008	ImPACT High School

< Go Back to Main Page

Print Report

Tech Facts Support Interpreting the ImPACT Report Privacy Policy Feedback

Interpretation Guidelines: Sources of Baseline Profile Invalidity



- “Horseplay”
- Failure to Understand Directions
- “Sandbagging” or Faking
- Not Using Mouse/Malfunctioning Mouse
- Incentive different at baseline/post-injury

Composite Summary of Results

In addition to the individual scores for each module described, ImPACT yields summary composite scores for Verbal Memory, Visual Memory, Reaction Time, Processing Speed and Impulse Control.

Numeric Display of all Composites over Time

Exam Type		Post-concussion	Post-concussion	Post-concussion	Post-concussion	Post-concussion
Date Tested		01/26/2006	02/01/2006	02/10/2006	02/24/2006	03/10/2006
Last Concussion		01/24/2006	01/24/2006	01/24/2006	01/24/2006	01/24/2006
Exam Language		English	English	English	English	English
Test Version		4.5.805	4.5.805	4.5.805	4.5.805	4.5.805

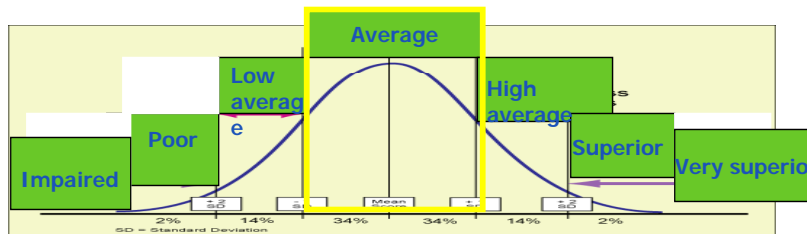
Composite Scores *										
Memory composite (verbal)	54	<1%	67	2%	72	7%	79	18%	78	18%
Memory composite (visual)†	38	<1%	47	1%	72	34%	70	30%	70	30%
Visual motor speed composite	19.00	3%	24.88	9%	30.80	32%	32.63	40%	31.08	32%
Reaction time composite	1.19	<1%	0.80	1%	0.64	13%	0.58	40%	0.55	62%
Impulse control composite	13		5		4		5		9	
Total Symptom Score	33		24		15		13		17	

* Scores in **bold type** indicate scores that exceed the Reliable Change Index score (RCI) when compared to the baseline score. However, scores that do not exceed the RCI index may still be clinically significant. Percentile scores, if available, are listed in small type. Please consult your ImPACT User Manual for more details.

† Clinical composite score is available only for exams taken in ImPACT version 2.0 or later.

Percentile Ranges

Superior/Very Superior	90 – 99 th	% ile
High Average	75 – 89 th	% ile
Average	26 – 74 th	% ile
Low Average	16 – 25 th	% ile
Poor (Borderline Impaired)	6 – 15 th	% ile
Impaired	< 5 th	% ile



Understanding the Use of Normative Data



With no baseline, athlete must be compared to pre-injury estimates of functioning

- ✓ Important to obtain educational and academic history
 - SAT/ACT score (percentile rank)
 - GPA/Grades
 - Learning Disability/Special Education?

- ✓ Estimated athlete's percentile scores on ImPACT
 - A/B student, High SAT = 65-75th percentile or higher
 - B/C student, Average SAT = 35-40th percentile or higher
 - D/F student, Low SAT, Learning Disability = 20th percentile or higher

- ✓ Need to understand symptoms and cognitive data in combination



The “Scholar – Athlete”: Managing Concussion Symptoms in School

Paul Krawietz, EdD, ATC, LAT
Athletic Training Education Program Director
Assistant Clinical Professor
The University of Texas at Arlington



Goal: Student safely returns to school and activity!

Main objectives related to role of the coach:

1. Gain awareness of the severity of the injury
2. Identify cognitive, emotional, and behavioral problems that may result from the injury
3. Identify accommodations that may be needed
4. Understand importance of communication among those involved



Impact of School and Learning on mTBI symptoms

We are most aware of negative effect of premature *PHYSICAL* exertion, but fewer are aware of problems cognitive exertion can cause.

– **Analogy:**

An athlete returning to drills too early after an ACL injury

An athlete returning to drills too early after a concussion

– **What about cognition (Thinking)?**

Cognition equates to mental “drills”



Impact of School and Learning on mTBI Symptoms

~ Cognitive Exertion (Thinking) can significantly increase symptoms, even when the student has begun to recover

~ Research suggests an energy crisis with concussion that causes symptoms to increase when returning to school



Impact of School and Learning on mTBI symptoms

~ Added stimulation of the *school environment*

~ Apparent causes

~ Subtle/Hidden Causes



Assisting School Personnel Understand the Symptoms

~ Presentation/Intensity varies and can be:

1. Cognitive
2. Somatic
3. Emotional

~ Can wax and wane throughout the day; usually gets worse as the day progresses

~ Student may not *look* or even *act* injured



Like a Hurricane: Cognitive, Physical, and Emotional Problems



Cognitive Symptoms in the Classroom: Communicate with classroom teachers

- Attention/Concentration Problems are Common:
 - Student “Drifts off” during class
 - Hard to focus on difficult material
 - Hard to focus for a sustained amount of time
 - Restlessness
- May experience difficulty with memory:
 - Learning new information
 - Recalling previously learned information
 - Forgetful and/or Repetitive
 - Remembering details of the injury



Cognitive Symptoms in the Classroom

- Student may report feeling less cognitively able
- Multitasking Difficult (auditory, visual, etc.)
 - Confused about instructions, time or places
 - Feels mentally “foggy”
 - Thinking/processing speed may be slowed
 - After school activities likely affected (e.g., memorizing lines for a play, assisting team while on “injured reserve”)
 - Difficulty handling new situations
 - Gets lost



Cognitive Symptoms: Accommodations for the classroom teacher to consider

- ~ No tests (especially mid-terms, APs, SATs)
 - Can the test be postponed?
 - SAT/ACT too high stakes to take
- ~ Untimed/extra time on tests/assignments
 - Is it critical that the test be timed?
 - Can extra time be allotted?
- ~ Elimination of certain assignments
 - Is this assignment critical?
- ~ Removal of distracting or extraneous information from materials
 - What are the most important features of the concept?
- ~ Math and math-like subjects are most difficult



Cognitive Symptoms: Accommodations

- ~ Consider using precise and direct language
- ~ Can schedules/checklists for assignments be provided to the student?
- ~ Can the teacher meet with the student at end of day to review?
- ~ Opportunities for working in a quiet environment?
- ~ Can preferential seating in classroom be arranged?
- ~ Is Tutoring /Mentoring/Extra Supervision possible?



Cognitive Symptoms: Accommodations

- ~ Reduced workload / Abbreviated assignments
 - Instead 20 problems, can it be 10?
- ~ Printed classroom notes / Taped lectures / Test reader or scribe / Books on tape
 - Are there resources that may assist the student?
- ~ Use of summary materials (graphs, templates, tables)
 - Are there summary opportunities with the material?
- ~ Breakdown assignments into organized, ordered steps
 - Is it a process that can be analyzed into parts
- ~ Taking notes during longer reading assignments
 - Opportunity for notes/note taker?



Cognitive Symptoms: Accommodations

- ~ Repetition of important information (Multiple modalities)
 - Opportunity to use several means/methods for review/summary
- ~ Delayed assignments (especially early in recovery)
 - Opportunity to make up the assignments at a later date?
- ~ Use cues prior to asking the student questions
 - Opportunity for reminders, prompters, clues?

WHAT	<ul style="list-style-type: none"> • What (issue(s)) do I want to address? • What is the goal? • What would happen if no decision was made or solution found? • What do I need to know to take action?
WHY	<ul style="list-style-type: none"> • Why do I need to address this situation? • Why did the problem or opportunity arise? • Why do I need to find a solution or way forward at all? • What's the goal?
HOW	<ul style="list-style-type: none"> • How will the situation be different? • How relevant to the information I am gathering? • How can I find out more? • How can I handle relevant people?
WHERE	<ul style="list-style-type: none"> • Where did the issue arise? • Where did it spread? • To the "right" (important)? • If not, why?
WHO	<ul style="list-style-type: none"> • Who are I trying to please? • Differences about the situation? Who is affected? • Who is involved (relationships, help, advice)? • Who needs to be informed?
WHEN	<ul style="list-style-type: none"> • When did the issue arise? • When do we need to act? • By when must it be resolved?

Emotional Symptoms in the Classroom

~ Concussion can change the athlete's social roles, sense of self/identity, self esteem.



~ Affects relationships with friends, parents, coaches, teachers, community.

~ May create difficulty in responding to new situations



Emotional Symptoms in the Classroom Include:

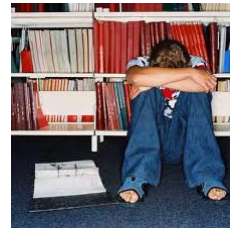
Withdrawn
Labile/unstable
Restless Angry
Hurt Scared
Betrayed Confused

Irritable Short-tempered *Impulsive*
Sad/Depressed
Flat/quiet
Anxious/Nervous



Emotional Symptoms in the Classroom

- Emotional reactions may occur to:
 - the trauma of amnesia or loss of consciousness
 - being significantly impaired or unable to perform
- Emotional or behavioral symptoms may be the direct result of the concussion OR a result of adjustment to injured status.
- Preexisting condition (e.g. depression, ADD, ADHD, LD) may be exacerbated or slow down recovery



Somatic (Physical Symptoms) in the Classroom

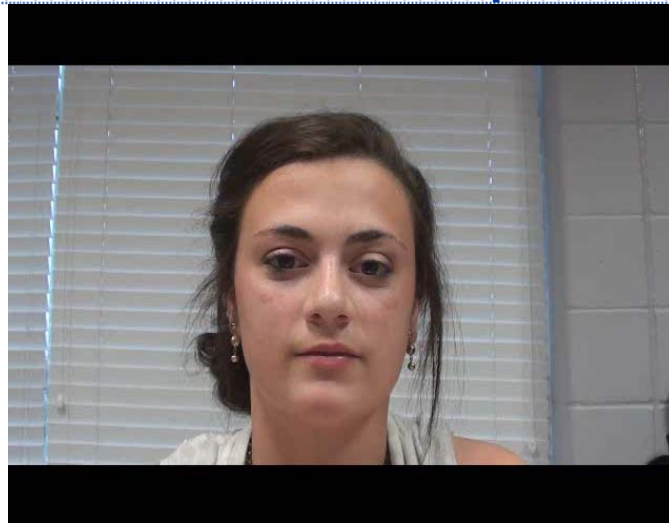
- ~ Headache pain, nausea, dizziness, clumsiness, drowsiness, visual or hearing problems, fatigability, sensitivity to light and noise, sleep disturbance etc.
 - may influence performance and abilities
- ~ With significant symptoms, student may miss whole or half days of school early in recovery
- ~ Injury-related sleep difficulties may lead to daytime drowsiness or fatigue
- ~ With prolonged recovery, medication may be used to manage symptoms, which also may produce side effects

Controlling Symptoms: What to do

Symptom/Problem	Solution
Overwhelmed; needs meds	Go to nurse for rest/ meds
Sensitivity to light	Sunglasses; hat; dim the room
Sensitivity to noise	Avoid cafeteria, assemblies, shop or other “noisy” classes
Crowded environment	Early dismissal from class before hallways fill up
Needs break	Nurses office or ATR



Are Accommodations Helpful? One Student's Perspective



Communicate



Suggested Practices

- ~ Communication with Teachers/Nurse/Counselor
- ~ Serve as liaison as needed; make principal aware also

Provide documentation (multiple copies of doctors orders)

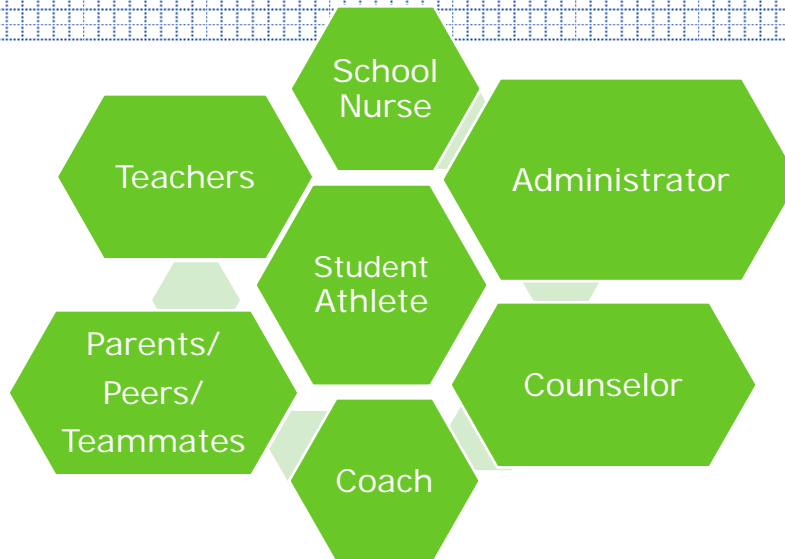
- Don't keep fellow professionals out of the loop

It's not "just a concussion"

- Seriousness/ returning too soon
- Accommodations
- Signs/ symptoms to look for

Concussion Action Plan (CDC)

Collaborative Approach by All



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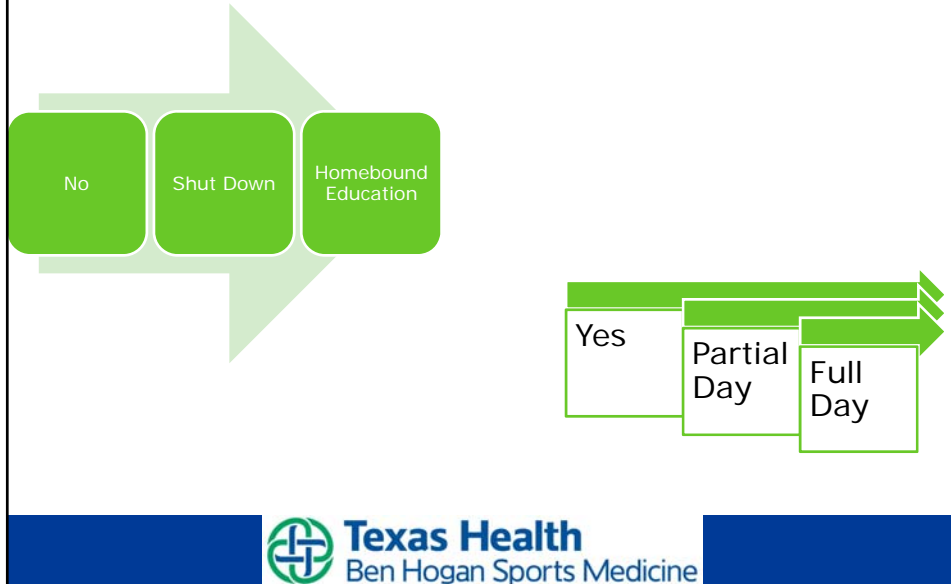
Why Accommodations May Fail...

Communication problems: Staff are not aware of the injury or the severity of the problems (parents, guidance counselor, school nurse are key)

Education problems: Shrug off injury because the student “looks fine,” “just had his/her bell rung,” or “this is only their first concussion, I had 10 when I played football and it didn’t bother me” (individual differences)

Resistance: From student (doesn’t want to look different, be treated differently, worried about impact on overall academics); From staff (unsure of how to implement)

Return to School and Play Considerations



Return to School: Step 1

Step 1

No School attendance: emphasize Cognitive & Physical rest

No tests, quizzes or homework

If student remains at step 1 longer than 2 weeks, consult the student support team* to discuss lack of progress

Go to Step 2 when:

Decreased sensitivity to light

Decreased intensity and frequency of headaches

Ability to read more than 10 minutes without symptoms increasing

-Sensitivity to light

-Sensitivity to noise

-Cannot read more than 10 minutes without symptoms returning

****Student support team = teachers/counselors/principal/nurse***

Return to School: Step 2

Step 2 Modified Daily class Schedule

1st day PM classes; 2nd day AM classes; 3rd day 10am-2pm

Reduce weight of back pack; provide 2nd set of books in each class

Obtain "5 minute" pass to avoid noisy hallways between classes

No tests/quizzes/homework; provide copies of class notes

Report to AT or Nurse daily

Allow sunglasses to view Smart boards/wear a cap/dim lighting

No PE or RTP exercise



Return to School: Progress to Step 3 When...

Each of class has been attended at least once

School activity does not increase symptoms

Overall symptoms continue to decrease/headache free



Return to School: Step 3

Step 3 Full Day of School

No tests, quizzes or homework; provide copies of class notes

Reduce weight of back pack; provide 2nd set of books in each class. Obtain "5 minute" pass to avoid noisy hallways between classes.

Teacher has discretion to use "**mastery learning**" criteria to reduce subject workload

- Report to AT or Nurse daily
- Start RTP exercise progressions



5 Stage Post-Concussion Exertion Program

Target Exertion calculated by Karvonen's equation:

$$[\text{Max. H.R.} (220 - \text{Age}) - \text{Resting H.R.}] \times \text{Target \%} + \text{Resting H.R.}$$

Stage	Activity
<p><u>Stage 1</u> Target Heart Rate : 25% of maximum exertion Recommendations: 10-15 minutes of cardio exercise; low stimulus environment; no impact activities; balance and vestibular treatment (prn); limit head movement/ position change; limit concentration activities</p>	<ul style="list-style-type: none"> -Very light aerobic conditioning -Sub-max strengthening -ROM/ Stretching -Very low level balance activities
<p><u>Stage 2</u> Target Heart Rate : 50% of maximum exertion Recommendations: 20-30 minutes of cardio exercise; exercise in gym areas; use various exercise equipment; allow some positional changes and head movement; low level concentration activities</p>	<ul style="list-style-type: none"> -Moderate aerobic conditioning -Light weight strength exercise -Stretching (active stretching initiated) -Low level balance activities
<p><u>Stage 3</u> Target Heart Rate : 75% of maximum exertion Recommendations: any environment ok for exercise (indoor, outdoor); integrate strength, conditioning, and balance / proprioceptive exercise; incorporate concentration challenges</p>	<ul style="list-style-type: none"> -Moderately aggressive aerobic exercise -All forms of strength exercise (80% max) -Active stretching exercise -Impact activities running, plyometrics (no contact) -Challenging proprio-balance activities

Return to School: Go to Step 4 When...

ImPACT/Neurocognitive test scores normalize
Symptoms almost resolved
School activity does not exacerbate symptoms

If student cannot go past Step 3 after an "extended period of time, make up home work should not be required and student should be reevaluated by the student support team for lack of progress including referral back to treating physician



5 Stage Post-Concussion Exertion Program

Target Exertion calculated by Karvonen's equation:

$$[\{ \text{Max. H.R.} (220 - \text{Age}) - \text{Resting H.R.} \} \times \text{Target \%}] + \text{Resting H.R.}$$

Stage	Activity
<p>Stage 4 (Non Contact Drills) <i>Recommendations:</i> continue to avoid contact activity, resume aggressive training in all environments</p>	<ul style="list-style-type: none"> -Non-contact physical training -Aggressive strength exercise -Impact activities/ plyometrics -Sports specific training activities
<p>Stage 5 (Return to Full Practice) <i>Recommendations:</i> Initiate contact activities as appropriate to sport activity; full exertion for sport</p>	<ul style="list-style-type: none"> -Resume full physical training activities with contact -Continue aggressive strength/ conditioning exercise -Sport specific activities



Return to School: Step 4

Step 4 Full Academic Load

Resume all academic responsibilities: tests/homework
PE and RTP exercises should be progression at this point
IF any symptoms return, return to Step 3

Report to At or Nurse Daily

Follow up w AT/nurse/counselor after one week for update; introduce counseling if needed

Students are encouraged to continue meeting with counselors to help determine if **“neurocognitive stall”** is occurring

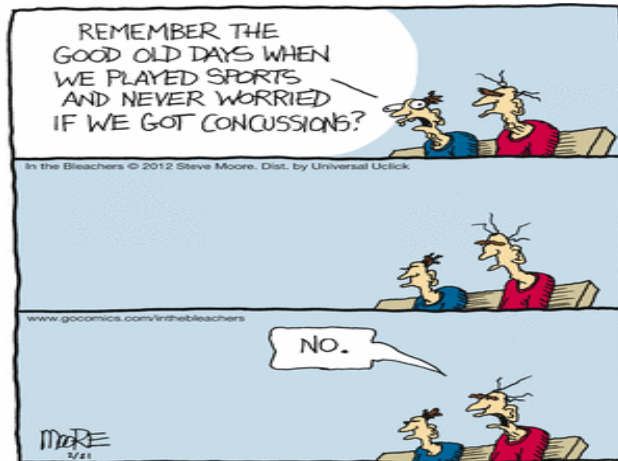


SUMMARY

- ~ Awareness, Cooperation, & Communication are key at all levels
- ~ Recovery is quicker and safer when students receive a consistent message- all on the same page
- ~ Teachers and injured students should discuss options/ observations
- ~ Proper accommodations should allow student to continue learning while controlling symptoms and maintaining grades
- ~ “Healthy” appearance of student is usually a difficulty, not advantage, in terms of self- and other-expectations
- ~ Athletes don’t stop learning just because they stop playing

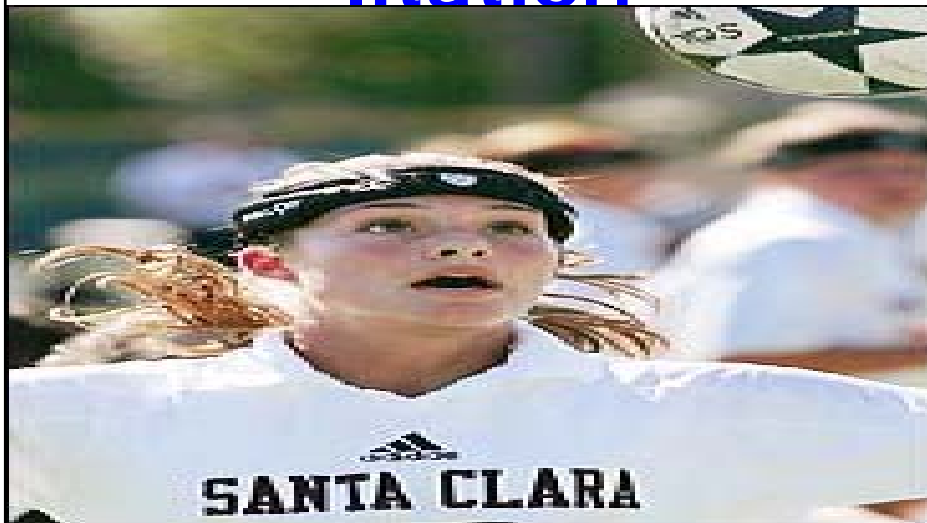


“What’s the big deal; I never had problems playing with a concussion?” Really? Really?



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Treatment/Rehabilitation



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Athletic Training: Shotgun Approach

7th Grade English:

Either/Or

Both/And



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Treatment Following Concussion




"Yo, Dewey! Got another one over here when you're done."

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Best Practice

Identify Signs/Symptoms
Remove from game/practice
Rest 48 hours no activity
See a Physician at day 3 or 4 to
get school accommodation
Once headache free/ full day
of school start RTP
progressions
RTP when cleared with
clinical, symptoms,
neurocog, & RTP all clear

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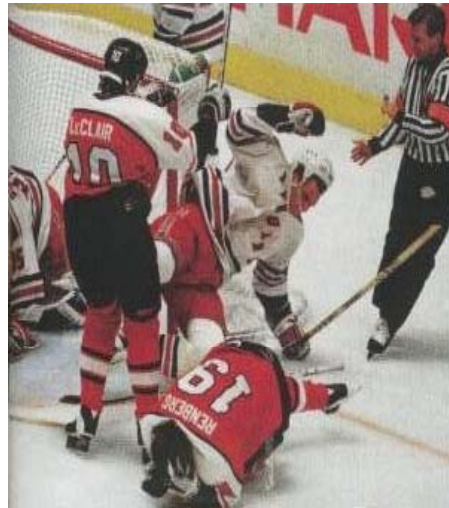
Sideline Evaluation

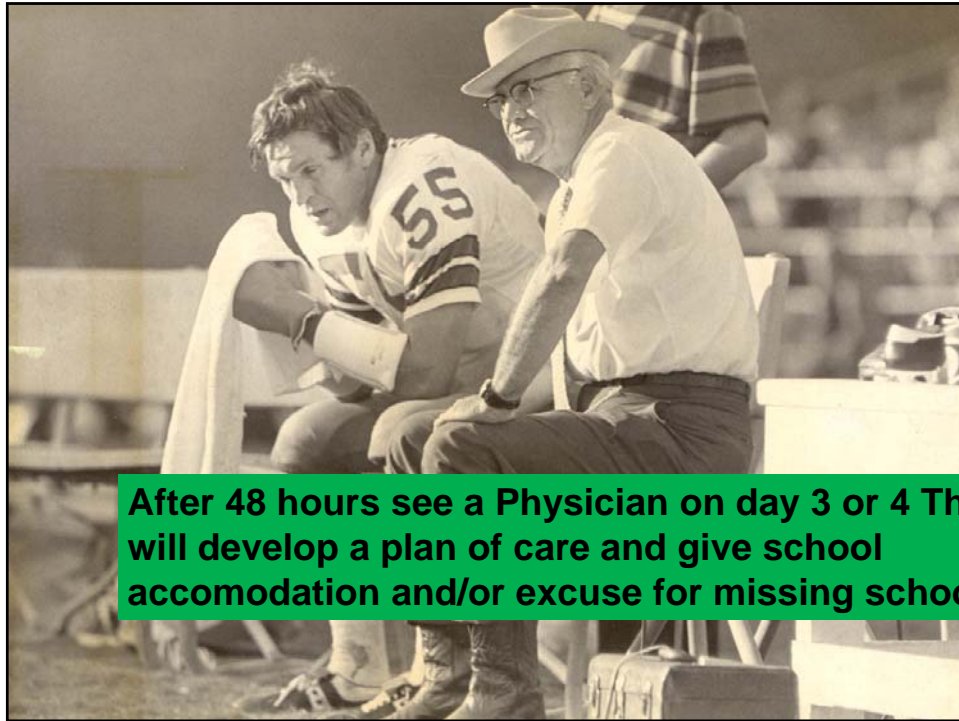
If Signs and Symptoms

Removes from practice
or game and DO NOT
return the same day


Rest for 48 hours no school

- **REST** No Texting
- **REST** No Videos/computer
- **REST** No TV/Concerts
- **REST** No Physical Activity
- **REST** No Chores (yeah!)
- **REST** LOTS of Sleep





**School will still be there
Tommorrow but will you know it?**

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We use a systematic approach; Treat every concussion with the same matrix



1. Presumed event (AT, coach, parent, doctor, etc.)
2. Office visit (Detailed History, Exam, Neurocognitive Test, Computerized Balance Test, Extraneous Tests)
3. Analysis of all data for clinical decision
4. Treatment (Rest, Academics, medications, Education, communication)
5. Follow-up
6. Return to classroom/play progression and clearance



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You will be on top of the world; and know it



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Before returning to contact:



- Fit in a different helmet using “finger” test
- Review number of helmet hits in your practices
- Review your coaching techniques
- Establish weekly helmet safety check procedures

Take Home Message “Cornerstones of Management”*

The 3 “R” s

Remove, Restrict, Return

Remove symptomatic player from competition

Restrict from competition until symptoms resolve

Return to Play (RTP) gradually after exertion and **without** symptoms

Neuropsych testing recommended

*Source 2001 & 2004 Vienna and Prague

Concussion Resources:

www.texashealth.org/benhogan

ACTive™

www.impacttest.com

www.cdc.gov/Concussion

www.TSATA.com

UPMC Sports Medicine

–Lovell, Collins, Pardini



If it looks like a concussion and acts like a concussion it probably *is* a **CONCUSSION**

