Your Child's Health: Concussion, Sleep, Texting, and Posture



NEUROLOGICAL INSTITUTE

Taipei American School April 2019

Overview



- Sports Concussion
 - Epidemiology
 - Mechanisms
 - Signs and Symptoms
 - Treatment
 - Return to School
- Sleep
- Posture
- Hydration



Houston Texas

Youth Concussion Rate per 1,000 AE





NCAA Concussion Rate 2009/10 – 2013/14 (Practice and Competition)



Men Women

Not Just for Men

Women:

- Have higher rate in some sports
- Have higher rate of post-concussive sxs
 - Also higher baseline rate of symptoms
- Are1.7X more likely to have cognitive problems
- Take longer to recover
- Why?
 - Neck strength/head to ball size
 - Physiology higher blood flow/Hormonal





Mechanisms of Concussion

Anatomy of a concussion

Researchers have learned a lot about the physics of sports concussions, using helmet impact sensors, game footage, lab animals, cadaver heads, crash test dummies and computer simulations. The key concussion forces are acceleration and shearing. Impacts shift momentum to the struck player's head. That momentum rapidly accelerates the brain, distorting its shape and causing damage when parts slide over and shear away from each other. Most sports concussions result from a combination of two types of acceleration.

Shear stress hot spots form

within the brain's interior.

1. Linear acceleration This is a sudden change in velocity occurring in a straight line, like a car accelerating from a stop light. Linear acceleration results from a direct hit aimed at the head's center of gravity. The focus of impact and the brain damage it causes are narrowly focused. Research shows concussion is likely when the impact is at least 21 mph. accelerating the head at 98 Gs. or 98 times the pull of Earth's gravity.

2. Angular acceleration

This change in velocity results from an off-center

blow, such as to the chin or cheek. It

rotates the head around its center of gravity like a roundhouse punch. Research suggests this may be the more damaging type of acceleration, causing shear stress throughout the brain as the head twists. If the head could spin freely like a top, a concussion-causing blow would accelerate it by 916 revolutions per second, every second.

2

G Forces

Acceleration is measured in Gs, a comparison with Earth's gravitational pull. Concussion-causing football hits produce surprisingly higher G forces than do other activities. Number of g's



SOURCES: "Concussion in Professional Football" research series, Journal of Neurosurgery; "Biomechanical Risk Estimates for Mild Traumatic Brain Injury"; "Is Head Injury Caused by Linear or Angular Acceleration?"; Popular Mechanics.

ASSOCIATED PRESS

Dazed Browns

hit by Steelers

quarterback Colt

linebacker James

Harrison in a Dec. 8

game in Pittsburgh.

McCoy after he was

- Helmet v. no helmet
 - Energy finds path of least resistance (ground/bone)



Warning Signs – Red Flags



- One pupil much larger than other
- Excessive drowsiness
- Any loss of consciousness
- Sever headache that gets worse
- Inability to move neck
- Persistent weakness or numbress in arms or legs
- Vomiting >2X
- Discoloration behind the ear

- Slurred speech
- Seizure
- Inability to recognize others or location
- Worsening confusion, agitation, or repeating self
- Any fluid discharge from ears and nose (except for common bloody nose

If any of the above consider contacting your doctor or taking your child to emergency department/urgent care

What To Do Immediately After a Concussion

- DO NOT PANIC!
- Call doctor?
- Observe child for at least 2-3 hours
 - Make sure they do not get worse or have red flags
 - May be very tired so keep up for first few hours
- Hydrate and lite meal/snack
- Do not give any medication for first few hours
- Can go to sleep after being observed
- Ice neck if sore
- Use Acetaminophen (Tylenol) only for first 48 hrs.
- CT scan <u>rarely</u> ever needed

Texas is a large!





Do not have to wake them up in middle of night

What to Expect Immediately After a Concussion

Signs You Will See

- Looks very fatigued
- Yawning a lot
- Stiff Neck
- Eyes Squinting
- Slow to respond
- More Irritable
- Moves slower/seems offbalance
- Poor memory
- Things seem too loud for child
- Sleeps a lot more/less

Symptoms Reported

- Headache
- Not feeling right
- Sore Neck
- Feeling irritable
- Double/blurry vision
- Lights too bright
- Dizzy or off-balance
- Nausea
- Change in sleep pattern
 More/less/falling asleep

What To Do

- Maybe miss school 1-3 days
 - No school work
 - Contact school?
- Reduce "screen time"
- Increase rest/sleep
- Use Tylenol first 48 hrs
 - Switch to
 - ibuprofen/naproxen
- Ice/heat neck
- Keep hydrated/lite meals
- Be evaluated
- <u>Gradually</u> increase physical and cognitive activity as symptoms improve

A Concussion Is More Than a Brain Injury



Signs, Symptoms & Deficits Following A Sports Concussion

Somatic

H/A Nausea Vomiting Balance Dizziness Lightheaded Drowsiness Photophobia Phonophobia Irrit Visual changes De

 Sleep Disturbance

 Too Much

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 Too Little

 ess
 Multiple Awakening

 Falling Asleep
 Ment

 Emotional
 Ment

 Irritability
 Conc

 Depression
 Mem

 Anxiety
 Kent

Feeling more emotional

Cognitive Mental fogginess Mental slowness Concentration Memory

Concussions Are Treatable



- Proper Assessment to determine multi-system injury
- Often rest and gradual activity is enough

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- Sometimes need to treat:
 - <u>Headaches</u>

• Eye movements

- **Balance**
- Dizziness

- Neck Sleep
- Mood
- Can take 3-4 weeks to fully recover



Concussions and Schools



What A Student Sees





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What Teachers Might See



- Squinting, yawning, distracted, head on desk, irritability
- Poor attention or concentrating
- Problems learning/remembering
- Longer to complete tasks/assignments
- Slow thinking & reading
- Difficulty mentally organizing or shifting between tasks
- Poor stress management
- More emotional
- Physical and Mental Fatigue

- Difficulties handling a stimulating school environment (lights/noise, etc.)
- Physical symptoms (headache, nausea, dizziness)



Ways To Help Return to School

- No School/Keep home
- Modified/Half days
- Trips to Nurse's office
- Restrict homework and tests/quizzes
- Remove from extra-curricular activity
- Often through a note to school ATC or nurse





Screen Time and Concussion

- Electronics emit blue light can be harsh on the eyes and some studies suggest disrupt sleep.
- TAS students have constant exposure to screens.
 - Irritating
 - Sleep
- Blue light-blocking and R-41 lenses
- F.lux app







Red Flags



- History of ADHD, psychiatric illness, or LD associated with prolonged recovery.
- High-achieving, high stress students
 - Issues of control/perfectionism
 - Pre-concussion somatization is a large predictor of recovery
- School calendar
 - Close to finals/exams



Subacute Exercising



- Notion of complete rest until asymptomatic is not true
- lite subacute exercising physical and cognitive
 - Goldilocks approach
- After 72 hrs depending upon symptom severity and type



Back to The Classroom

A Student's Return to School After A Concussion



- Returning to school is stressful and even scary
- The student may require specific accommodations
- Be supportive and innovative
 - Video-recorded classes, audio or paper notes, 1 on 1
- Observe any changes in the student's symptoms
- Use your best judgment and keep the student's interest in mind when assigning work and making accommodations
- Not too little, not too much

5 Steps – Return to Learn



- Helps student transition back to academics
- A graduated approach maximizes student's abilities & minimizes the effects of concussion.
 - Student progresses as symptoms decrease and functioning improves.
- Modify and revise based upon:
 - medical advice
 - school policy
 - student's personality and pre-existing abilities



Texas Medical Center

5 Steps Returning to School



Rehabilitation Stage	Functional Exercise at Each Stage of Rehabilitation	Stage Objective
Pre-stage. No activity	Physical and cognitive rest – usually lasting 24-48 hours	Rest allowing metabolic recovery
Stage 1. Symptom- limited activity	Daily activities that do not provoke symptoms.	Gradual reintroduction of work/school activities
Stage 2. Light aerobic exercise (15-20 mins)	Walking, swimming or stationary cycling keeping intensity, 50-70% MPHR; no resistance training	Increase HR
Stage 3. Sport-specific exercise	Sport-specific aerobic activity 60-75% MPHR using various techniques – (no contact work)	Add movement
Stage 4. Non-contact training drills	Progression to more complex training drills, eg, passing drills in football and ice hockey; may start progressive resistance training 80+% MPHR (add lite contact at the end – 15-20 <i>controlled</i> reps on sled or 15-20 headers 8 feet away tossed 10 feet high)	Exercise, coordination, conditioning & cognitive load
Stage 5. Full contact practice	Following medical clearance, participate in normal training activities	Restore confidence. Assess functional skills
Return to play	Normal game play	

Sleep and School



- The National Sleep Foundation recommends adolescents aged 14–19 years sleep 8–10 hours per night
 - elementary & middle school-aged children between 9 and 11 hrs.
- Sleeping \leq 7 hours is associated with:
 - Increased risk of car accident
 - 3-6 pm highest rate of accidents in teen drivers
 - Sports injury
- Poorer grades

• Depression,

- Occupational injury
 - anxiety poor





Sleep in Taiwanese Teenagers

- Ages 12 18
 - 24% have insomnia
 - 15% say it interferes with daily fct
- Avg weeknight sleep is 7.12 hrs
- Avg weekend sleep is 9.26
- Taipei 30% teenagers have insomnia
 - Spend more time in extracurricular and after school programs
- 30% teenagers who spend > 2 hrs/day playing video games/surfing report insomnia and "unsatisfactory academic performance.



- Taiwan society of sleep medicine, 2016 study
- Huang, YS et al. Sleep Med;11(10): 1035-42

Sleep, Fatigue and Depressive Symptoms in Taiwan HS



Chen, T-Y, et al. Neuropsychiatr Dis Treat. 2015; 11: 741–750.

Total Time in Bed During the Weekday by Gender

Total Time in Bed During the Weekend by Gender



Lin, LN et al 2018, Sleep J, 1-10 – performed in Taipei area

Start Young



- Predictors of poor sleep quality in 3-6 y.o.
 - Over 50% of 3-6 y.o. watch TV in bed before going to sleep.
 - 67% did not have a well darkened room when going to sleep.

Lo, MJ Ann Acad Med Singapore. 2016 Dec;45(12):549-556.

Taiwan Youth Study

- Short sleep (e.g., less than 6 h a day), inconsistent sleep schedule (e.g., social jetlag), and sleep problems increase the risk of:
 - Conduct problems
 - Poor academics
 - Poor self-esteem

Health Effects of Chronic Sleep Deprivation in Teenagers

- Metholist NEUROLOGICAL INSTITUTE
- Sleep deprivation and mood disorders go hand-in-hand.
 - Each hour of lost sleep increases risk of depressive symptoms and anxiety
 - Rate of suicide and suicidal thoughts higher too
- Sleep deprivation associated with increased:
- inattentiveness, hyperactivity, impulsivity/ disinhik and oppositional behavior.
- Increased obesity
- Growth hormone secreted during sleep.



Sleep Hygiene

- Set time to go to sleep
 - Weekends too!
- No electronics <u>minimum</u> of 30 minutes before bed (all electronics – phone too!!)
- Do not over schedule/committee during the week
- Caffeine limit
- Educate in school





Actually, my species is not nocturnal: I'm just a teenager...

Backpacks and Posture



Backpacks and Posture













Backpack should be $\leq 10\%$ of student's body weight





of students 12-17 carry bags that weigh 15% or more of their body weight





HOW TO CHOOSE AND WEAR YOUR BACKPACK:



Never carry more than **10%** of your body weight.



Do not let the backpack sit any lower than the **hollow** of your lower back.



To reduce the strain of the backpack, place the heaviest items **closest to your back**.



When selecting a backpack, pick the **smallest** one you can manage, while still being able to fit all your things into it. The smaller the backpack, the less likely you are to add more weight to it.



Always use **both** straps.



The **wider and more padded** the straps are the better. Thin straps can cut into the nerves and circulation in your shoulders.



Try using digital textbooks on either an **iPad or Kindle** to reduce the weight of the backpack.

Cell Phone Posture aka Text Neck Syndrome













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Poor Posture at a Laptop

Proper Posture at a Laptop

Photo Jamery Lips/Lipton

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Depression in Teenagers



- About 12% have depressive symptoms
 - Increases throughout teenage years
 - Females more than males
- After-school homework, academic enrichment schools/programs, and cram schools significantly:
 - Increase academic performance
 - Increase depressive symptoms

Studies done in Taiwan

Lin, HC et al. Psych. and Clin. Neurosci, 2008; 62: 412–20. Strong, C et al. Child Psychiatry Hum Dev, 2016; 47:347–357 Chen, S-Y et al. Adolescence, 2009(Dec).

Summary



- Concussions will take time to recover
- Can impact school for a few weeks
- Slowly return to school
- Concussions effect different parts of the body and may need special treatment
- Sleep is critical to better school
 - Target is 8 hrs/night

- Backpack weight <=10% body weight
 - Proper alignment and posture
- Posture with cell phones and laptops





Hydration & Nutrition: Tips for the Everyday Athlete



General Information



- Youth athletes have higher water requirements than adults
- The amount of fluid intake differs based on the size and activity level of the child
- On average 6-8 cups = 48-64oz = About ½ gallon of fluid should be ingested during the course of the day without exercise
- Do not rely upon thirst to determine need for fluids

Dehydration



Most Common Signs and Symptoms:

- Thirst
- Dry Mouth
- Headache
- Disorientation
- Dizziness
- Nausea
- Heat Cramps (calves or abdomen)



Heat Illness



Severe signs and symptoms of dehydration:

- Cool, moist skin (goose bumps)
- Heavy sweating
- Fainting
- Severe muscle cramps
- Vomiting
- Pale skin
- Dark colored urine

Steps to Treat Heat Illness:

- Remove from heated environment to a cool place
- Drink fluids
- Cool body
 - Cool towels/sponges; ice bags
- If signs or symptoms continue call 911

Prevention of Dehydration



- 2 hours prior to exercise drink 16oz of fluid
- During exercise drink 8oz every 20-30 minutes or as often as possible
- Post workout: make sure to replace fluids lost during exercise = 24 oz. per lb. of weight lost
- Fluid choices to AVOID
 - Carbonated drinks
 - Energy drinks
 - Caffeine
 - Drink/Juices high in sugar (>10g) & sodium (>300mg)

Nutrition



- Water Rich Foods
 - Fruits
 - Watermelon, strawberries, cantaloupe, oranges, pineapple, grapes, apple slices
 - Vegetables
 - Cucumbers, celery, tomatoes, broccoli, spinach, carrots,
 - Contains 80-98% water



Sleep Amount

Sleep in Taiwanese Teenagers



- Females spent less time in bed (TIB) during the week and more TIB during the weekend with larger discrepancy between the two than males
- Average weekday TIBs in adolescents from grade 7 to 12 ranged from 391.8 to 464.5 min (6.5 – 7.7 hrs)
 - fail to meet recommendations.
 - Asian adolescents have a shorter TIB on weekdays compared with their counterparts in the United States, Europe, and Australia [58].

50% of subjects went to school in Taipei

Lin, LN et al 2018, Sleep J, 1-10

Taiwanese Teenagers Self-report from Annual Survey



Males Females

Lin, LN et al 2018, Sleep J, 1-10 – performed in Taipei area

Factors Impacting Sleep and Stress



- "Comprehensive Assessment Program for Junior High School Students."
- 9th grade cram classes

Risk Factors for Concussion



Taiwan National Health Insurance Research Database

- 72,181 children (aged 3-11 years), adolescents (12-17 years), and young adults (18-29 years) with ADHD compared to match controls
- ADHD associated with 4.6X increase risk of concussion (4% vs 1%)
- ADHD medication reduces the risk slightly
 - Weakness of study based upon reported injuries may have missed many concussions that went unreported

Nutrition



Pre-exercise Snacks

- PB & Jelly sandwiches
- String cheese
- Pretzels
- Sandwich meat
- Granola bars
- Crackers
- Nuts (almonds, pistachios, peanuts, etc.)

Nutrition



Post Exercise Snacks

- Low- fat chocolate milk
- Hearty, healthy meal
- Greek yogurt
- Popsicles













Vestibulo-Ocular Reflex

- Coordinates the eyes and head movement
 - Allows eyes to stay focused on object when head moves
- Major cause of dizziness or imbalance
- 55% will have disruption after concussion
- Problems reading with increased headache
- Impacts ability to look from computer to front of class or move head Source of physical and cognitive fatigue, fogginess, headache, and dizziness







Ocular-Motor



- Ability to control movement of the eyes independent of head movement
 - Tracking object, moving eye
- Vergence Insufficiency
- Impaired pursuit
- Problems reading with increased headache
- Eye Strain/pain, headache, fatigue, mental fogginess





Cervical/Neck

- Often significant flexion and extension of neck
- Nerve complex runs through top of neck
 - Easily irritated
 - Pain is often referential
- Alignment can be affected
- Headache, fatigue
- Hunched over laptop and backpack contribute to problem.









Cognitive/Fatigue



- Prevalent as brain metabolism normalizes
- Slower thinking, poor memory and difficulty sustaining attention
- Running out of energy quicker





Psychological/Emotional

- Has strong role in recovery rate
 - Preinjury somatization score best preinjury predictor of recovery

(Nelson et al 2016, Neurology <u>86</u> - May)

- Expectation as etiology
 - Prolonged recovery because of "concussion crisis"
- High Expectation of Student/Family
- Anxiety/Depressive Sx
 - Exercise withdrawal
 - Poor sleep increases sx
 - High achieving students
 - Stress about missed and piling up work







Migraine/Headache





- Most common post-concussion symptom
- Multiple causes
 - Concussion, neck, eyes, stress, poor sleep
- Increases with activity



Soccer Concussions

- Typical Header
 - Linear force is about 50% below threshold for concussion
 - Torque is about one-quarter below threshold for concussion



Location	Percentage*	
Head/Head	30	
Head/Elbow	15 - 35	
Head/Ground	10 - 15	
Head/Knee	3 - 15	
Head/Ball	6 - 10	
Head/Apparatus	15	

*commonly accepted level in literature

- In HS 80% of the time the player was trying to head the ball when the concussion occurred in HS
- In Middle School 30% of concussion were with ball contact and 86% of concussions occurred during the game

