

Cincinnati Children's Sports Medicine Biodynamics Center

Physical Therapy Management of Post-Concussion Syndrome


4th Annual Pediatric Sports Physical Therapy Conference: April 4-5, 2014

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Insert subject Cincinnati Children's Sports Medicine Biodynamics Center

Outline

- Evidence Review
- Symptom/Vital Assessment
- Role of Manual Therapy
- Role of stretching/strengthening
- Sport-specific/Interval Exercise



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4th International Consensus Statement on Concussion in Sport 2012


- Science of concussion is evolving
 - Recognition of individualized approach
 - Also supported by American Academy of Neurology
- Recognition of modifying factors
- Multidisciplinary approach for patients with post-concussion syndrome (PCS)
- Optimal timing of rest and/or activity is unclear


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Modifying Factors (McCroory 2012)

- Female Gender
- Significance of LOC
 - > 1 minute
- Amnesia
- Convulsive Movements
- Depression
- ADD/HD







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Evidence in kids?

- Currently there are NO evidence-based return to play guidelines validated for pediatric athletes after concussion (March 2014)
 - Adult model adopted from 4th International Conference on Concussion (≥ 13 yo)
- Greater amount of youth concussion medical literature in adolescents (14 years) (Vidal, 2012)






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Table 1 Graduated return to play protocol

Rehabilitation stage	Functional exercise at each stage of rehabilitation	Objective of each stage
1. No activity	Complete physical and cognitive rest	Recovery
2. Light aerobic exercise	Walking, swimming or stationary cycling keeping intensity <70% maximum predicted heart rate No resistance training	Increase heart rate
3. Sport-specific exercise	Skating drills in ice hockey, running drills in soccer. No head impact activities	Add movement
4. Non-contact training drills	Progression to more complex training drills, eg passing drills in football and ice hockey May start progressive resistance training	Exercise, coordination, and cognitive load
5. Full contact practice	Following medical clearance participate in normal training activities	Restore confidence and assess functional skills by coaching staff
6. Return to play	Normal game play	


McCroory P, Meuwisse W, Johnston K, Dvorak J, Aubry M, Mollwag M, Carls R. Consensus statement on concussion in sport-The 3rd international conference on concussion in sport held in Zurich, November 2008. PM R. 2009; 1(5): 406-20. PMID: 19627927



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“Typical” Return to Play Procedure


1. No Activity/Complete Rest
 - Symptoms resolve usually 24-48 hours
2. Light Aerobic Exercise (no resistance)
 - Half days → Full days of School
3. Sport-Specific Exercise
 - Increasing Aerobic Capacity, low-risk play (dribbling)
4. Non-contact Training
 - Sport-specific (position drills), Run and Jump as able
5. Full-contact Practice
6. Return to Play



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What are we seeing?


- “Typical” Athlete vs Athlete with PCS
 - Typical athlete will progress through RTP stepwise progression
 - Pass all Concussion Testing
- Athlete with Post-Concussion Syndrome
 - PCS can occur in up to 14% of athletes 6-18
 - Between 20-30% at CCHMC have prolonged recovery
 - WHO = 3 or more symptoms for > 6 weeks
 - Headache, dizziness, fatigue, irritability, insomnia, concentration difficulty, memory difficulty
 - Predictors of protracted recovery (Lau, 2011)



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Rehab A → Z



1. Symptoms/Vitals
 - Beginning and periodic
2. Aerobic Exercise
 - Manual Therapy
 - Stretching
 - Strengthening/Resistance
 - Sport-specific/Interval training
 - Balance/Vestibular/Oculomotor
3. Patient Education



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Aerobic Exercise


- Mode of Exercise
 - Bike
 - Treadmill
 - Clinic Area
 - Elliptical
 - Swimming
- Intensity of Exercise
 - HR
 - Perceived Exertion
- Time

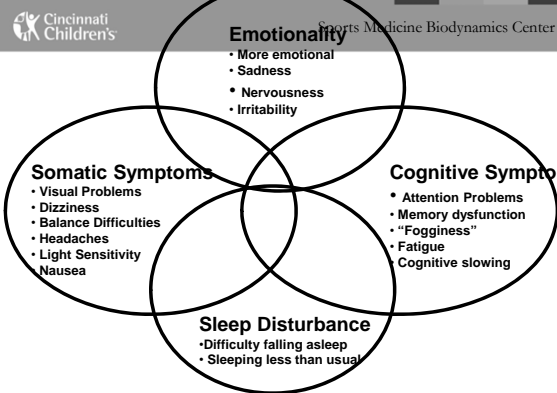
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Symptom Re-assessment within session

<p>Pay attention to:</p> <ul style="list-style-type: none"> • Headache • Nausea • Balance problems • Dizziness • Fatigue • Sensitivity to light/sound • Feeling slowed down • Visual problems 	<p>Don't pay attention to:</p> <ul style="list-style-type: none"> • Trouble falling asleep • Sleeping more/less • Irritability • Sadness • Nervousness • Feeling more emotional
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Emotionality

- More emotional
- Sadness
- Nervousness
- Irritability

Somatic Symptoms

- Visual Problems
- Dizziness
- Balance Difficulties
- Headaches
- Light Sensitivity
- Nausea

Cognitive Symptoms

- Attention Problems
- Memory dysfunction
- "Fogginess"
- Fatigue
- Cognitive slowing

Sleep Disturbance


- Difficulty falling asleep
- Sleeping less than usual

Factor Analysis, Post-Concussion Symptom Scale (Pardini, Lovell, Collins, 2004)
N=327, High School and University Athletes Within 7 Days of Concussion

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Rehab A → Z

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Manual Therapy


- Joint Mobility
 - Upper vs Lower Cervical
 - Upper Thoracic
- Soft-tissue Mobility
 - Suboccipital region
 - Scalenes
 - Upper Trapezius
 - Levator Scapulae
 - SCM
- Headaches



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Cervicogenic Headache (CEH)


- Systematic Review 2012 (Chaibi)
 - 7 RCT's
 - Physiotherapy
 - Cervical spinal manipulative therapy (SMT)
 - RCT's suggest that physiotherapy and SMT might be an effective treatment in management of CEH
- Other causes of headache
 - Tension-type
 - Migraine
 - Autonomic Dysfunction



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Stretching/Strengthening Exercise

- NO Evidence in Concussion
 - Ylinen et al. 2010 RCT – Neck Ex and CEH
 - Stretching was LESS effective alone than when combined with muscle endurance and strength training
 - Focus on DNF's and Scapula
- Mechanism of Injury:
 - Whiplash
 - Rotational
- Posture Presentation




BAD POSTURE (EXAMPLES OF)

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Strength Training

- Follow stepwise progression
 - Light resistance initially
- Set parameters
 - Sets, reps, resistance, rest times
- If asymptomatic during ex → progress
 - Need to account for cumulative effect of exercise



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Our 16 y/o football player


- Initial plan
 - Low weight, low reps, form focused → posture
- Progression
 - Low weight, higher reps → target deficits
- Progressive resistance
 - Increasing weight and reduction in reps
- Core lifts
 - Squat, Bench, Clean, Deadlift



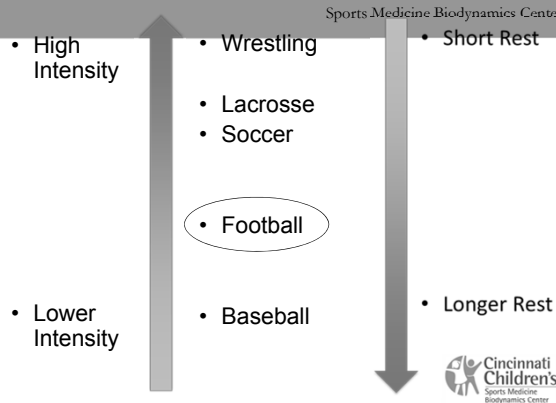
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Sport-specific/Interval Training


- Criteria
 - Steady decline in symptoms
 - Able to remain symptom free during aerobic portion of exercise
 - Increasing resistance levels with strength exercise
- Begin with appropriate work:rest ratio
 - Example: 10 seconds on: 50 seconds off



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- High Intensity
- Wrestling
- Lacrosse
- Soccer
- Football
- Baseball
- Lower Intensity
- Short Rest
- Longer Rest



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16 y/o FB – start of interval training


- Initial plan
 - Low level agility (agility ladder, line)
 - 5 seconds: 30 seconds at BORG 11
 - Remain asymptomatic → re-assess vitals/PCSS
- Progression
 - Agility ladder → complexity of patterns (dual task)
 1. Same ratio w/ higher intensity
 2. Change ratio (10:20) at same intensity
- Sport Specific
 - 5-10 second bursts (Borg 16-18) with 30 second rest



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Case Series of Active Rehabilitation

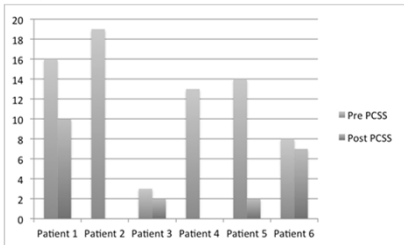
- 6 adolescents (16.5 ± 2.18 years)
- 4.6 ± 3.1 months of PCS prior to start of program
- Duration of program 6.7 ± 4.9 weeks
- Mean PCSS at start = 12.1 ± 5.8
- Mean PCSS at finish = 3.5 ± 4.1




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Case Series

- Symptoms start to “finish”




Patient	Pre PCSS	Post PCSS
Patient 1	~16	~10
Patient 2	~19	~10
Patient 3	~3	~2
Patient 4	~13	~10
Patient 5	~14	~10
Patient 6	~8	~7



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Balance/Vestibular/Oculomotor


- Incorporated throughout treatment
- Initially
 - Gaze stability
 - Eye-head coordination exercise most often prescribed initially for vestibular rehabilitation after concussion (Alsalaheen 2012)
 - Convergence – “difficulty going to/from board in class”
 - “dizzy” “eye fatigue” “difficulty reading”
- “Room is spinning” – refer on



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Treatments


- Gaze Stability
 - Seated in chair, 3 feet from wall, with objects on wall 3 feet apart
 - 140 bpm on metronome
 - Go until symptomatic, rest, repeat
 - Track number of repetitions
- Beaded String
 - Focus on going far to near/near to far with beads
 - Increase sets, reps or change distance
- Saccades



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Role of Dual Task


- Cognitive Domain Impairments Persist
 - Attention Problems
 - Memory dysfunction
- Supplement PT with Speech Therapy input/activities
 - Balance with retro counting
 - Postural re-education with counting by multiples
 - Immediate and Short-Term Recall
 - SCAT, Standardized Assessment of Concussion



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Pitfalls of Active Rehabilitation


- Improper clinic setup
 - Time of day
 - Lighting/noise
- Reliance on symptom reporting
- Disconnect between old vs new school
- Disconnect between patient and parent
- NO GREAT EVIDENCE



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Education


- Includes patients, parents, coaches, school, etc....
- Balance school, activity, sports and rehab
- Coaches and parents
 - Risks of multiple concussions
 - Second impact syndrome
 - Role of proper technique in prevention
 - AWARENESS



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Return to Play Decision Making

- Multidisciplinary Approach
 - Input from various healthcare providers
 - Progress made
 - Gradual team participation without contact
 - Eventual return if able
- Legal ramifications
 - www.knowconcussion.org
- Patient and parent EDUCATION
- Prevention and minimizing risk



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Risky Sports



• Football	• Boxing
• Rugby	• Ice Hockey
• Soccer	• Wrestling
• Horseback Riding	• Gymnastics
• Martial Arts	• Ski/snowboarding
• Cheerleading (stunt)	• Lacrosse
• Basketball	• Baseball/softball ?



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Role of PT with Concussion


- Diagnostic Tests and Measures
- Rehabilitation
 - Address Impairments
 - Aerobic Exercise
 - INDIVIDUALIZED
 - Continuously "Evolving"
- EDUCATION!!!

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Putting it all together...

- No protocol available
- Individualized and evolving treatments
- Sub-symptom aerobic exercise is beneficial and SAFE
- PT can address additional impairments
- EDUCATION



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