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The Role of the SLP in Multidisciplinary Concussion Management for Adolescents Experiencing Persistent Concussion Symptoms (PCS)

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1

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We have no disclosures

2

Learning Objectives

1. Describe the pathophysiology of concussion, clinical symptoms, and theories for the etiology of persistent concussion symptoms (PCS).
2. Identify the required multidisciplinary practitioners for effective and coordinated concussion management.
3. Describe the models for coordinating integrated care in different contexts including school-based coordination and medical-school coordinated communication.
4. Describe the range of available SLP-delivered treatment options to address ongoing symptoms disrupting return to learn, play, and community

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3

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What is Concussion?

- Epidemiology
- Definition
- Pathophysiology
- Clinical symptoms
- Development of persistent concussion symptoms (PCS)

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Epidemiology

- 1.6-3.8 million annual concussions in U.S.
- Estimated 300,000 SRC annually in U.S.
- SRC and MVA most common causes ages 15-24

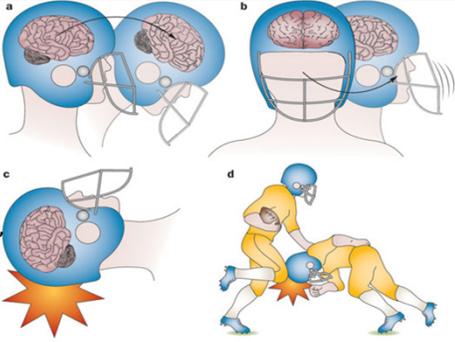
(Marar, McIlvain, Fields, & Comstock, 2012)
(Giza & Kutcher, 2014)
(Gonzalez & Walker, 2011)

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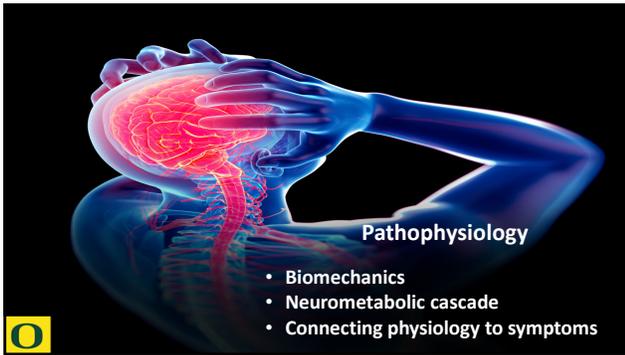
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Definition:

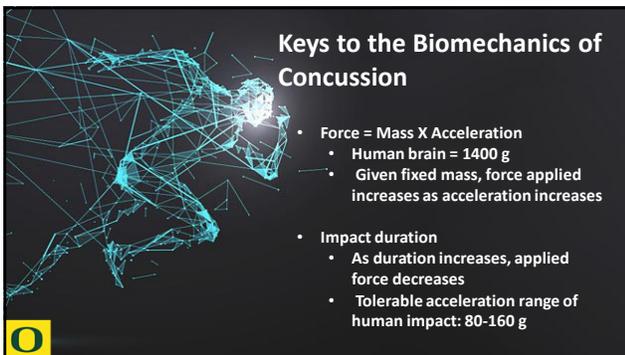
The application of biomechanical force to the head and/or neck via linear and/or rotational acceleration that leads to observable changes in cognitive, somatic, and neurobehavioral functioning



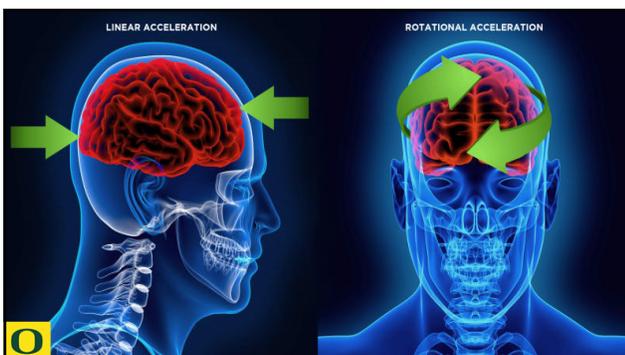
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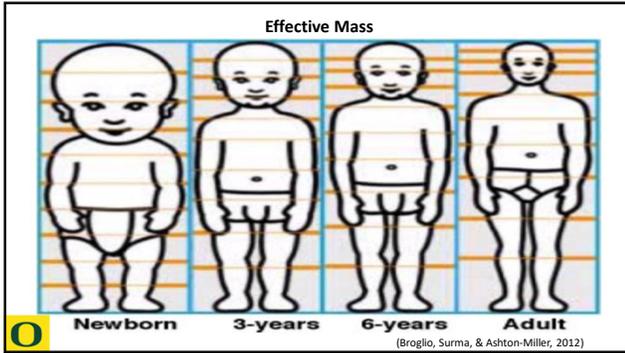
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Impulse Magnitude

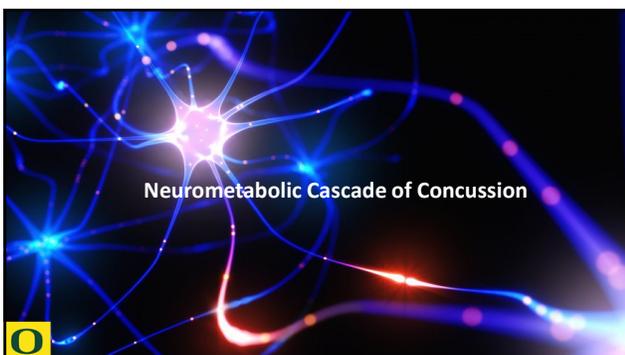
Force during the impact / Duration of the impact



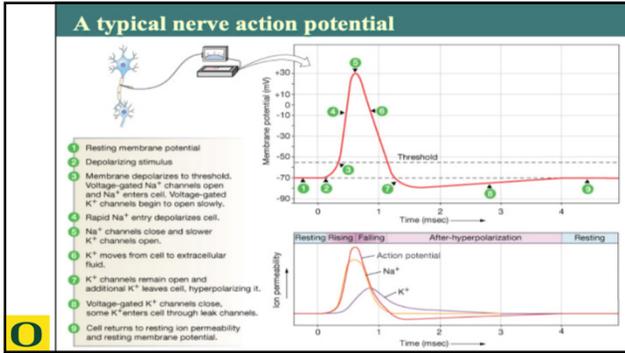
That's why helmets are important:

1. Prevent skull fractures
2. Reduce direct energy transfer resulting from skull to skull contact
3. Reduce the rate of head acceleration by increasing impact duration, thus reducing force to the head

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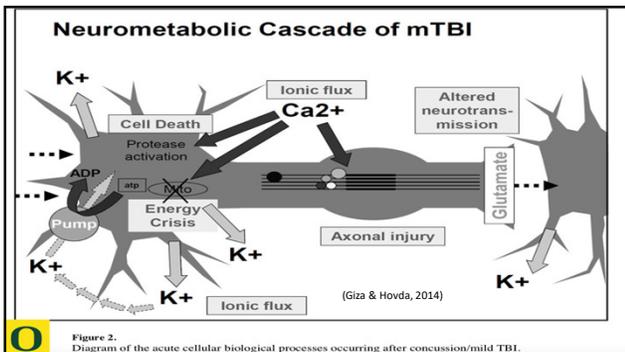


13

Stages of the Cascade

1. Biomechanical force applied to head/neck region and transferred to brain
2. Ionic flux and mass release of glutamate
3. Energy crisis
4. Cytoskeletal damage and axonal dysfunction

14



15

Ionic Flux and Mass Release of Glutamate

- Glutamate is the primary excitatory neurotransmitter in the CNS
- Application of force triggers mass release of glutamate – significantly depolarizes the axon
- Depolarization:
 - K^+ ions pumped out of the neuron
 - Na^+ and Ca^{2+} ions pumped in

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16

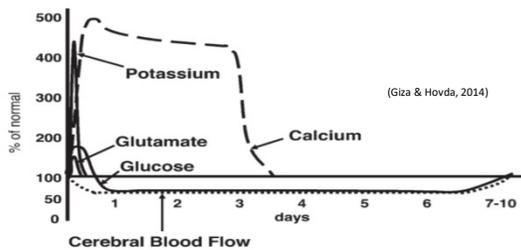
Energy Crisis

- Hyperglycolysis to restore homeostasis
- Over-pumping of sodium-potassium ion channels quickly burns through the neuron's energy reserve
- "Uncoupling" of glucose metabolism and cerebral blood flow (CBF)
 - Demand goes up, supply goes down
 - Very significant as the brain accounts for 15% of total body metabolism
- Metabolism further exacerbated by the accumulation of calcium in the mitochondria
- "Spreading depression"

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17

Neurometabolic Cascade



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FIGURE 1. Time course of the neurometabolic cascade of concussion.

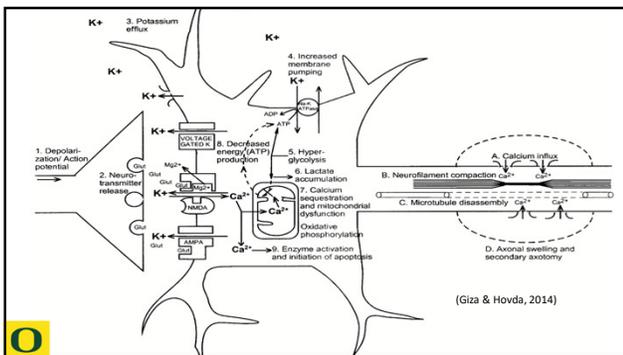
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Cytoskeletal Damage and Axonal Dysfunction

- Intra-axonal calcium flux negatively affects the structural integrity of axons
- Biomechanical force causes the stretching of axons – causes axonal blebbing
- Force also disrupts microtubules that line the axonal membrane
 - Interferes with axonal transport
 - Can even result in the disruption of neural transmission at the synapse and cause axonal disconnections

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19



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20

Early Events of the Neurometabolic Cascade

- Mass release of glutamate and efflux of potassium/influx of sodium that triggers brief period of hyperglycolysis
- Persistent calcium influx
- Mitochondrial dysfunction that reduces glucose metabolism to depressed state
- Reduced CBF
- Axonal injury

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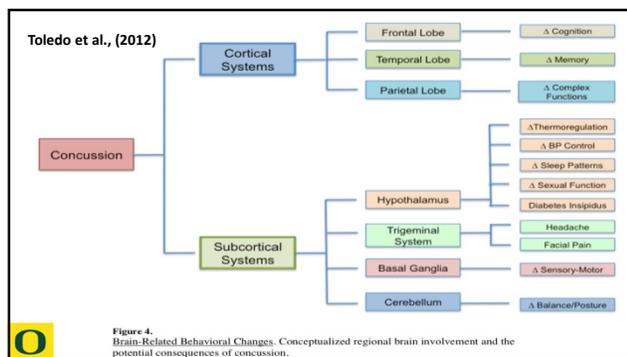
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Late Events of the Neurometabolic Cascade

- Recovery of glucose metabolism and CBF
- Delayed cell death
- Chronic alterations in neurotransmission
- Axonal disconnection

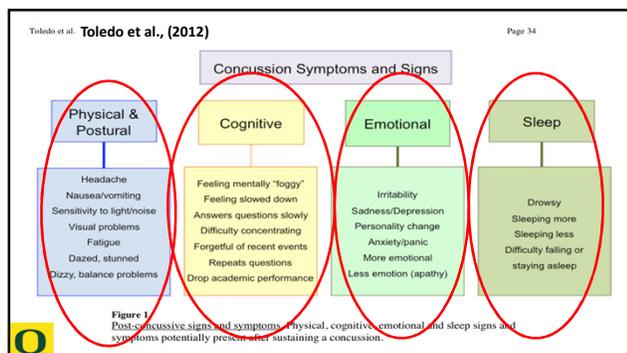
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24

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Complexities to Treating PCS

- Need for multidisciplinary communication and coordination
- Eugene Youth Concussion Management Team (CMT)

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25

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PCS Defined

- Occurs in 10-15% of the 1.6-3.8 million annual concussion cases
- Shift in literature to use the term "Prolonged Concussion Symptoms" instead of "Post Concussion Syndrome"
- General consensus between DSM-IV and ICD-10 in diagnostic criteria of PCS
- Defined as the presence of three or more symptoms for at least three months following the injury

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26

There are many mediators of cognitive symptoms responsible for persistent effects

COGNITIVE SYMPTOMS → Attention, memory, executive functions: What SLPs focus on

IATROGENIC FACTORS → Incorrect diagnosis (cervicogenic), over-investigation/over-testing, over treating
Creates expectation of lasting symptoms

COMORBID CONDITIONS → Depression, anxiety, PTSD, chronic pain, fatigue, sleep disturbance
All can contribute to maintenance of PCS

PSYCHOLOGICAL FACTORS → Expectation as etiology, recall bias good old days, perception of little/no control, symptom-focused hypervigilance, personal gain

PRE-INJURY FACTORS → Diminished resilience (self-efficacy, optimism & positive emotions, positive reframing of negative thoughts, social support, sense of purpose in life), Personality characteristics (neuroticism, low self-esteem, poor coping)
Previous concussions; Maternal hx of migraines

Our interventions must address the key issues beneath the surface

27

This complicated interplay between pre-injury and post-injury factors means that...

- We are often treating students for whom there are no biomarkers to measure their medical condition of "concussion"
 - Cognitive tests often fail to corroborate patient's report of symptoms
 - When cognitive/learning measures do show impairment, the source is often not clear
- The interaction of the different symptoms and contexts requires an integrated approach to management



31

SILOED Healthcare & Educational Supports Do Not Work



32

- 1 Primary Role**
 - Has extensive knowledge of concussion and its consequences
 - Leads advocacy efforts, promotes community awareness, develops the protocol with other professionals, gains district approval, trains and oversees program implementation, works directly with students, collaborates with medical providers, and updates protocol as needed
- 2 Secondary Role**
 - Has working knowledge of concussion and its consequences
 - Advocates for team development, promotes community awareness, works directly with students, and provides feedback to team leaders
- 3 Tertiary Role**
 - Has limited knowledge of concussion and its consequences
 - May advocate for development of a team and provide relevant information to decision-makers

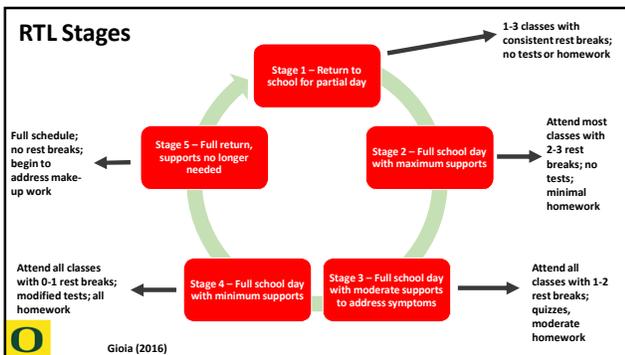
Dachtyl, Sarah A., and Pedro Morales. "A collaborative model for return to academics after concussion: athletic training and speech-language pathology." American journal of speech-language pathology 26.3 (2017): 716-728.

33

Requirements for an integrated, coordinated team:

- Designated lead
- Range of necessary disciplines
- Providers interested in concussion
- Shared consent
- System for reviewing progress

37



38

Step 1. Total rest.	• No mental exertion (computer, texting, video games, or homework), stay at home, no driving.
Step 2. Light mental activity.	• Up to 30 minutes of mental exertion, but no prolonged concentration, stay at home, no driving. • Progress to next level when able to handle up to 30 minutes of mental exertion without worsening of symptoms.
Step 3. Part-time School.	• Maximum accommodations (shortened day/schedule, built-in breaks, provide quiet place for mental rest, no significant classroom or standardized testing, modify rather than postpone academics, provide extra time, extra help, and modified assignments). • Progress to next level when able to handle 30-40 minutes of mental exertion without worsening of symptoms.
Step 4. Part-time School.	• Moderate accommodations (no standardized testing, modified classroom testing, moderate decrease of extra time, help, and modification of assignments). • Progress to next level when able to handle 60 minutes of mental exertion without worsening of symptoms.
Step 5. Full-time School.	• Minimal accommodations (no standardized testing, but routine testing ok; continued decrease of extra time, help, and modification of assignments; may require more supports in academically challenging subjects). • Progress to next level when able to handle all class periods in succession without worsening of symptoms AND medical clearance for full return to academics.
Step 6. Full-time School.	• Full academics with no accommodations (attends all classes, full homework).

https://detr.org/sites/default/files/resources/return_to_jca_demo.pdf

39

Concussion Management in the School Setting

- All 50 states have at least some policy for public school to identify concussions and monitor Return-to-Play status (RTP)
- Standardized guidelines on Return-to-Learn (RTL) is lacking
- Consensus that RTL should occur before RTP for athletes
- RTL differs by state and school district
- The state of Oregon has CBIRT - <https://www.cbirt.org/tbi-team>
- Chicago Public Schools offers this handbook - <https://policy.cps.edu/download.aspx?ID=258>



40

Oregon TBI Team

- 9 Liaisons lead the TBI team members
 - Funded by Oregon Department of Education
 - Liaisons lead TBI team members to support districts and families
 - Liaisons currently asked by districts to train staff regarding TBI



41

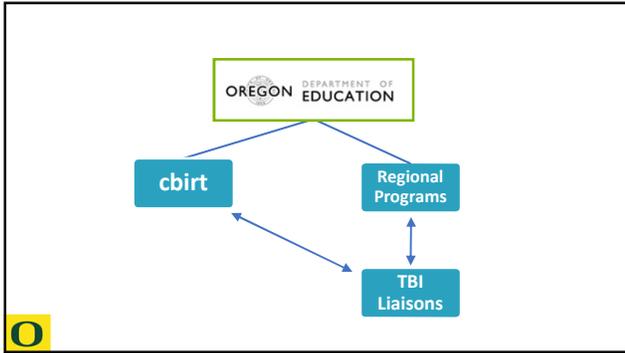
Statewide TBI Resource Team

Team members provide training & consultation to educators working with students with TBI. **Services can be** general or tailored to an individual student

- Activities can include:
- Attend IEP meetings
 - Providing materials
 - Phone consultation
 - Observations in classrooms
 - Provide training
 - etc

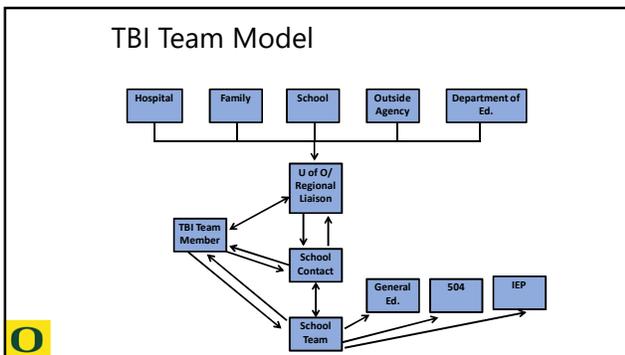


42



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43



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44

School Options for Supporting Students Recovering From Concussion

Academic Adjustments	Academic Accommodations	Academic Modifications
<ul style="list-style-type: none"> • Tier 1 Support • Changes to environment 1-3 weeks post-injury • Shortened school day, peer note-taker, sunglasses in class, reduced homework, etc. 	<ul style="list-style-type: none"> • Tier 2 Support • Formal intervention through a 504Plan for problems that persist beyond 3 weeks • May include standardized testing arrangements or change in student schedule 	<ul style="list-style-type: none"> • Tier 3 Support • Permanent changes to child's education • Student receives special education services through Individualized Education Plan (IEP)

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45

Academic Accommodations Matrix

Student Name: _____ Date of Evaluation: _____ Staff Contact: _____

Following concussion, students who receive academic accommodations with penalty for missed work are more successful and better able to reintegrate into school.

General	Cognitive/Thinking	Fatigue/Physical	Emotional
Adjust class schedule (alternate days, shortened day, abbreviated class, late start to day).	Reduce class assignments and homework to critical tasks only. Exempt non-essential written classwork or homework. Base grades on adjusted work.	Allow time to visit school nurse/counselor for headaches or other symptoms.	Develop plan so student can discreetly leave class as needed for rest.
No PE classes until cleared by a healthcare professional. No physical play at recess.	Provide extended time to complete assignments/tests. Adjust due dates.	Allow strategic rest breaks (e.g., 5-10 minutes every 30-45 minutes) during the day.	Keep student engaged in extra-curricular activities. Allow student to attend but not fully participate in sports practice.
Avoid noisy and over-stimulating environments (i.e., bands) if symptoms increase.	Once key learning objective has been presented, reduce repetition to maximize cognitive stamina (e.g., assign 5 of 30 math problems).	Allow hall passing time before or after crowds have cleared.	Encourage student to explore alternative activities of non-physical nature.
Allow student to drop high level or elective classes	Allow student to demonstrate	Allow student to wear sunglasses indoors.	Develop an emotional support plan for the

46

Table 1
Ascending levels of academic support applied to concussion

Level or Tier	Focus of Level/Tier
Universal Level, Tier 1	<p>At the Universal Level, Tier 1:</p> <ul style="list-style-type: none"> Students receive informal assistance within the general education setting Students receive quick and early screening Students receive <i>academic adjustments</i> promptly and liberally Students receive academic supports that can be adjusted frequently (hourly, daily, weekly) by the general education teacher An IEP is a tailor-made plan for students whose healthcare needs affect or have the potential to affect the student's safe and optimal school attendance and academic performance Universal Level Applied to Concussion: Seventy % of students with a concussion recover within 4 weeks, therefore, the RTL plan needs to be immediate and applied in general education General education teachers need to be widely trained and empowered to front-load academic supports within the first 4 weeks and fade academic supports as the concussion symptoms subside An IEP may prove to be an ideal mechanism for use in the RTL (either at a Tier 1 or 2) process for students who have sustained a concussion
Targeted Level, Tier 2	<p>If support at the universal is not adequate, an intermediary level of more intensive support may be implemented at the Targeted Level/Tier 2</p> <ul style="list-style-type: none"> Students may receive academic supports in a more customized fashion Students may receive academic supports for a longer period of time The most common Tier 2 support is the Section 504 Plan. Section 504 of the Rehabilitation Act is a federal civil rights law. A 504 Plan may be considered if a medical condition, substantially limits at least one of the major life activities such as thinking, concentrating, reading, or learning Academic supports provided in a 504 Plan would be referred to as <i>academic accommodations</i> <p>Targeted Level Applied to Concussion: Especially in the case of protracted recovery from concussion (beyond 1 month), a 504 Plan may prove to be an ideal mechanism for use in the RTL process for symptoms that are severe and/or long-lasting, resulting in more customized or longer educational need</p>
Intensive Level, Tier 3	<p>If a student is unable to receive reasonable benefit from general education alone and/or requires specialized instruction, placement, programming, intensive level, Tier 3 supports may be provided on an IEP.</p> <ul style="list-style-type: none"> Academic supports provided on an IEP may include <i>academic modification</i> of the curriculum Intensive Level Applied to Concussion: Since concussions are commonly short-term, transient injuries that rarely result in a significant disability,

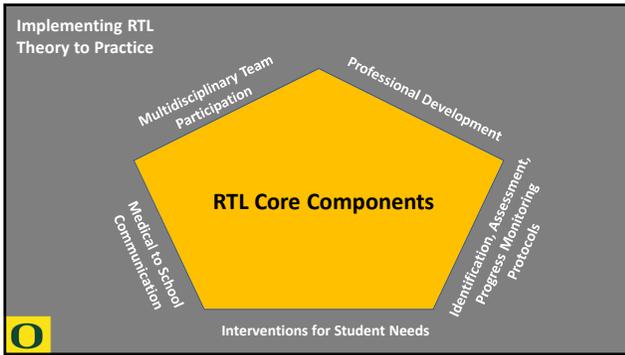
McAvoy et al., 2018

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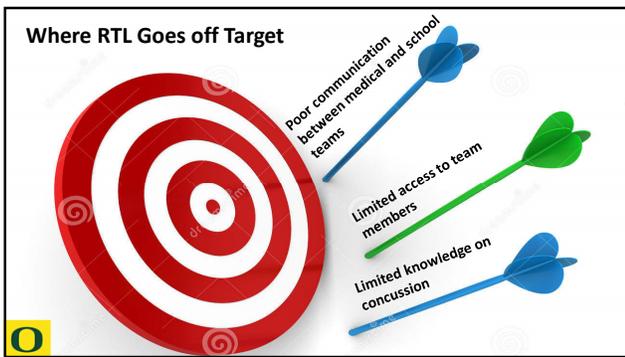
Considerations

- **Not every General Educator can implement the accommodations and early supports due to constraints on time, resources and/or training**
 - What are models in your context where SPED, SLP, might be able to provide indirect or coaching supports?
- **In Oregon we have the Regional Brain Injury Resource Team**
 - Trained team members may serve on evaluation and IEP teams;
 - Provide trainings for district staff on effective strategies
 - Collaborate with student's medical team
 - <https://cbirt.org/>
- **If students remain symptomatic, will want to bring in extra supports both in school and outside of school.**

48



49



50

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SLP Treatment

- Cognitive challenges following concussion
- Therapy goals
- Treatment options
- Progress measurement
- Results from retrospective case series

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51



WHY Me?

- SLPs have the skills to manage common concussion symptoms
- SLPs are in most schools

52

The Literature Describes Models with SLPs as Key Players

AJSLP
Clinical Focus

A Collaborative Model for Return to Academics After Concussion: Athletic Training and Speech-Language Pathology
Sarah A. Dachty^{1*} and Pedro Morales^{2*} 2017 AJSLP

Multidisciplinary Management of Collegiate Sports-Related Concussions
Kelly Knollman-Porter, Ph.D.,¹ Fofi Constantinidou, Ph.D.,² Jennifer Beardlee, MEd, ATCL,³ and Stephen Dailey, M.D.³

O 2019 Seminars in Speech and Language

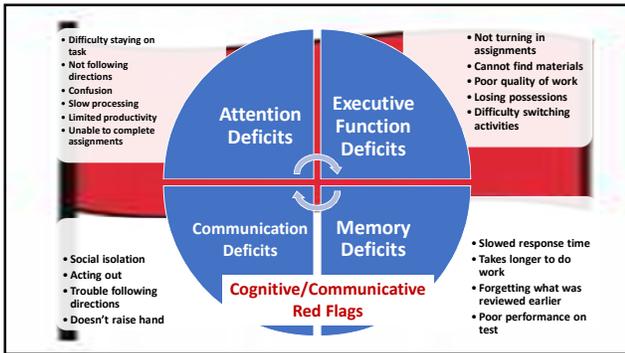
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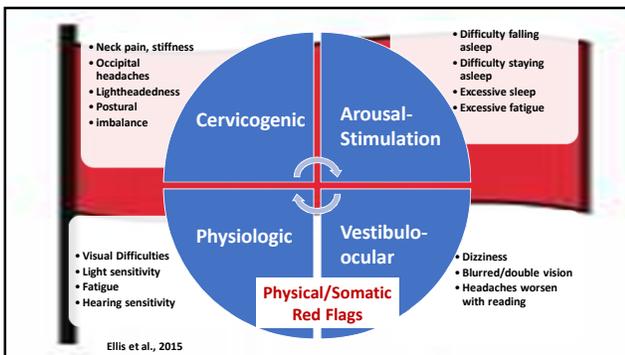
How Might Concussion Symptoms Manifest in the Classroom?

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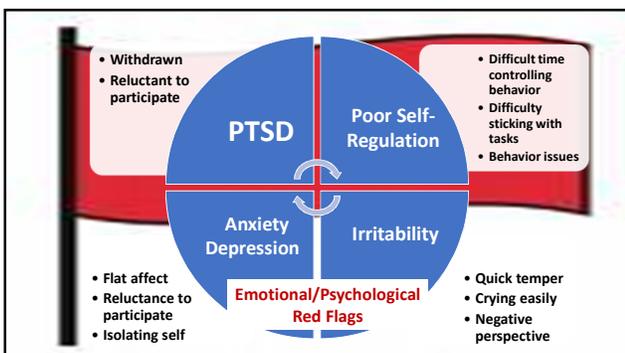
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56



57

Symptoms May Be Worsened by

- Mental exertion
- Physical exertion
- Anxiety
- Academic stress
- Environmental stimulation
 - Screen time



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58

Early Supports-Prevention of PCS is the Goal

- Progressive return to learn protocol
- Sample Early Academic Accommodations
 - Built in rests or breaks
 - Alternative test setting
 - Extended time for assignments or tests
 - Peer notetaker
 - Adapted schedule
- Psychoeducation

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59

Key Early Supports

PSYCHOEDUCATION

Messages based on individual profile to facilitate positive expectation for improvement; decrease anxiety; and promote behavioral health/compliance with recommendations

ACCOMMODATIONS

Temporary adjustments in expectations or provisions of supports to decrease cognitive and emotional load

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60

Early Psychoeducation is key

Common Messaging

- Concussion caused by a temporary, minor disruption of some signals in the brain which can cause very disruptive symptoms.
- Symptoms are predominantly related to physical trauma, stress from injury and concern over recovery
- Reassurance
 - Rapid and full recovery very likely
 - We will support you
- Reactivation
 - Importance of returning to physical and cognitive activity.
 - Newest literature suggests you can push yourself a bit above where you start to be symptomatic and there



61

Common Psychoeducation—Promoting Wellness and Self Efficacy

BEHAVIORAL HEALTH

- SLEEP
 - Relationship between sleep and performance
 - Sleep hygiene
- SCREEN TIME
- RISK REDUCTION
- SYMPTOM MANAGEMENT
 - Relationship between pain and cognitive performance

ANXIETY/PSYCH

- Re-activation (can push yourself a bit)
- Expectation for improvement: Takes a while but you will get better
- Family messaging



62

Possible Challenges to Identification

- Student looks “normal” and sometimes feels normal
- Standard medical and neuro-cognitive testing often do not show significant impairment
- Expectation from self and others to “get over it” and “get back in the game” hence self identification is low
- Student may have had academic or behavioral issues prior so it’s assumed that issues are pre-existing
- Student may lack awareness of concussion related symptoms
- Students and parents may not be informed about the importance of identification and management



63

What About Assessment

- Depends on context
- Medical setting: tests and questionnaires of executive functioning and working memory are useful
 - BRIEF
 - FAVRES
 - RBANS
- School setting: typical SLP testing doesn't identify challenges (e.g. Woodcock Johnson)
 - Need for more sensitive assessment measurements
 - Symptom management also an option

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64

YOUR TURN: HOW WOULD THIS WORK IN YOUR SCHOOL, CLINIC, OR PRACTICE?

- What current systems are in place to identify students at risk?
- What current communication systems are in place to exchange information?
- What current systems are in place to develop protocols?
- What current systems are in place to monitor students?
- Identification methods
- Options for academic accommodations
- Graded RTL Protocol
- Psychoeducation—Spreading the word

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65



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66

BEGIN WITH THREE KEY QUESTIONS

- **WHAT DO YOU WANT TO CHANGE?**
 - What matters to the student?
- **WHAT IS PREVENTING YOU FROM REACHING YOUR GOALS?**
 - What are the primary challenges responsible for school concerns?
- **WHAT IS GOING WELL?**
 - Identify strengths and skills so you can build on them

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67

Question #1: Range of Functional Goals

Improve Grades (overall GPA, course quiz, assignment performance)

Increase Assignment Management (assignment completion, study skills)

Improve Academic Skills (reading, writing, lecture comprehension, oral presentation)

School Motivation

Feel Socially Connected

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68

Question #2: Range of Possible Obstacles

Cognitive Challenges (e.g., WM, EF, attn)

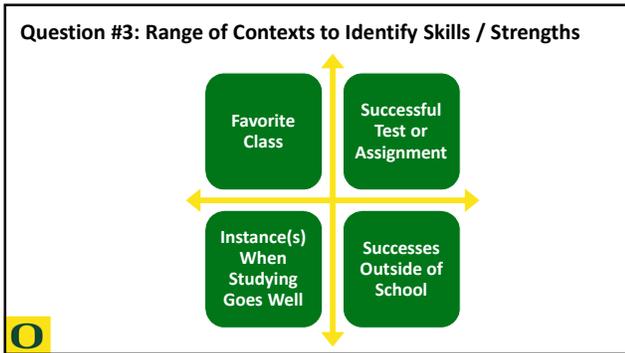
Psychosocial Variables (anxiety, motivation, confidence)

Knowledge Gaps (pre-existing school challenges)

Somatic Variables (headache, fatigue)

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69



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70

The GAS Process

- Divides overarching goals into five discrete levels
- Allows clinicians and clients to clearly define a range of outcomes
- Can measure longitudinal change
- Can measure degree to which intervention is effective

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71

Goals should be:
Achievable – in a reasonable amount of time and be important to you!

Priorities
We've talked about several things you might be interested in working on with us. Which seem most important?

Build a Measurement Plan

How often?
per week, day, hour, 15 min block?

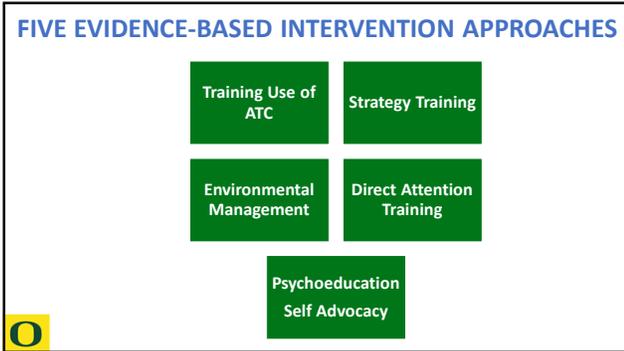
How well?
Accuracy
Performance

How much time does it take?
Efficiency
Self-rating, 1-5
Rate your effort (during the task)
Rate your confidence (to do the task)

WHO will measure?
HOW will they measure?

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72



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73

Assistive Technology: The three most used tools in our clinic

- **Electronic readers with special reading comprehension software**
 - Kurzweil 3000 <https://www.kurzweilededu.com/k3000-firefly/overview.html>
- **Smartpens**
 - C-Pen <https://cpen.com/> [text to speech pen-reads text aloud]
 - Livescribe pen <https://www.livescribe.com/en-us/smartpen/>
- **Tablets/IPADS with apps or software**
 - Adobe Acrobat Reader <https://acrobat.adobe.com/us/en/acrobat/pdf-reader.html?promoid=C4SZ2XDR&mv=other>

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74

Assistive Technology for Assignment Management

- **Task Management Apps**
 - To Do Apps like Things, Todoist, Google notes and lists
- **Homework Management Apps**
 - Priority matrix
 - Istudy App
- **Metacognitive Strategies**
 - Binder organization
 - Homework completion steps
 - Self reward

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75

Study Skills Strategies

- Reading Comprehension/Retention Strategies
 - CampusReader (Before, During, After Reading)
 - SQ3R
- Writing Strategies
 - Self-regulated strategy development (SRSD)
- Test Taking Strategies
- Note Taking Strategies/Lecture Comprehension and Retention
 - Cornell notes <http://lsc.cornell.edu/notes.html>
 - Graphic note-taking organizers
 - Review strategies-After class strategy: review; put in own words,



76

Managing Somatic Symptoms- Psychoeducation

- Sleep hygiene
 - Partnering with psychologists; trouble staying vs trouble falling asleep are two different profiles
- Screen behavior
- Headache Management
 - <http://www.headachereliefguide.com/index.php>
- Symptom Monitoring
 - Monitoring triggers, response, effect
 - Monitoring low symptom periods



77

Accommodations/Self Advocacy

- Copy of course slides and notes
- Alternative test setting
- Extended time for assignments or tests
- Peer notetaker

https://cbirt.org/sites/cbirt.org/files/resources/classroomaccommodations_ocamp.pdf



78

More Academic Accommodations

- Allow rest breaks during school in quiet location
- Reduced course and work load if needed, drop unnecessary classes
- Focus on essential material
- Decrease homework
- Avoid overstimulation, cafeteria and noise hallways
- Allow student to wear sunglasses or baseball cap to help with light sensitivity



79

Regardless of the Approach Use...

DYNAMIC COACHING MODEL

(KENNEDY, 2015; USED WITH PERMISSION)

- | | |
|--|---|
| 1. IDENTIFY
POTENTIAL GOALS | 5. INITIATE STRATEGY
STEPS |
| 2. SELECT A DOABLE
GOAL | 6. CHECK: STRATEGY
USE |
| 3. IDENTIFY
POTENTIAL
STRATEGIES OR
SOLUTIONS | 7. TRACK
PERFORMANCE |
| 4. CREATE STEPS AND
MATERIALS | 8 COMPARE OUTCOME
TO GOAL & ADJUST |



80



**Identification of Key Therapy Ingredients for
SLPs Serving on Multidisciplinary Teams
Facilitating Return to Learn for Students with
Prolonged Cognitive Effects after
Concussion: A Retrospective Case Series
Analysis**

Wright, Sohlberg, Watson-Stites, & McCart (2019)



81

Retrospective Case Series

- Used Clinical Data Mining
- 15 students ages 13-18 with PCS
- Data Extracted in Four Categories:
 - Student characteristics
 - SLP Treatment Parameters
 - Clinical Outcomes
 - Nature of Multidisciplinary Treatment Communication

We wanted to explore RTL supports in the absence of a co-located multidisciplinary clinic



82

Context

- University Training Clinic: Graduate students supervised by one of four SLPS
- Students with concussion referred by pediatric neuropsychologist
- Loose concussion management team
 - Pediatric neuropsychologist was the lead
 - Provided initial testing and psychoeducation
 - Activated relevant practitioners
 - Monthly case review meeting that could be attended by phone



83

Student Characteristics

- 8 Female; 7 male
- Age 12-18 yrs
- 9 sports injuries; 3 falls, 2 MVA, 1 assault
- Modal duration of time till we treated—4 months
- All students considered chronic (longer than 3 months)
- Number of previous concussions: 10 had at least 1
- Psych Hx: 5 anxiety or depression



84

Student Characteristics Cont.

- **Primary symptoms:** 12 reported symptoms in all three domains (Cognitive, Somatic, and Psychological)
- **Academic Supports:** 3 received initial academic accommodations; 9 on 504; 2 on IEP



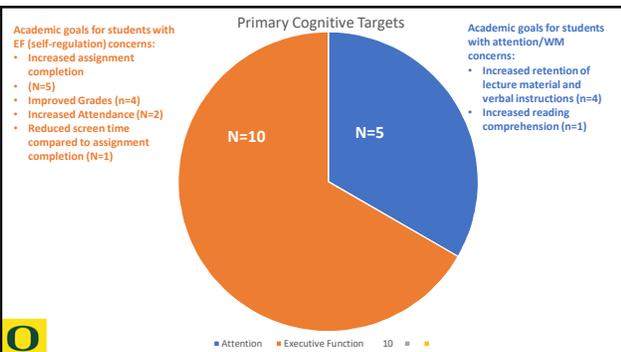
85

SLP TREATMENT

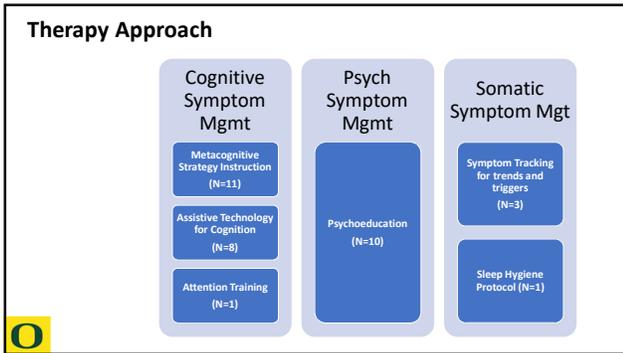
- **Dosage:** Average 9 session; range 4-19
- **Therapy Goals**
- **Therapy Approach**



86



87



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88

Goal and Therapy Selection Process

- Review of cognitive testing and school records
- Use of the three target questions:
 - What do you want to change about school right now?
 - What do you think is getting in the way?
 - What aspects of school are going well?

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89

Specific Therapy Activities

<ul style="list-style-type: none"> • Types of MSI • Internal self talk/verbal mediation to reauditorize information (N=6) • Reading comprehension/retention strategies (N=4) • Prediction (N=2) • Task planning sequence (N=2) • Test study strategies (N=1) • Visualization (N=1) • Mood regulation (N=1) 	<ul style="list-style-type: none"> • Types of ATC • Paper planner/Calendar app (N=5) • Task initiation chart (N=1) • Smart pen for lectures (N=1) • Apple iOS screen time feature corresponding to homework completion (N=1)
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90

Psychoeducation Themes

- Expectation for improvement (N=7)
- Increasing understanding about relationship between anxiety and cognitive symptoms (N=6)
- Increasing understanding about relationship between sleep and cognitive symptoms (N=2)
- Emphasizing importance of reactivation to increase activity level (N=6)

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91

Clinical Outcomes

PRIMARY SESSION MEASUREMENT

- Fluency and accuracy with steps to use strategy and devices
- Reflection of trends and triggers

TYPES OF ACADEMIC OUTCOMES

- GPA
- Attendance
- Number of missing assignments

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92

Overall Outcome Measurement

- **Goal Attainment Scaling**
 - goal hierarchies for homework completion (N=5)
 - 2 goal hierarchies for attention/retention of school material (N=2)
 - 1 goal hierarchy for school attendance (N=1)
 - All achieved expected progress or better
- **Rating Scales**
 - Perceived usage and effectiveness of tools and strategies (N=4)
 - 3 students had high ratings but didn't necessarily translate into academic outcomes

- **Data from school/parent/tool**
 - Attendance (N=2)
 - Grades (N=4)
 - IOS screen tracker information (N=1)
 - 5 students met goal levels
- **Test/Retest**
 - Reading comprehension pre/post (N=1)
 - Headache Impact Test (N=1)
 - Both students showed significant changes

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93

Multidisciplinary Communication

- 7 types of practitioners in 6 locations
- 7 high schools, 2 middle schools; 3 districts
- Most frequent provider communication was with: neuropsych; educational liaison, and clinical psychologist.
- Least communication was with PT
- Examples of positive effects of team
 - “It’s ok if your headache increases a bit; it won’t harm you”
 - Parent support based on psychologists concern parent was inadvertently receiving psychological benefits for child staying home



94

GAS Example Measuring improved grades resulting from ATC training

Goal	Improve my grades by inputting my assignments into my Google Calendar
+2 Much more than expected	I will input all assignment deadlines into the Google Calendar app 5 days out of the week
+1 More than expected	I will input all assignment deadlines into the Google Calendar app 4 days out of the week
0 Expected	I will input all assignment deadlines into the Google Calendar app 3 days out of the week
-1 Baseline	I will input all assignment deadlines into the Google Calendar app 2 days out of the week
-2 Decline	I will input all assignment deadlines into the Google Calendar app 1 day out of the week
Measurement	SLP and student reviewed the Google Calendar each week and determined progress.



95

GAS Measuring Use of Lecture Note/Review Strategy

Goal	Increase my ability to recall classroom content in geometry class
+2 Much more than expected	I remembered geometry content from one day to the next 4 days this week
+1 More than expected	I remembered geometry content from one day to the next 3 days this week
0 Expected	I remembered geometry content from one day to the next 2 days this week
-1 Baseline	I remembered geometry content from one day to the next 1 days this week
-2 Decline	I remembered geometry content from one day to the next 0 days this week
Measurement	Student documented whether she could recall specific content from the previous lecture at the beginning of each class.



96

Prerequisites

CONCUSSION KNOWLEDGE PREREQUISITES

- ✓ Concussion physiology
- ✓ Usual recovery course
- ✓ Risk factors for PCS
- ✓ Concussion symptoms affecting learning
- ✓ Interplay between somatic, psychological, and cognitive symptoms

ASSESSMENT & TREATMENT KNOWLEDGE PREREQUISITES

- ✓ Range of academic accommodations
- ✓ Psychoeducation for concussion
- ✓ Functional cognitive rehabilitation

SYSTEMS PREREQUISITES

- ✓ Resources for multidisciplinary Team
- ✓ Mechanism to communicate between school and other providers
- ✓ Progressive RTL Plan
- ✓ Monitoring recovery and adjustment

97

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98
