

***Traumatic Brain Injury in Adolescence:  
Treatment approaches and outcomes***

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# Introduction

- Background
- Training
  - Doctorate of Psychology: Counseling
    - Colorado State University:
  - Pre-Doctoral Internship: Pediatrics
    - CHOC Children's Hospital
  - Post-Doctoral Fellowship: Pediatric Neuropsychology
    - Advanced Neurobehavioral Health of Southern California
  - Children's Hospital Colorado: Department of

# Objectives

1. Identify outcomes for mild, moderate, and severe injuries sustained in adolescence.
2. Describe how moderate/severe TBI can impact typical development in adolescence.
3. Describe the impact of brain injury on emotional regulation and executive functioning adolescence.
4. Outline treatment approaches in moderate/severe TBI for teens, parents, providers.

# Acknowledgements

- Jeanne Dise-Lewis: BrainSTARS
  - Children's Hospital Colorado
  - Developmental Model
  - Multidisciplinary approach
- Shari Wade: Coping with Head Injury
  - Cincinnati Children's Hospital Medical Center
  - Family problem solving

**RECOVERY COURSE:  
MILD, MODERATE, SEVERE**

# Historical Context

- TBI one of the most common causes of acquired disability in childhood
- Range from mild to severe
- Primary vs. Secondary deficits
- Role of Neuropsychologist
  - Understand difficulties
  - Inform/educate parents and educators
  - Liaison with school and rehab providers
  - Design academic/behavior interventions

# Epidemiology

- 250: 100,000 experience TBI
- Half will not seek medical care
- 5-10% experience neuropsychological changes
- 5-10% fatal injuries
- 85% classified as mild, 44% no LOC

# Epidemiology

- Age
  - Younger than three have highest rate of TBI
  - Infants = trauma associated with falls or child abuse
    - Severe, high mortality
  - Preschool age = due to falls, pedestrian accidents
  - School age and adolescents = sporting, cycling, pedestrian accidents
- Fatality rate decreases with age

# Epidemiology

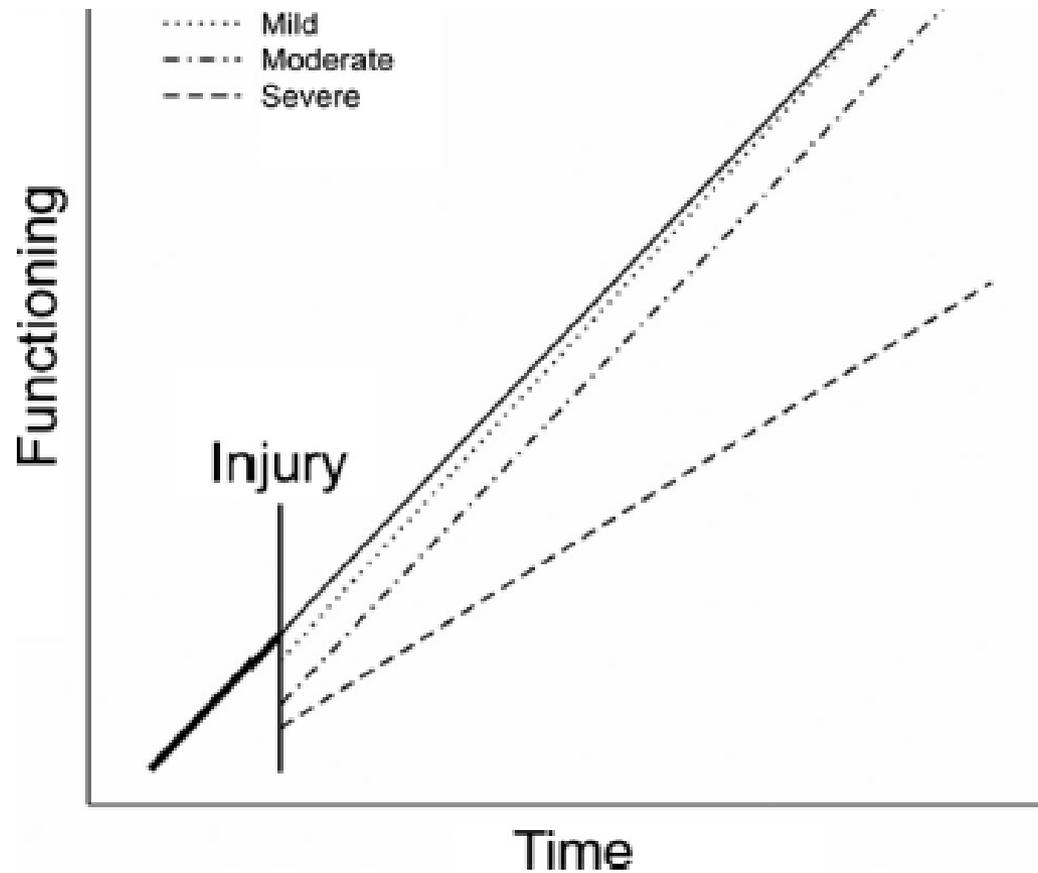
- Gender
  - Preschool: male: female 1.5:1
  - School age: boys 2 X as likely
  - Males sustain more severe trauma
  - Increase risk with age for boys, decreased for girls
- Psychosocial factors
  - Occur on weekends, holidays, and afternoons
  - More common in socially disadvantages, unemployed, or emotional disturbed
  - Premorbid learning, social, cognitive, and/or behavior problems

# Outcomes

- Outcomes of injury depend on
  - Severity of injury
  - Child's age
    - Younger the child, more generalized decrease in capacities (IQ, behavioral control, and social development)
    - Older child more likely to have problems in limited areas of neurocognitive function

## Neurocognitive Outcomes and Recovery After Pediatric TBI: Meta-Analytic Review of the Literature

Talin Babikian and Robert Asarnow  
David Geffen School of Medicine at UCLA



*Figure 2.* Summary diagram of trends in neurocognitive outcomes and recovery over time.

# Mild TBI

- Most commonly cited stats from CDC (hospital-based)
  - Estimated 1.7 million people sustain TBI each year with majority of these being mild TBI
    - Do not include urgent cares, PCP, etc.
    - Many do not even seek medical care
    - Poor diagnostic consistency
  - Broad estimations -sports and recreation account for ~ **3.8 million** concussions each year (includes non-hospital)
  - Mild TBI is more prevalent in these groups:
    - Athletes
    - Children 4 and younger
    - Teens 15-19
    - Males

# Post-Concussive Signs (i.e., observable)

Physical/Sleep	Cognitive (Mental Status)	Emotional
Balance problems/clumsy	Confusion	More emotional or moody
Vomiting	Disorientation	Irritable
Loses consciousness	Slurred speech	Sad or anxious
Sleepiness/lethargy	Poor focus	
Pronounced sleep changes	Immediate forgetting	
	Repeating self	
	Slowed response	

# Moderate/Severe TBI

- Symptom Clusters
  - Physical Consequences
    - Fatigue, Sleep difficulties, Changes in appetite and weight, Motor impairments
  - Cognitive Consequences
    - Problems with attention, working memory and executive function skills, Speech and communication difficulties, Specific learning disabilities (reading, math)
  - Behavioral Consequences
    - Impulsivity, poor self-regulation, Secondary attention deficit hyperactivity disorder is common, Can range from apathy and withdrawal to emotional volatility and explosive anger, Depression, anxiety, internalizing symptoms, Post traumatic stress disorder

# **ADOLESCENT DEVELOPMENTAL MODELS**

# Models of Development

- Cognitive development:
  - Jean Piaget
- Emotional Development:
  - Erik Erikson
- Moral Development:
  - Lawrence Kohlberg
- Sexual Development:
  - Sigmund Freud

# Developmental Achievements (12-16)

- ability to consider many aspects of a problem simultaneously
- development of abstract reasoning
- ability to plan, organize, and carry out complex projects
- ability to learn new information independently
- increasing autonomy
- identity development
- ability to assume limited responsibility for self and others
- maturing social skills, including friendships based on shared interests

# Brain Injury at this stage usually causes:

- uneven cognitive skills and learning deficits
- difficulty learning new information, especially abstract information
- difficulty with inference, summarizing, planning, and organizing
- rigid, inflexible thinking
- reduced spontaneity
- judgment and reasoning difficulties
- dependence on others
- uncertainty about self and abilities
- difficulty managing frustrations
- reduced ability to assume responsibilities
- withdrawal from peers and limited social involvements

# Interventions

- conduct a comprehensive evaluation of cognitive strengths and weaknesses to adequately understand the sources of learning difficulties; educate the student about his/her own profile
- create accommodations addressing both school and social success
- increase structure in the environment
- limit homework assignments
- reduce amount of content to be covered in coursework to support depth of understanding/ mastery
- increase communication between home and school regarding assignments, tests, and upcoming curriculum
- provide opportunities to talk with nonfamily members about the emotional impact of the injury
- be alert for signs of depression and proactively intervene to address these
- use videos, movies, field trips to create context and familiarity with new school topics
- identify clear roles and responsibilities in classroom and in group assignments

# Developmental Achievements (16-19)

- complex reasoning and judgment
- capacity for spontaneous appropriate behavior in situations requiring judgment, weighing of consequences, and decision-making
- consolidation of academic accomplishments
- development of vocational plans and goals in line with personal interests and strengths
- ability to develop and accomplish goals independently
- solid sense of personal identity and relatively stable personality
- sophisticated social skills
- emancipation from home

# Brain Injury at this stage usually causes:

- rigid thinking
- slow mental processing
- difficulty understanding and responding to complex situations
- difficulty identifying the most important parts of problems
- poor decision-making and judgment
- poor organizational skills
- difficulty with appropriate, spontaneous behavior
- interference in developmental drive toward independence/separation
- insecure body image, self-image, and/or social image
- social awkwardness
- defensiveness regarding emotional/cognitive problems
- depression

# Interventions

- recognize the rippling effects of the injury on personal, emotional, and social life
- identify roles and responsibilities within the competence of your student
- provide a forum for expression of feelings and exploration of coping skills
- clarify the nature of learning difficulties and develop appropriate accommodations
- reduce course load, tailoring coursework to student's strengths
- waive grade point average requirements for participation in school sports
- provide a counselor or other professional at school for your student to check in with on a daily basis
- involve student in problem-solving group
- be alert for difficulties reconciling new profile of strengths/weaknesses with previous self-identity

# **TREATMENT APPROACHES**

# Family Problem Solving

- Braga et al. (2005)
  - Seminal study
  - Family-delivered cognitive and physical rehabilitation more effective than standard clinician-delivered rehabilitation
- Shari Wade and colleagues have done an impressive amount of family-based intervention work
  - Wade and Ohio colleagues - Taylor, Yeates, Stancin
    - Dozens and dozens of peer reviewed publications since the 1990s
  - Since 2008, Mayo Clinic and Children's Hospital Colorado

# Why is the family important?

- There is a reciprocal relationship between the family's and the injured individual's functioning.
- Individuals from well functioning families show greater recovery.
- Individuals with more severe injuries and greater changes in behavior have more stressed families and caregivers.
- Families can make a big difference in terms of the success or failure of behavioral treatments and school-based accommodations

## Involving Parents and Families in the Child's Behavioral Treatment: Does it make a difference?

- Braga, DaPaz, & Ylvisaker (2005) demonstrated that rehabilitation intervention delivered by the family was more effective in improving outcomes long-term than rehabilitation intervention delivered by hospital-based clinicians.
- Parents can be particularly effective interventionists because they are with the child on a daily basis.

## Underlying Tenets of Family Problem Solving Intervention

- Problem solving, self-regulation and communication skills are helpful for youth with TBI as well as their family members (parents and siblings).
- Sometimes, problems with other family members contribute to family burden and can be addressed through family problem solving.
- Better caregiver coping/problem solving will support the child's recovery.

## Models of Family Involvement in Outpatient Rehabilitation following ABI

- Treatments targeting the family (example-family problem solving)
- Treatments in which the parent/family serves as therapist (i.e., Braga et al., 2005; parent-skills training)
- Treatments in which parents scaffold or support treatment (e.g., attention training)
- Families must be involved at some level because they need to consent, bring the child to treatment etc.

# Problem Solving Therapy as An Intervention for ABI

- Facilitates parent/family coping in response to injury and other stresses in their lives.
- Provides the injured individual with an executive function heuristic for addressing post-injury challenges.
- Flexible to accommodate the different kinds of issues facing survivors and their families.



# Summary of Child Outcomes: Older Teens in CAPS Report Greater Improvements

- High school-age children in CAPS were rated as having lower levels of:
  - Executive function behaviors
  - Externalizing problems
  - Aggressive behaviors
  - Attention problems
  - ADHD
  - Conduct Disorder
- Long term outcomes
  - Group differences in externalizing symptoms were not maintained over time.
  - Treatment group differences in overall functioning did not emerge until 12 months following treatment.
  - For older adolescents, CAPS participants had significantly lower internalizing symptoms, anxiety/depression, and executive dysfunction than IRC participants at the 12-month follow-up.

# Health and Behavior Intervention

- **Interventions require consideration of a variety of theoretical approaches:**
  - **Developmental Psychology**
  - **Trauma**
  - **Grief**
  - **Pain**
  - **Cognitive-Behavioral Therapy**
  - **Interpersonal process therapy**
- **ABC's of Behavior Regulation**
  - **Antecedent**
  - **Behavior**
  - **Consequent**

# Goals of Intervention

- Environmental interventions reinforcing targeted behaviors
- Antecedent behavior management (shaping the environment to avoid behavior problems)
- Anger management training
- Cognitive behavioral therapy for depression and anxiety
- Social skills training
- Peer mentors
- Training in emotion recognition
- Training in communication skills
- Intervention to address sleep hygiene, medications
- Aerobic exercise interventions to address weight issues and fatigue
- Direct attention training
- Training in problem-solving, planning, and organization (executive function skills)
- Metacognitive strategy training
- Remediation of specific skills/errorless learning

# ABC Model of Behavior

- **A (Antecedents):** The events, actions, conditions, and/or environments that come before behavior.
- **B (Behavior):** Can be desirable and appropriate, or problematic.
- **C (Consequences):** Can also be positive or negative.
- Remember: **A**  **B**  **C**

# Antecedents Set The Stage

- Physical environment
  - emphasize clear structure, support the activities and behaviors desired, and limit overly complex or distracting stimulation.
  - Multidisciplinary Approach:
    - What worked well?
    - What are some of the challenges you have faced?
- Visual cues
  - photographs, written words, printed or drawn symbols, gestures and signals, signs, schedules, routine flowcharts, and color coding.
  - Verbal directions and cues are fleeting and demand good attention, memory, and processing speed.
  - Multidisciplinary Approach (Speech):
    - What worked well?
    - What are some of the challenges you have faced?

# Antecedents Set The Stage

- Schedules, mini-schedules, and routines
  - A **routine** is doing things the same way every day.
    - Routines conserve energy and reduce fatigue, because they allow a person to go on automatic pilot for some activities.
  - **Schedules** are visual representations of routines.
    - Post the schedule in a place where your child can see it easily and refer to it often.
    - At first, your child will need to practice using the schedule: she will benefit from looking at it with you and checking off listed events and activities as she goes through them.
    - You can create mini-schedules to help your child prepare for and conduct a series of substeps in a more complicated routine or activity.
- Multidisciplinary Approach (Nursing):
  - What worked well?
  - What are some of the challenges you have faced?

# Antecedents Set The Stage

- Physical prompts
  - Range from lightly touching your student's shoulder to placing your hand over hers as she performs an action.
  - Provide in a **gentle and matter-of-fact manner**
  - Once the physical prompts have helped steer your child toward successful performance, **give him recognition** for the accomplishment.
  - When your child is working on learning a new skill, it is important that you determine and use **the least but still sufficient** physical prompts necessary to bring about the desired behaviors.
  - Multidisciplinary Approach (OT/PT):
    - What worked well?
    - What are some of the challenges you have faced?

# Antecedents Set The Stage

- Modeling of skills and positive behavior
  - Your child will learn best from structured observation of others' behaviors, including:
    - Watching the behavior
    - Imitating and practicing the behavior
    - Receiving recognition
    - Repeating the sequence
- Provide more support, structure, and guidance at these junctures by giving **short and to-the-point verbal descriptions, visual cues, physical guidance, and reassurance.**

# Antecedents Set The Stage

- Language Development
  - What you say to your child should be **simple, relevant to the activity at hand, and positive.**
  - Choose words that guide your child toward using a skill or complying with a direction.
- Instructions and directions
  - When you give a child an instruction or direction, be **clear, concise, simple, and specific.**
- How do we all work together to build language skills?

# Antecedents Set The Stage

- Child's physical and emotional state
  - Physical: Fatigue, pain, hungry/thirsty, not feeling well
  - External: Stress, significant life transitions
  - Internal: Anxiety, frustration, anger, sadness
- How do we all work together to support emotional coping and behavior?

# Consequences

- Potential pitfalls
  - The positive or negative nature of a consequence depends on whether the person who experiences the consequence considers it positive or negative.
    - Negative attention
    - Unintended outcomes

# Consequences

- Getting the most out of positive consequences
  - The power of rewards
  - Link the consequence with the behavior
  - Vary the consequences
  - Rewards...mix and match!

# Executive Functioning

- **Metacognitive strategies**
  - “Ready, Do, Done”
  - **Systemic thinking**
  - **Goal Management Training**
  - **Self-monitoring/Self-regulation**
- **Group based Intervention in working memory, self-monitoring, self-regulation**
  - **Life skills, social communication**
- **Practice in *everyday functional activities***

# Memory

- Memory
  - Remediation vs. compensation
  - Severe Impairment
    - External aides (notebook, schedule, memory log)
    - Errorless learning
    - External compensation with application to functional activities
  - Mild-Moderate Impairment
    - Organizational technique (semantic clustering, story telling)
    - Associations (first, letter, visual imagery)

# Emotion Regulation

- Why difficulty staying in control?
  - Part of brain that controls emotions may have been injured
  - Things may be harder now than they used to be
  - May feel less connected to friends and have a harder time shaking things off
- Anger: STARRS
  - STop
  - Accept
  - Relax
  - Reframe
  - Solve

Brain

Injury

Group



# Purpose

- Connect with other families with similar shared experiences
- Discover resources available for brain injury recovery



# Hope

- Meet someone new
- Hear an inspirational story
- Share your experience to help another
- Connect with a new resource
- Find answers to questions about follow up

# Conclusion

- Brain Injury in adolescences can result in a number of cognitive, behavioral, and emotional challenges specific to the adolescent developing brain
- Involving family in intervention is known to improve outcomes
- Interventions should include medical team, school, therapists, family, and child for best outcomes