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UNC SCHOOL OF MEDICINE

School-based Interventions for Executive Function Following Childhood Traumatic Brain Injury

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Abstract

The goal of this paper is to systematically review the empirical evidence on childhood traumatic brain injury (TBI) and its effect on executive functioning, with a focus on research-based interventions for use in schools. A literature search of scholarly article databases was conducted using keywords like "traumatic brain injury", "child" and "executive function". Forty-one studies, varying in methodology and published between 1996 and 2016, were ultimately used in the review. Findings showed that executive function deficits, which affect the brain's ability to engage in problem-solving and goal-directed behavior, are common following a TBI. Children with TBI frequently demonstrate deficits in planning, cognitive flexibility, behavioral inhibition, organization, self-monitoring and memory. These difficulties impact many spheres of the educational experience: academic, social, emotional, and behavioral. To address these needs, a variety of TBI-specific interventions have been developed, ranging from explicit skill instruction to environmental modifications. Research supports the use of interventions related to (a) strategies for organization and planning (b) methods of improving attention and working memory (c) antecedent-based strategies for circumventing inhibition difficulties and (d) a cognitive-behavioral rehabilitation approach. The literature emphasizes the need for these interventions to be delivered in the child's natural setting for maximum generalizability of skills. Thus, school psychologists, teachers, and other school personnel are well poised to implement these strategies to support youth who are recovering from a TBI.

Contact

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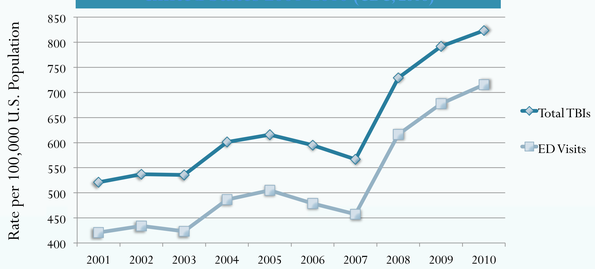
Childhood TBI

National Brain Injury Association definition: an insult to the brain, not of a degenerative or congenital nature but caused by an external physical force, that may produce a diminished or altered state of consciousness, which results in impairment of cognition or physical functioning.

- Ages 0 -14: 3000 deaths, 29,000 hospitalizations, 400,000 ER visits yearly (CDC, 2000)
- Cognitive, adaptive, academic, behavioral, social deficits, as well as psychopathology and familial stress
- Factors affecting outcomes:
  - Severity of injury
  - Age at injury

(Crowe et al., 2012; Ewing-Cobbs et al., 2004; Gioia et al., 2004; Nadebaum et al., 2007)

Rates of TBI-Related Emergency Visits, Hospitalizations, and Deaths, United States 2001-2010 (CDC, 2016)



Executive Functions

"Control, supervisory, or self-regulatory functions that organize and direct all cognitive activity, emotional response, and overt behavior" (Gioia et al., 2004)

- Planning, organization, inhibition, cognitive flexibility, self-monitoring, working memory
- Impacts task initiation, goal setting, anticipation, following directions, strategy flexibility
- Academic difficulties
- Behavioral and social problems
  - Self-awareness
  - Adaptability
  - Social problem-solving
  - Impulse control & emotional regulation

(Hanten et. al., 2000; Krause et al., 2015; Nadebaum et al., 2007; Yeates & Taylor, 2006)

EF Interventions

- Contextualized intervention
- Explicit, direct, modeled, repeated
- Behavioral interventions
- Compensatory strategies
- Environmental modifications
- Cognitive coaching
- Support family & positive relationships
- Consider influence of sleep

(Feeney, 2010; Feeney & Ylvisaker, 2008; Krasny-Pacini et al., 2014; Shay et al., 2014)

Accommodations

Minimize auditory & visual distractions

Structured assignments & directions
- 3-5 second "wait time"
- Repeat back directions

Link instruction to experiences & interests

Alternate non-preferred/preferred tasks

"Chunking"

Memory & organization aids
- Post expectations
- Planners, checklists, graphic organizers, outlines

(Childers & Hux, 2013; Feeney & Ylvisaker, 2008; Krause et al., 2015)

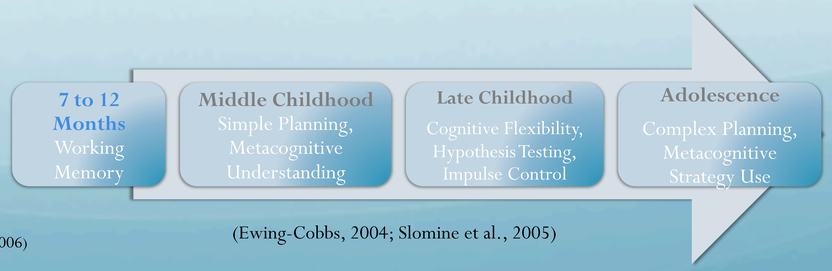
Organization & Planning

Self-monitor strategy use

Task analysis
- What do I have to do? How much? When am I done? What next?

Goal-Plan-Do-Review
- What am I trying to accomplish? What steps are needed? What was I trying to accomplish? What worked? What didn't? What would I change next time?

(Feeney & Ylvisaker, 2008; Krasny-Pacini et al., 2014; Savage et al., 2005)



(Ewing-Cobbs, 2004; Slomine et al., 2005)

Positive Behavior

Make demands manageable

Prepare in advance for transitions

Positive reinforcement

Pre-planned consequences

Augmented self-modeling

(Hooper & Baglio, 2001; Kehle et al., 1996; Savage et al., 2005)

Cognitive Behavior Rehabilitation (Feeney, 2010; Feeney & Ylvisaker, 2008)

Collaboratively Structure Daily Routine	Student input Specific steps toward goals Sequenced routine
Visual Supports	Photo cues and sequences Involve student
Self-Monitor Performance	Goal-Plan-Do-Review script
Communication Strategies	Self-regulation and escape scripts Scaffold assistance Reward positive communication

The School Psychologist

Standardized & informal assessment
- Performance vs. skill
- Frequent IEP updates

Consultation with teachers
- Psycho-education
- Behavior tracking, FBA & BIP

Consultation with outside providers

District-wide TBI & school transition teams

(Hooper & Baglio, 2001; Savage et al., 2005; Yeates & Taylor, 2006)

Future Directions

- Clarify EF domain trajectory
- Metacognition research
- EF interventions & social difficulties
- Web-based interventions at school

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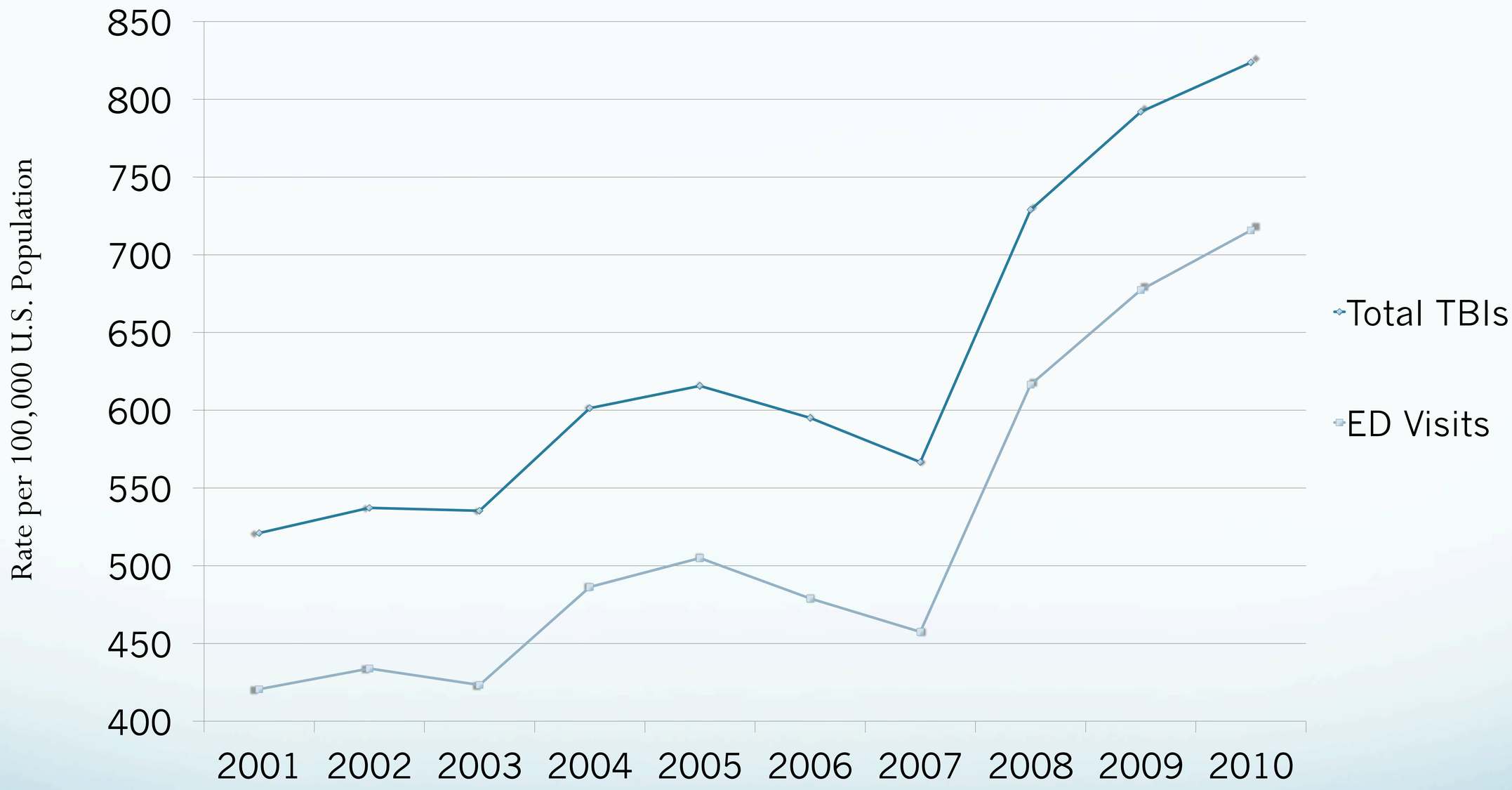

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