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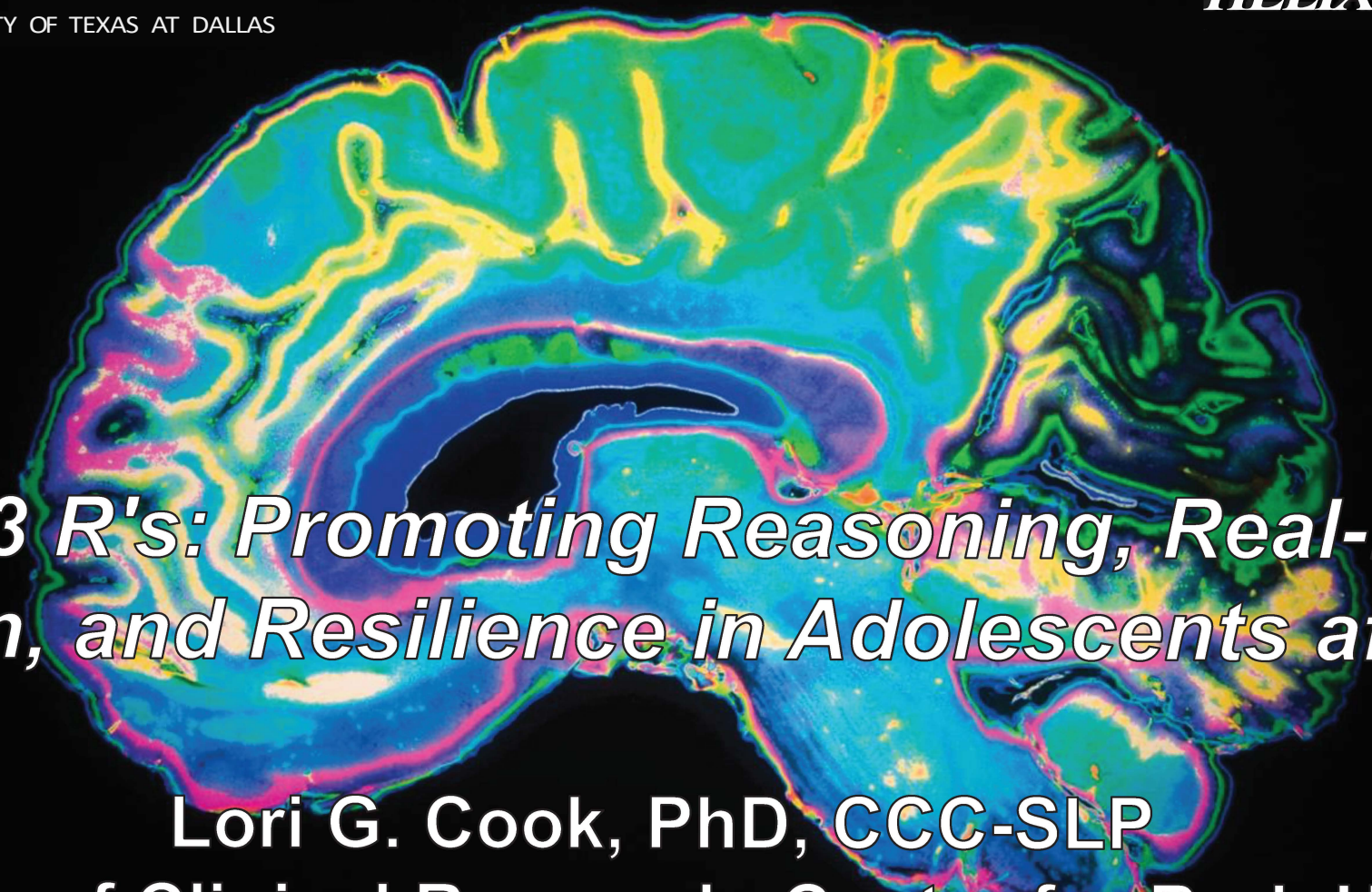
November 15, 2022
HELIX Conference



The 3 R's: Promoting Reasoning, Real-Life Function, and Resilience in Adolescents after TBI

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The University of Texas at Dallas

Overall Learning Objectives

1. Identify the current limitations regarding generalizability of traditional cognitive and social remediation approaches in pediatric brain injury.
2. Describe the benefit and application of strategy-based approaches to mitigate impairments in higher-order cognitive skills (i.e., learning, executive functions, social cognition, etc.).
3. Describe proactive methods for addressing real-life cognitive and social challenges, including integrated technologies and approaches promoting overall brain health and resilience-building.

General Outline

1. Overview: Impact of Injury on the Developing Brain
2. Brain-Based Approaches to Assessment & Treatment in pTBI
3. Strategy-Based Applications to:
   - Learning
   - Executive Functioning
   - Strategic Attention
   - Behavioral & Social/Emotional Functioning

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What is Brain Health?

- Neural Health

  - Brain blood flow, connectivity, structural integrity, etc.

- Cognitive Health

  - Learning, executive functions, mental flexibility, etc.

- Psychological Health

  - Mitigating addiction, depression, anxiety, stress, etc.

- Social Health

  - Building positive relationships, social problem-solving, etc.

- Thriving in Real-Life Functions

  - Making (and meeting!) goals in school, work, and life

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1 | Impact of Injury on the Developing Brain

Traumatic Brain Injury (TBI) Focus Areas

ID & MONITORING

REGENERATION

RESILIENCE

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Consequences of Pediatric Brain Injury

- Inefficient discourse processing—gist vs. details
- Decreased problem solving skills
- Impaired Motivation and response to rewards
- Impulsive behavior
- Prospective and working memory deficits
- Emergence of maladaptive behavior

Younger is not better

1. Prognosis for functional recovery of *old* skills is better in early brain injury

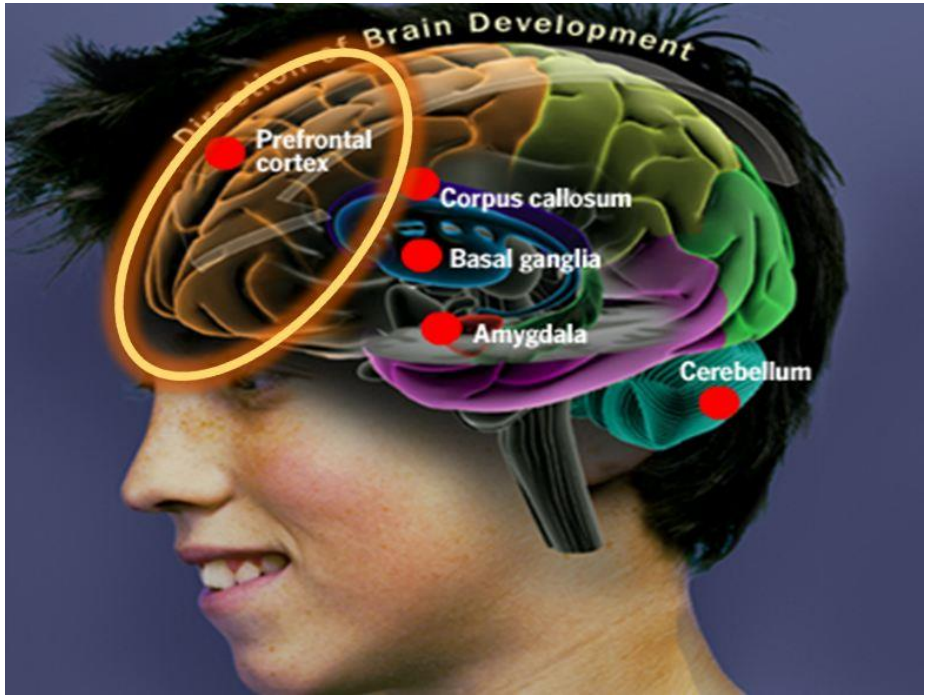
2. Prognosis for acquiring *new* skills after injury is worse after early brain injury

The Teen Brain

"High Horsepower, No Steering"

- Frontal Lobe Development
  - Ex: inhibitory and planning
- Heightened reward system
- Emotional Brain
- Hormone Changes

= Most vulnerable and optimal brain stage



http://www.macleans.ca/society/life/inside-your-teenagers-scary-brain/

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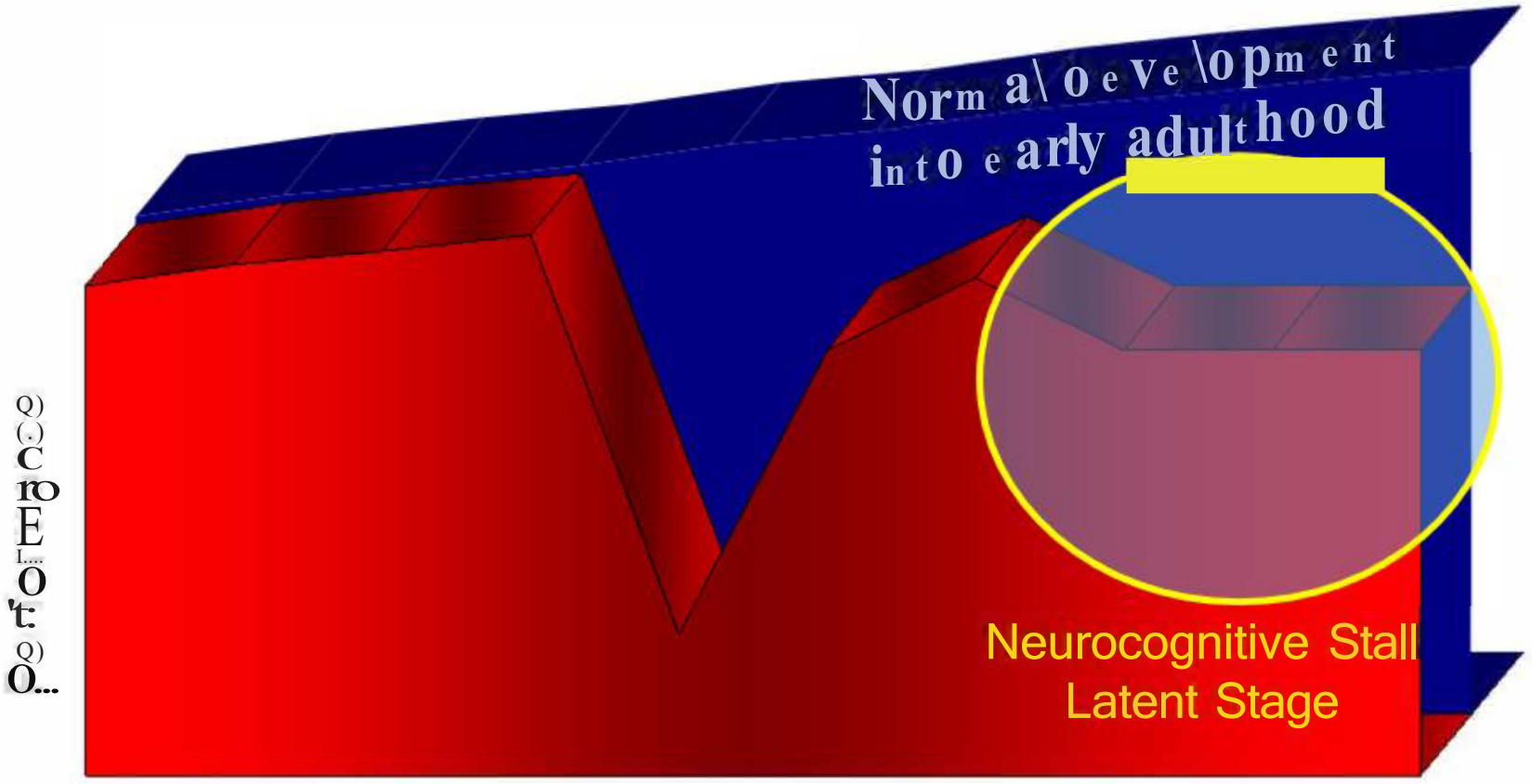
Puzzling Paradox of Pediatric Brain Recovery

- Fall behind in middle school
- Traditional cognitive measures insensitive
- May recover many intellectual functions
- Recovery is not a one-time phenomenon

Pediatric TBI: Not Just “Little” Adults

- Some impairments may get worse over time
- New difficulties can emerge years later
- Children may have to recover at each new stage of development

Neurocognitive Stall
Pediatric TBI: Latent Phase of Recovery



Chapman, 2006, Brain Injury Professional

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CDC 2018 Report to Congress

The Management of Traumatic Brain Injury in Children: Opportunities for Action

https://www.cdc.gov/traumaticbraininjury/pubs/congress-childrentbi.html

- Details the impact a TBI can have on children and their families
- Identifies gaps in care
- Provides opportunities for action to reduce the gaps
- Highlights key policy strategies to address the short and long-term consequences of a TBI
- Take-home message: The management of TBI in children is complex and depends on multiple service delivery systems that often do not provide systematic or coordinated care to ensure a successful recovery

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2 | Brain-Based Approaches to Assessment & Treatment in pTBI

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Real-Life Challenges

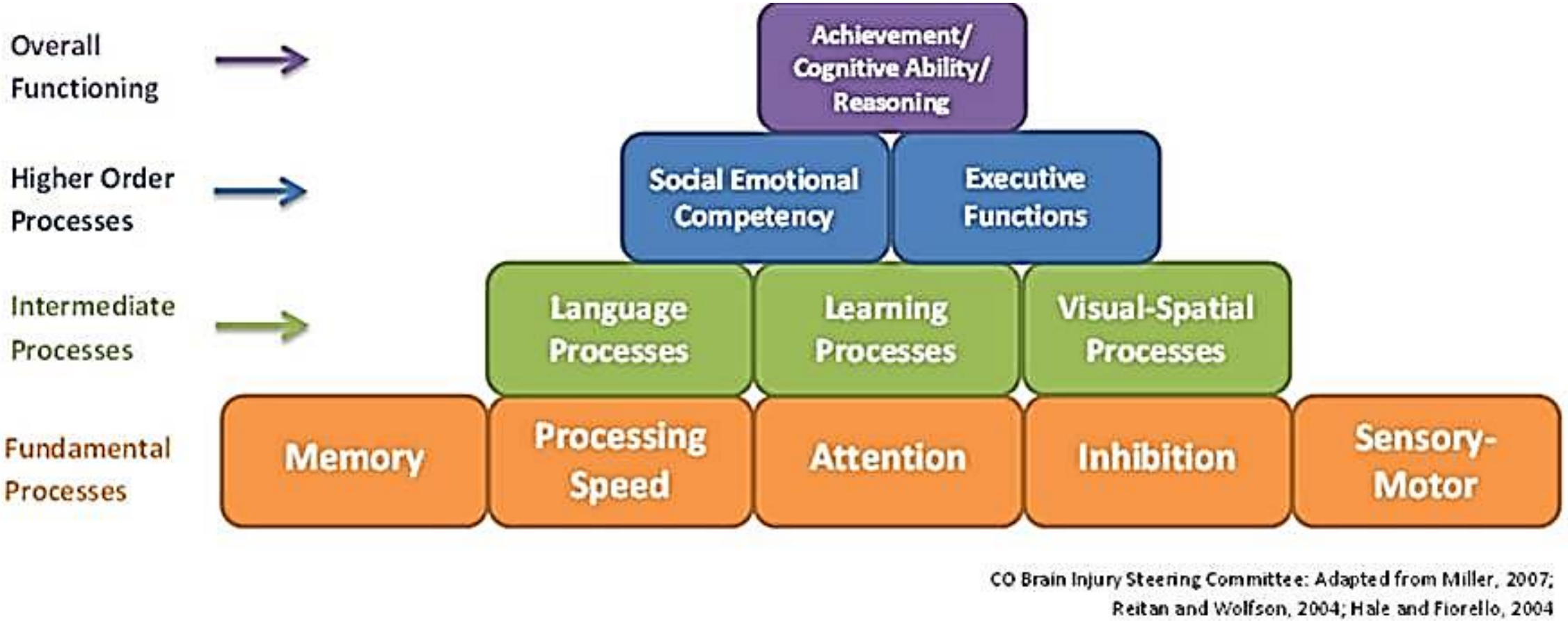
1. Many children with TBI demonstrate persistent residual difficulties in everyday life functioning

2. Most traditional cognitive approaches fall short in characterizing and remediating “real-world” difficulties after TBI

Assessment of cognition in TBI is complex…

- Most children with severe TBI improve neurologically in ways that may not be predicted easily
- Recovered knowledge & skills acquired before the injury can combine with new disability, creating misleading profiles
- Pronounced inconsistency in the child's performance related to neurological, emotional, and contextual factors adds to difficulty of direct interpretation of test results
- Executive function deficits are difficult to identify & classify with standardized tests

Building Blocks



CO Brain Injury Steering Committee: Adapted from Miller, 2007; Reitan and Wolfson, 2004; Hale and Fiorello, 2004

https://www.cde.state.co.us/cdesped/sd-tbi_buildingblocks

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Standardized Testing: Positives

- Information can be quantified
- Tests can be repeated and compared
- Efficacy of procedures is more universally accepted among professionals
- Useful for insurance coverage, justifying services/supports, etc.
- Can often be interpreted by various professionals

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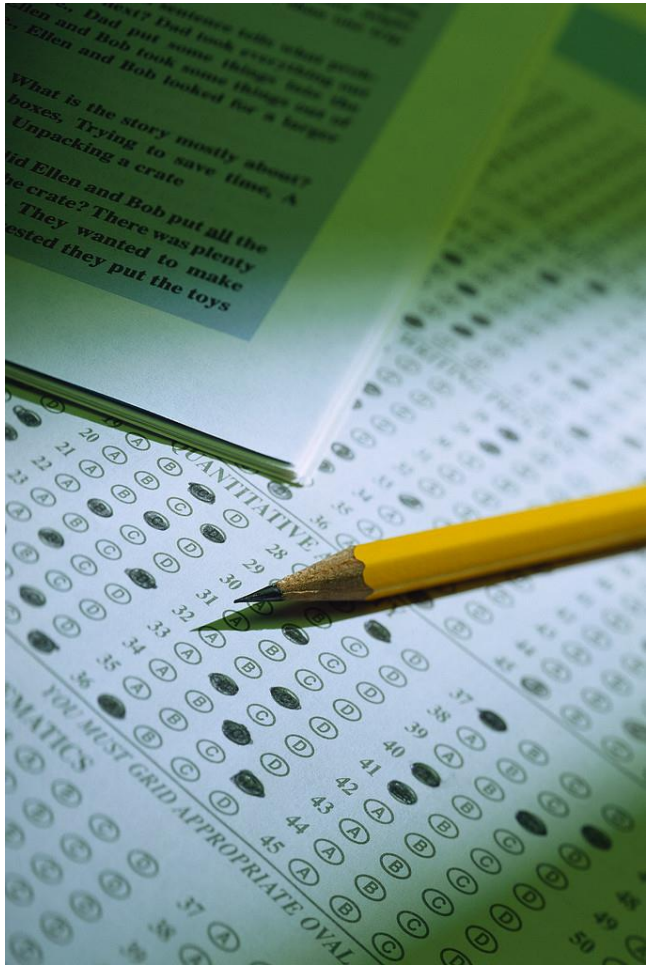
Standardized Testing: Negatives

- Does not provide information regarding typical performance in context/everyday situations
- The one-on-one testing environment may control for attention & concentration issues
- Clarity of test directions may mask some executive functions (initiating, shifting, attention, monitoring)
- Use of basals & ceilings may not uncover gaps below basal or information learned above ceiling (characteristic of TBI)

Cognitive Assessment

- Domain-Specific Processes
  - *Isolated*
  - *Integrated*
- Goal-Oriented Executive Control/Regulatory Processes
- Environmental Influences



Assessment Strategies

- Ongoing
- Contextualized
- Collaborative
- Hypothesis-Testing

Develop your own novel EF tasks (for informal observation)

1. Create a task which is demanding, yet achievable, given the child's estimated level of functioning.
2. Provide end-goals, but withhold offering specific how-to instructions.
3. Provide an array of materials which are both relevant and irrelevant to the task-outcome.
4. Resist the urge to provide help by pointing out errors, redirecting attention, prompting the student to start or stop, or providing solutions.
5. Allow for failure, within reason.
6. Observe and capture a profile of EF performance.

Fahy (2014). Assessment of Executive Functions in School-Aged Children: Challenges and Solutions for the SLP. SIG 16 Perspectives on School-Based Issues, 15, 151-163. doi:10.1044/sbi15.4.151

School-Age Children & Transitioning Youth

- For school-aged youth, assessment focuses on the child's ability to perform academically and interact with peers.
- Assessment describes strengths and needs for supporting new learning and/or re-learning and helps identify areas for remediation.
- Development of cognitive-communication skills continues to be monitored through high school and during the transition to post-secondary or vocational settings
- The impact of new demands and challenges is assessed so that strategies to maximize functional outcomes and life participation can be implemented.

Neuroplasticity: Hope for Regeneration, Repair, & Resilience

Our brain is one of the most modifiable parts of our whole body.

- Just as the body can be improved through physical fitness, the brain can be strengthened by how we use it.
- We have decades of scientific evidence on how to strengthen the brain – in health, after injury and disease diagnosis.

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Discoveries in Brain Research

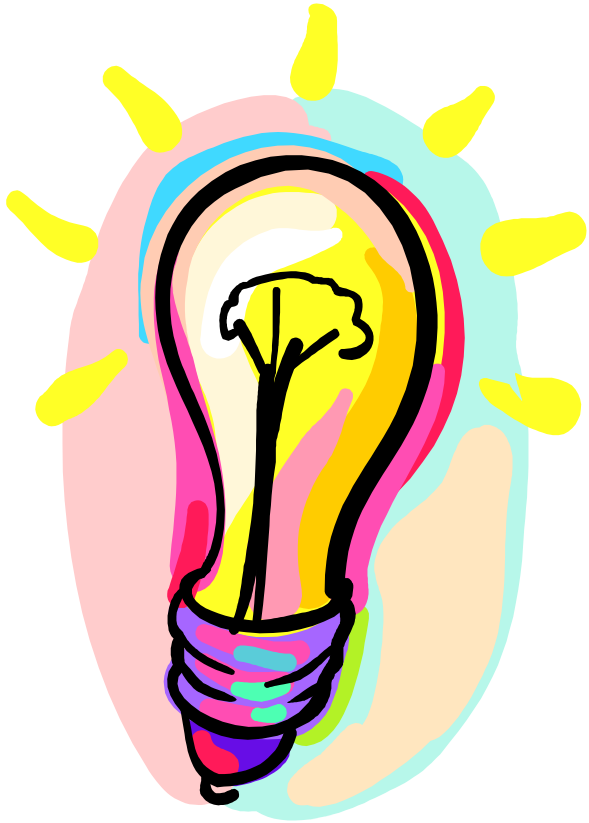
The Good News:

- The brain continues to make new connections and likely even new cells (neurogenesis) throughout our life
- The brain has the capacity to reorganize, forming new connections and strengthening weakened neural pathways
- Sophisticated brain imaging technology has made it possible to better understand the brain's response to treatment (how the brain changes)

What can we do now?... A lot!

- Treatment can enhance functional and structural aspects in the brain

- Improvements can be made in meaningful real-life outcomes



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Brain-based cognitive interventions

As we learn how the brain works, we can advance:

- Neurocognitive treatment development
- Educational teaching strategies

General Treatment Approaches

- Compensatory
- Restorative
- Habilitative
- Functional

* These are NOT mutually exclusive*

Remediation: Mid/Late Stage of Recovery

1. Language
2. Social/Pragmatics
3. Discourse/Strategic Learning
4. Executive Functioning

Remediation: Language (older children)

- Inferencing
- Higher-Level Comprehension
- Narrative & Discourse Processes
- Academic or Vocational Literacy

Examples:

- Talk about figurative language/ambiguities in classroom literature, poetry, etc.
- Look at news stories to think critically about current events
- Look online or in newspapers/magazines for jokes and humor to analyze
- Use strategic approaches for semantic, syntactic skills
- Use current, age-appropriate social situations for problem solving and critical thinking skills

Remediation: Social/Pragmatics

Michelle Garcia Winners “I LAUGH” approach:

explains the multiple skills and concepts that we must process and react to in order to succeed at social interaction and personal problem solving:

- *Initiating communication*
- *Listening actively (with eyes & brain)*
- *Abstracting & Inferencing*
- *Understanding Perspective*
- *Gestalt: getting the big picture*
- *Humor & human relatedness*

https://www.socialthinking.com/

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Intervention is designed to:

- Capitalize on strengths while addressing impairments
- Facilitate activities and participation by helping the child acquire new skills and strategies
- Modify contextual factors that are barriers and enhance facilitators of successful communication and participation, including identification and use of appropriate accommodations

Proactive focus on four major outcomes

1) Participation in the learning process

2) Development of skills that make a person employable

3) Understanding of social skills needed for communication at home, school and work

4) Development of independent living skills

3 | Strategy-Based Applications

Strategy-Based Approach

- Therapy activities should be strategy-based

  What tools is he/she gaining for improving this ability rather than just "drilling" or practicing it?

- Home program activities should engage parents to review/reinforce strategies

- Engage everyday communication partners for carryover when possible

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Cognitive Strategies

Cognitive strategy is a procedure or operation (i.e., something that is done) that goes beyond the processes that are a natural consequence of carrying out the task, that is used to achieve a cognitive goal, and that is at least potentially conscious or controllable.

Teaching Cognitive Strategies

- Must be embedded in meaningful academic or social context
- Intensive and ongoing—multiple opportunities needed for long-term effects
- More than equipping a person with a strategic procedure
- Many aspects must be built into the intervention to support generalization & maintenance

Cognitive Intervention/Training: Going Top-Down!

Top-Down Approach to Cognitive Rehabilitation

Combining cognitive theory with neural evidence

- Top-down control processes are **goal-oriented**, **voluntary/volitional** (not automatic) and **internally driven** (not stimulus driven) cognitive operations *(Chen & D'Esposito, 2010).*

- Top-down = emphasis upon child identifying, developing, and utilizing cognitive strategies to manage and perform daily tasks more effectively
- Bottom-up = developing/training foundational or discrete skills/tasks

Examples of Top-Down Approaches

- Theory of sustained or vigilant attention → Goal Management Training *(GMT, Robertson et al., 2004)*
- Theory of problem solving → Problem Solving Training *(Rath et al., 2004)*
- Theory of Functional Specialization and Functional Integration → Goal-oriented attentional self-regulation training *(GOALS, Novakovic-Agopian et al., 2006, 2010)*
- Construct of Gist reasoning → Strategic Memory Advanced Reasoning Training *(SMART, Chapman & Mudar, 2014)*

You are a neuro-engineer

The CEO of your brain is its frontal lobe networks

- Planning and organization
- Reasoning and problem solving
- Filtering and selection of information
- Integration of details & application of knowledge
- Emotional regulation
- Adaptable and flexible thinking

The health and performance of your brain has a lot to do with how you use it!

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Learning

Significance of Strategic Learning

The brain is most effective at extracting the gist, not at retrieving the details (takes less effort)

Forming bigger ideas and suppressing irrelevant details helps you think faster and more efficiently

Remembering the “gist” of something is more resilient than remembering details—actually continues to improve with age

Pulling out the gist does not mean that you:

- Do not attend to details
- Process information less thoroughly

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Strategic Learning

Implementing a top-down, strategic approach to learning by:

1. extracting important information while inhibiting unimportant information,
2. holding key ideas in working memory, and
3. synthesizing information to form abstracted gist-based meanings through complex reasoning

(Cook, Vas, & Chapman, 2014; Gamino, Chapman, & Cook, 2009; Gamino et al., 2010)

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Characteristics of Strategic Learning: PICK

Prioritizing important information

7 – 8 Years Old

Inhibiting unnecessary detail

9 – 10 Years Old

Collapsing details into bigger ideas

12 – 14 Years Old

Keeping abstracted meaning

15 + Years Old

Learning in Pediatric TBI: Suspected Challenges

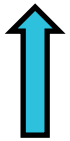
Bottom-up processing in TBI

- Too little inhibition
- Too much selection

Impaired strategic attention

- Surface-level processing
- Concrete-level thinking

Impaired abstraction & reduced cognitive flexibility



- Higher-order functions required to strategically learn/problem solve may continue to be at risk

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Strategic Learning Facilitates “Gist” Reasoning

Humans encode, store and retrieve information best in abstracted, gist meanings – continually.

Definition of gist reasoning

- *Transforms the details*
- *Integrates with world knowledge*
- *Synthesizes into generalized meanings*
- *Generates novel ideas*

Discourse Processing Skills: What are they?

- The ability to interpret connected language, such as through a story

- Includes the following skills:
  - *Story comprehension (implicit & explicit questions)*
  - *Processing of the central meaning (summary & lesson)*
  - *Choosing & remembering salient information*

Discourse after TBI: What We See

- Discourse measures are often more sensitive to TBI deficits than traditional language measures

- Impairment in narrative discourse takes the form of:
  - *Reduction in amount of information*
  - *Impairment in structure, organization*
  - *A failure to retain the "gist"*
  - *Discourse deficit patterns are most associated with frontal lesions*

Test of Strategic Learning (TOSL)

- Involves reading three narratives of increasing difficulty
- Discourse skills assessed include the following:
  1. *Summary (Using own words, globalizing/gist, inferencing, organization)*
  2. *Lesson/Moral (abstract, expected moral)*
  3. *Explicit & Implicit Content Probes (recall of factual and inferential information)*
  4. *Recognition of Important vs. Unimportant Information*

Strategic “Gist” Reasoning vs. Detail Processing

- 20 Children with moderate/severe TBI and 20 age- and SES-matched TD controls ages 10-15 yrs.
- Assessed on Test of Strategic Learning
- TBI group demonstrated:
  - *Significant impairment in ability to abstract gist-based meaning*
  - *Relatively preserved ability to recall and encode details from text*

(Gamino, Chapman, & Cook, 2009)

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Summary of discourse findings in Pediatric TBI

- Marked deficits in combining detail information into more generalized gist meanings (Chapman et al., 2004)
- Predominant use of an immature strategy to reduce information by deleting information (Chapman et al., 2006)
- Youth with TBI condensed text to the same degree as controls but simply retold explicitly stated ideas without forming gist-based concepts (Chapman et al., 2006)

Optimizing the top-down learning process

1. Use questions and other techniques to increase metacognitive awareness
2. Push for depth of understanding over breadth of recall
3. Promote integration of knowledge—connecting new information to their own knowledge/experiences
4. Plan and create opportunities for transfer and generalization of the skills that are learned
5. Encourage students to connect seemingly unrelated subjects and ideas and derive their own questions

Strategic “Gist” Learning Training

Issues addressed in prior research:

1. Does strategic “gist” learning provide an index of complex cognitive stall in TBI?

2. Can strategic “gist” learning serve as a platform to improve
   - Cognitive capacity – trained and untrained
   - Real life functionality

Strategic “Gist” Training: SMART

SMART: *Strategic Memory Advanced Reasoning Training*

- A top-down, integrated approach

- Cognitive strategies to more effectively evaluate, manage, synthesize, and apply information (learn!)
  - *8-10 training sessions*
  - *45 minutes each*
  - *Over a 4-5 week period*

Strategic Memory Advanced Reasoning Training (SMART)

Goal: Equip metacognitive strategies to improve higher-order/ cognitive control functions of:

1. Strategic Attention (Filter to Focus/Down-select)
2. Integrated Reasoning (Big-Picture Thinking)
3. Innovation (Flexible thinking)

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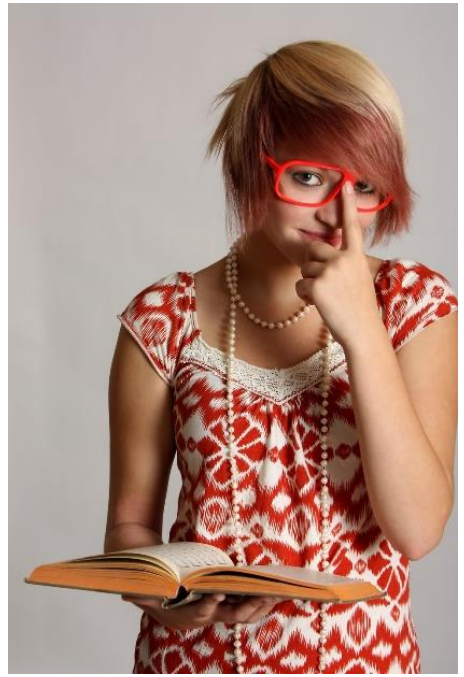
SMART Ideas



- Manage information overload by blocking unimportant information *before* focusing on key points
- Make information your own rather than getting bogged down in word-for-word details
- Look for themes and summarize as you go
- Abstract deeper-level ideas from multiple perspectives
- Generate “take-home” messages, creating new knowledge to apply to your life
- Demonstrate more complete understanding by zooming in and out to show both the “forest” and the “trees”

(Laane & Cook, 2020, *Seminars in Speech and Language*)

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SMART in children with ADHD

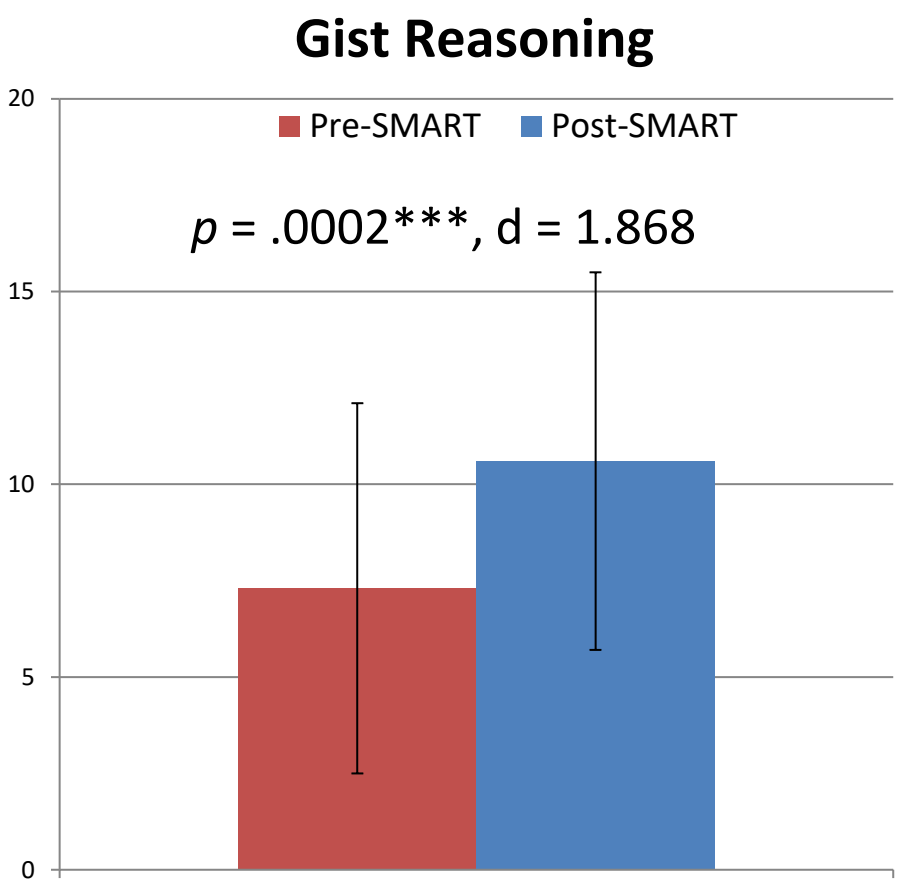
- 27 children with ADHD (ages 8-15) randomized into either SMART or alternate attention/inhibition intervention
- At baseline, both groups performed similarly on the TOSL ($p > .05$)
- Post-intervention, children in SMART group showed significantly improved TOSL performance ($p = .01$), unlike the other group ($p > .05$)

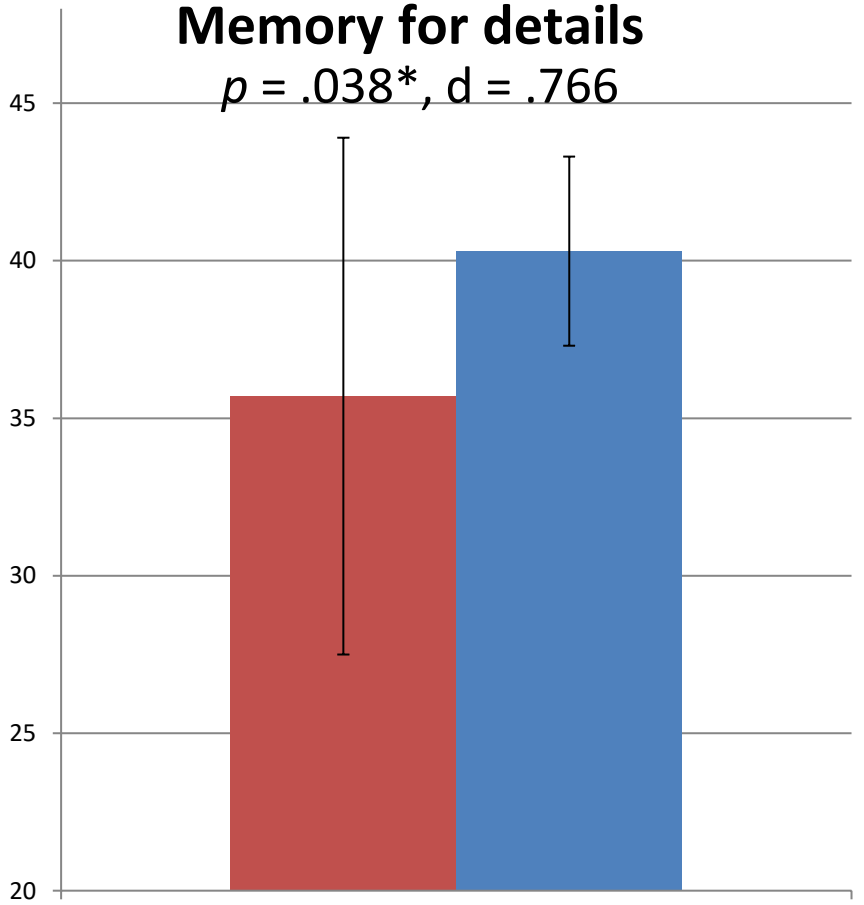
SMART in Adolescents with TBI *(NICHD R21-HD062835)*

- 20 adolescents, ages 12-20 (M=15.30, SD=2.25), with complicated mild to severe TBI
- At least six months post-injury
- Randomized into either one-on-one SMART (gist-based training) or fact-based control training (rote memory strategies)
- Pre- and post-training assessments

(Cook et al., 2014, Frontiers in Neurology)

SMART: Primary Gains





- In contrast, the Memory training yielded no significant gains
- The group difference (SMART vs. Memory) in effect of training on gist reasoning was significant (p = 0.006; d = 1.41)

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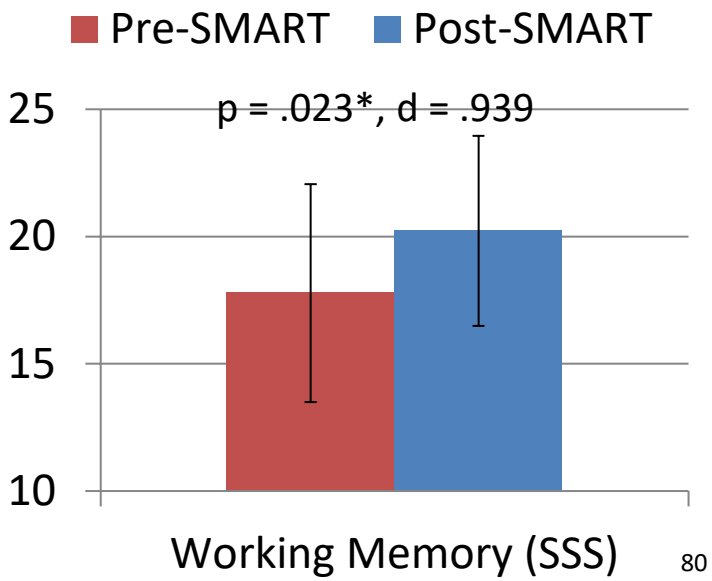
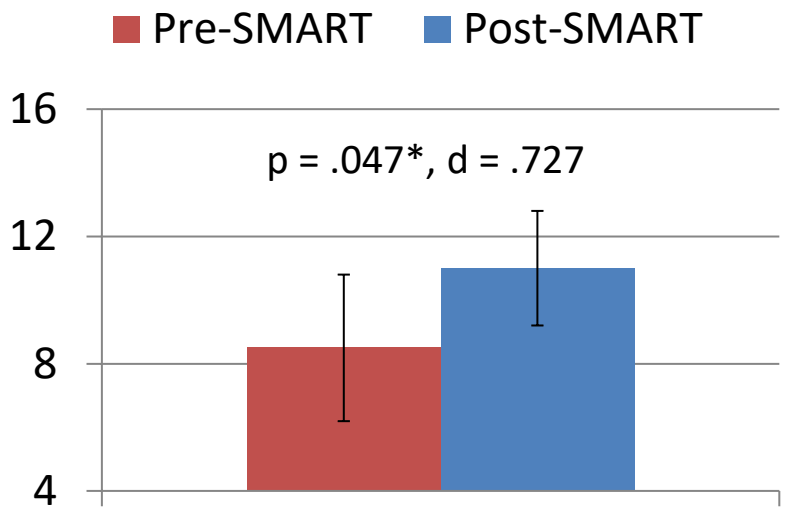
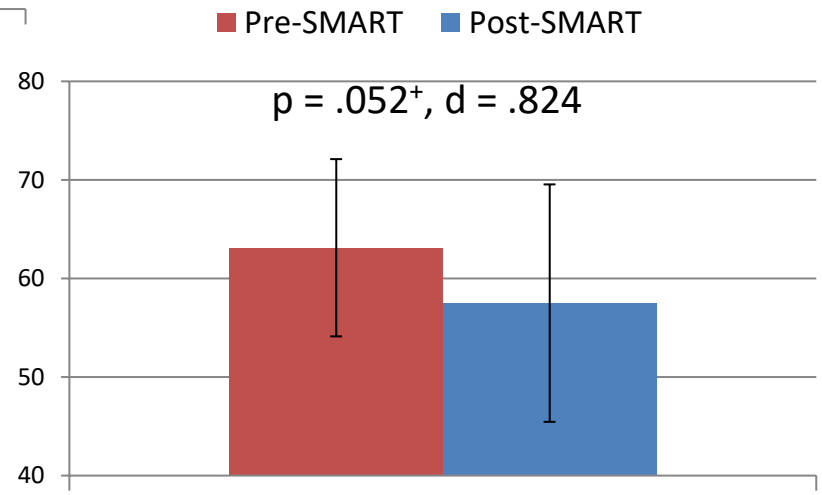
SMART: Other Benefits



Working Memory (SSS)



Inhibition Accuracy



Parent BRIEF GEC

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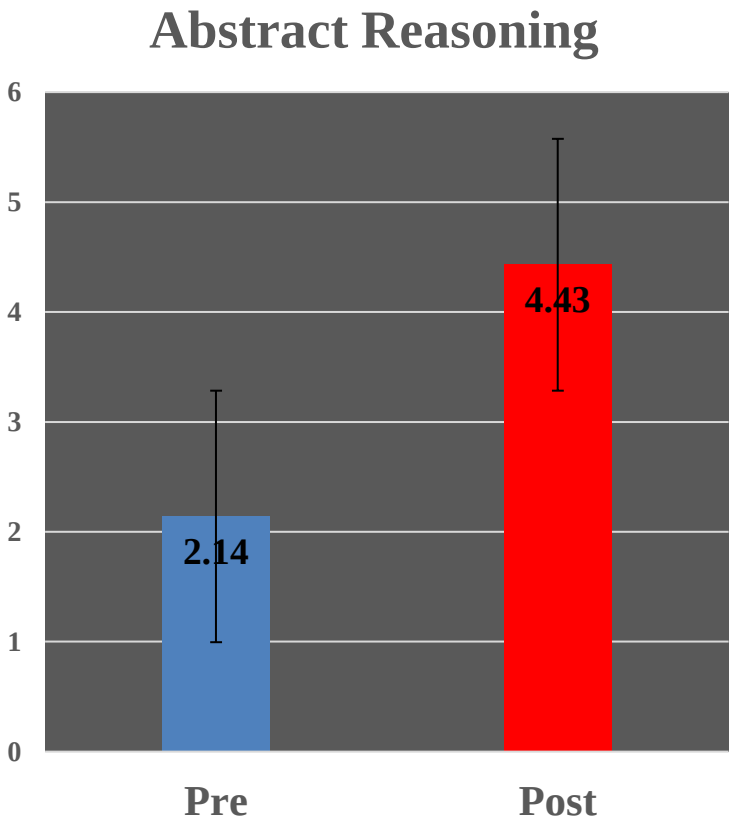
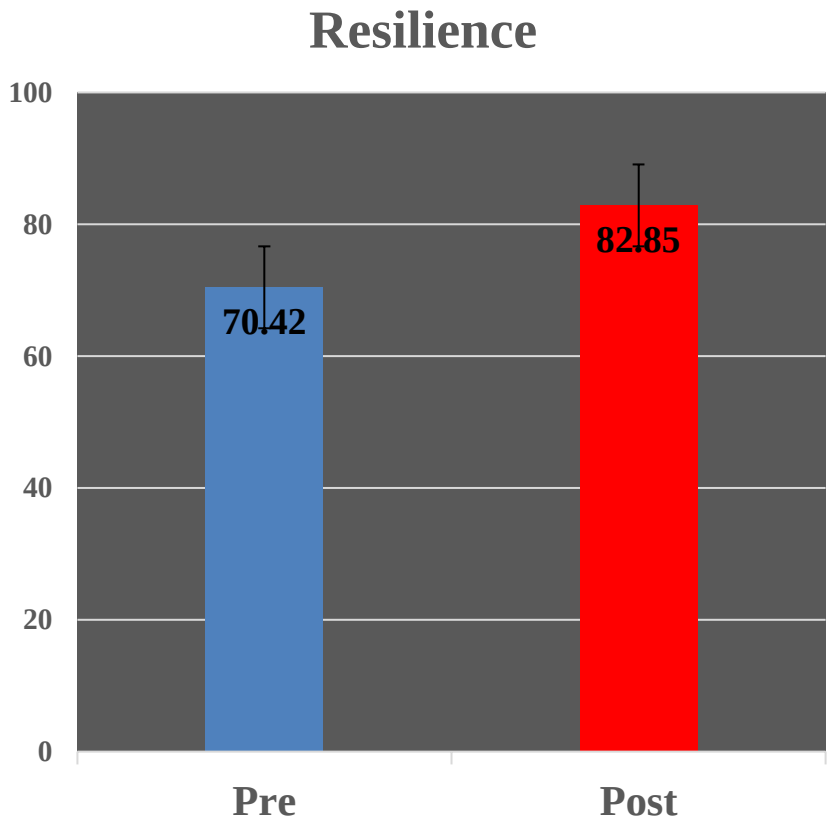
Collegiate TBI study (Richland, DCCCD)





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Adolescent Reasoning

(Gamino et al., 2014, *Frontiers in Human Neuroscience*)

- Evaluated reasoning and fact recall in over 900 public middle school students (7th & 8th graders)
  - 556 received SMART in their classroom
  - 357 did not receive SMART

- SMART increased reasoning and fact recall abilities regardless of socioeconomic status (SES)

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Service Members with TBI Regain Brain Health After Brain Injury

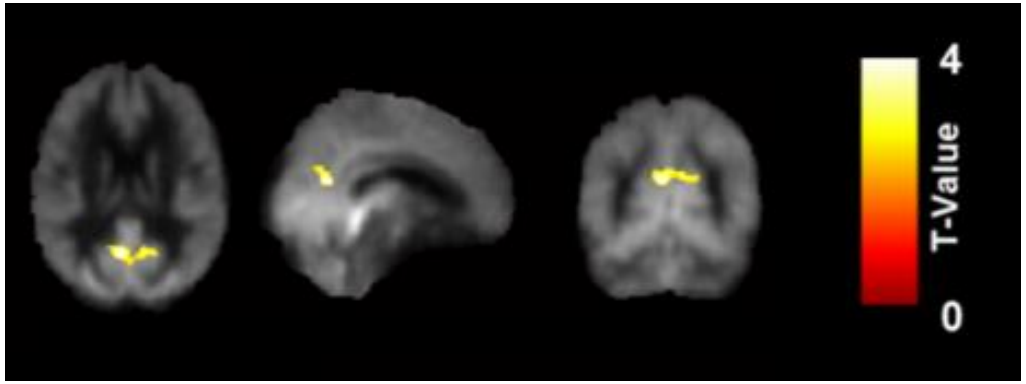
Cognitive, emotional and brain gains from high-performance brain training compared to active control group

Cognitive Benefits

- 23% increase in complex reasoning
- 38% increase in memory
- 14% increase in daily life activities

Psychological Health

- 58% decrease in depressive symptoms
- 42% decrease in stress-related symptoms



Enhanced Neural Health

(CBF) in bilateral precuneus vs. control group (p<.05)

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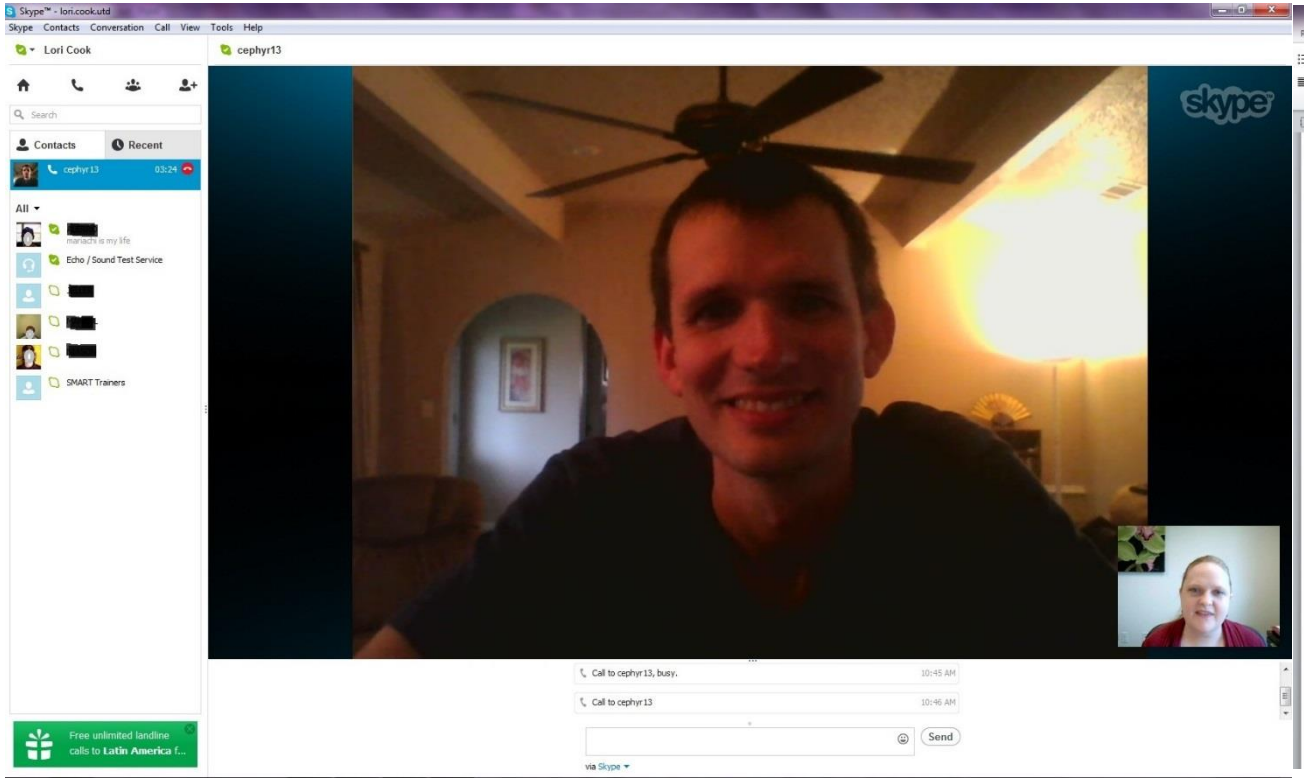
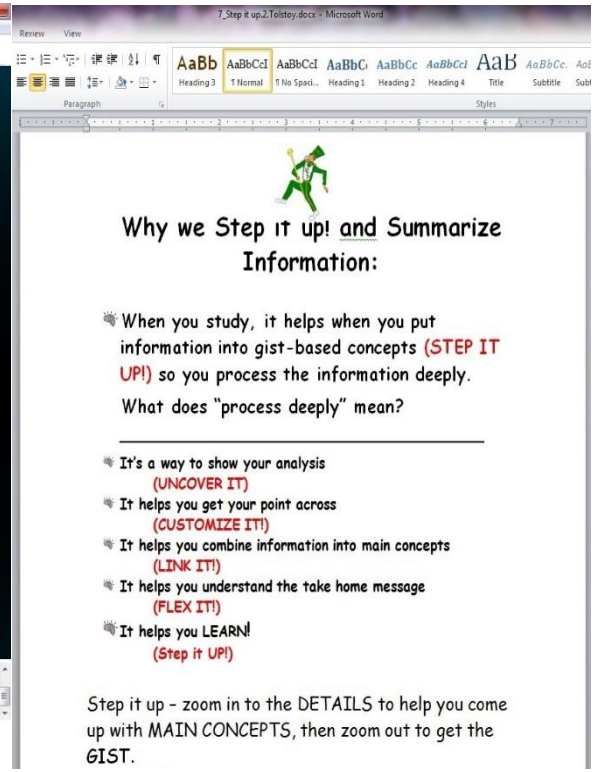
Virtual “Tele”-SMART (Tele-Rehab)





Tele-SMART yielded significant gains in:

- Gist/Abstraction
- Lessons
- Detail-level Recall

- Working Memory
- Cognitive Flexibility
- Real-life EF (Parent BRIEF)

(Cook, Caulkins, & Chapman, 2020)

(Vas, Cook, Keebler, & Chapman, 2016, Brain Injury Professional)

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SMART: Findings Across Populations

- SMART has demonstrated effectiveness in promoting gains for:
  - Children & teens with ADHD *(Gamino et al., 2009a, 2009b)*
  - Typical and disadvantaged middle schoolers in the classroom *(Gamino et al., 2010, 2014, 2022; Motes et al., 2014)*
  - Healthy adults *(Anand et al., 2010; Chapman, Aslan, et al., 2015; Chapman et al., 2016, 2017, 2021; Gallen et al., 2016; Motes et al., 2018)*
  - Adults with Mild Cognitive Impairment *(Das et al., 2019; Mudar et al., 2013, 2016)*
  - Adults with Bipolar Disorder *(Venza et al., 2016)*
  - Adults with Rheumatoid Arthritis *(Blalock et al., 2020)*
  - Military Personnel & Law Enforcement *(Young et al., 2021)*
  - Adults with brain injury/stroke *(Han et al., 2014, 2016a, 2016b, 2017, 2018a, 2018b; Samuelson et al., 2020, 2021; Vas et al., 2011, 2015, 2017, 2020)*
  - Teens with brain injury *(Cook et al., 2014, 2020)*
  - College student-athletes *(Nguyen, 2017)*

Various cognitive performance improvements have been observed in research populations, including:

Gains in primary areas:

- Synthesized thinking
- Concept abstraction
- Innovative thinking

Executive Functions
Targeted by Training

Generalized cognitive gains:

- Memory
- Working memory
- Speed in cognitive switching
- Inhibition

Discrete Cognitive Processes

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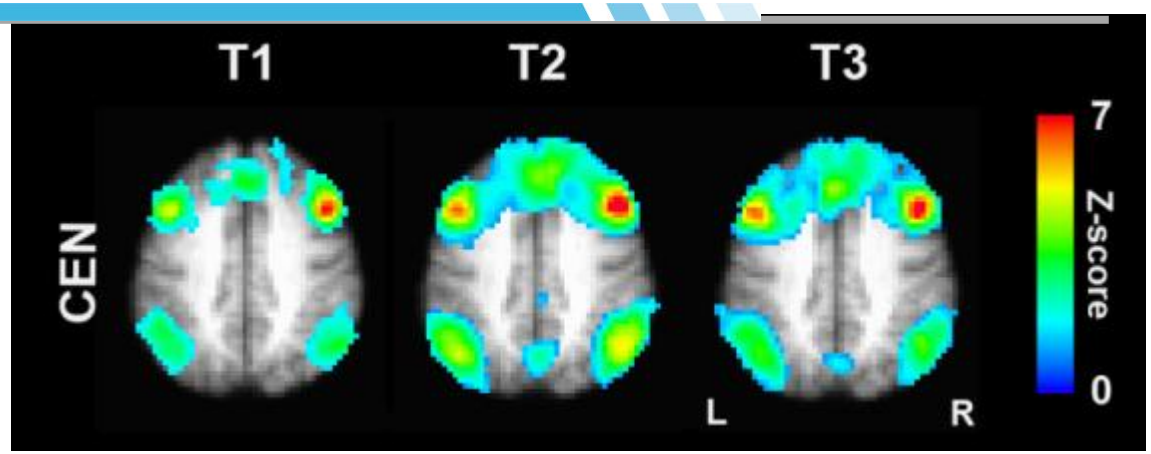
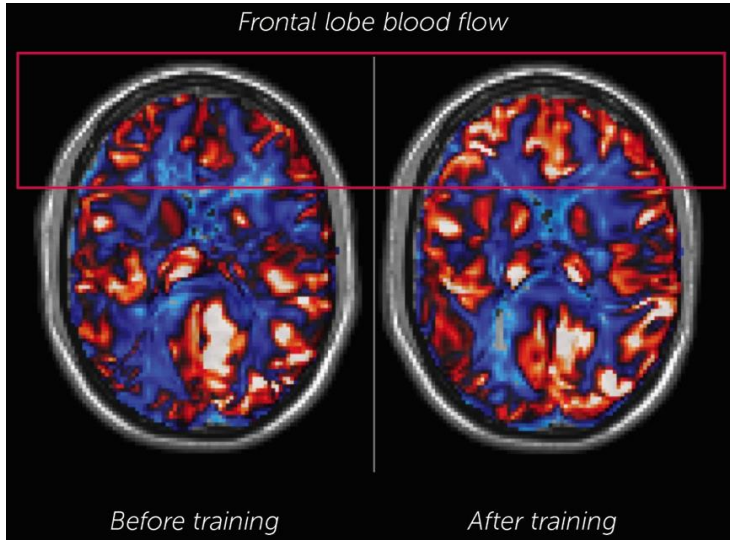
SMART in Healthy Adults: Metrics of Brain Health

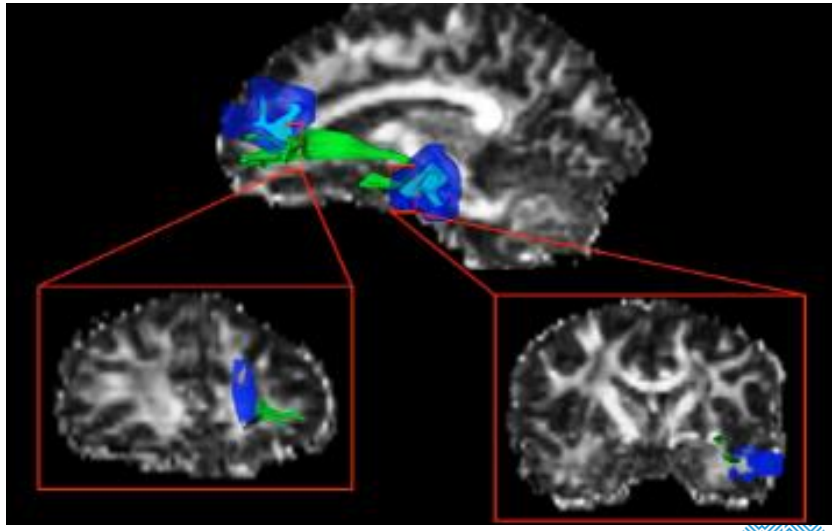


fMRI Functional Connectivity

Brain Blood Flow



Structural Connectivity



(Chapman, Aslan et al., 2015, *Cerebral Cortex*)

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Executive Functioning: Goal Setting & Problem-Solving

Goal-Plan-Do-Review

- **Goal** -- What do I want to accomplish?
  - *Are there any potential obstacles?*
- **Plan** -- How will I accomplish my goal?
- **Do** -- Try my plan
  - *I am trying my plan (this is how it is going so far)*
- **Review** -- How did it go?
  - *Do I need to revise or make a new plan?*

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Example:

1. Goal

- I want to bring iny planner to school everyday

2. Plan

- I plan to put iny planner in front of the front door when I go to bed

3. Do

- I will do iny plan for 5 days and l<eep tracl<of how it went.

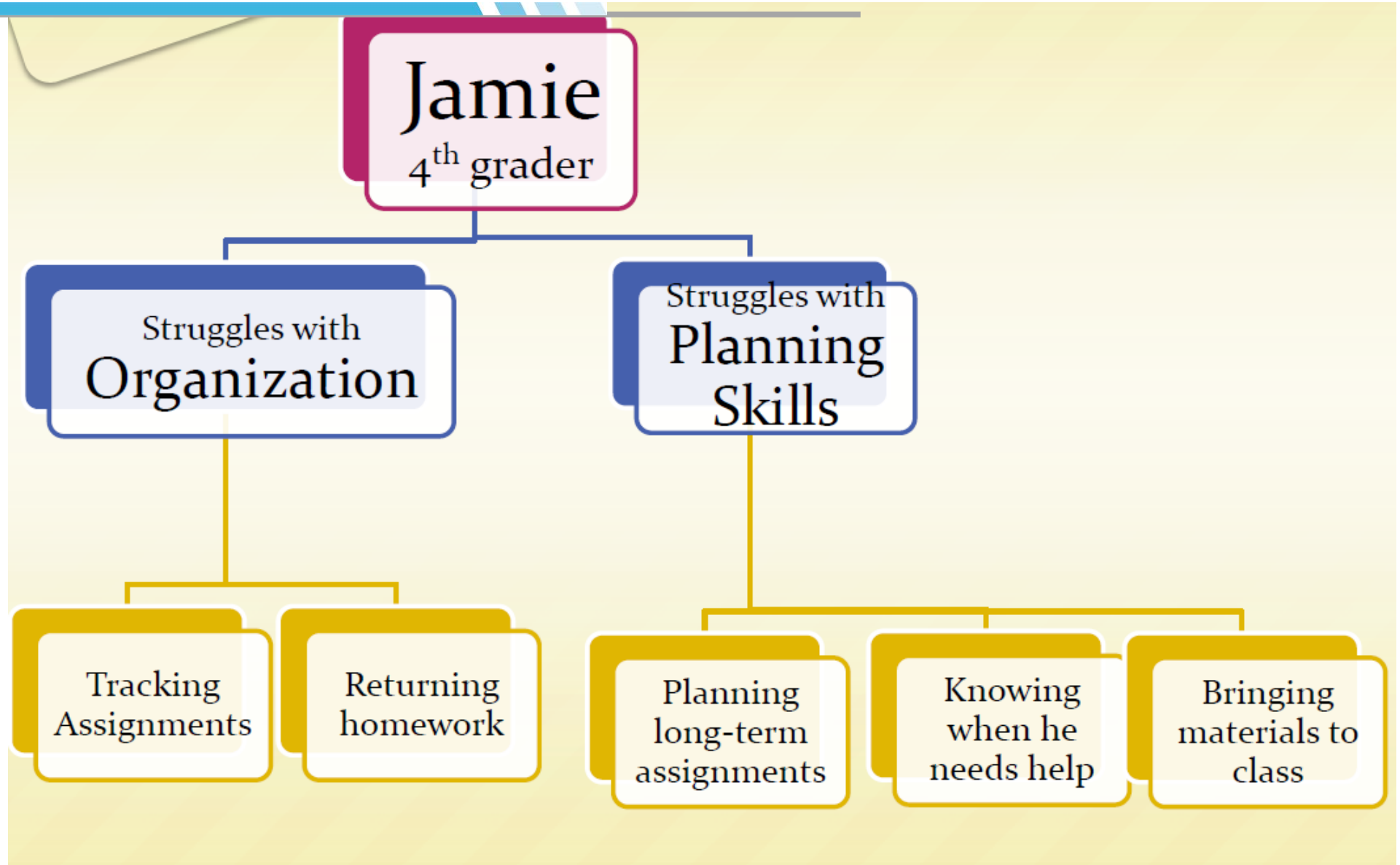
4. Review

- I only reineinbered iny planner 2 out of 5 days with this plan. I need to revise tny plan.

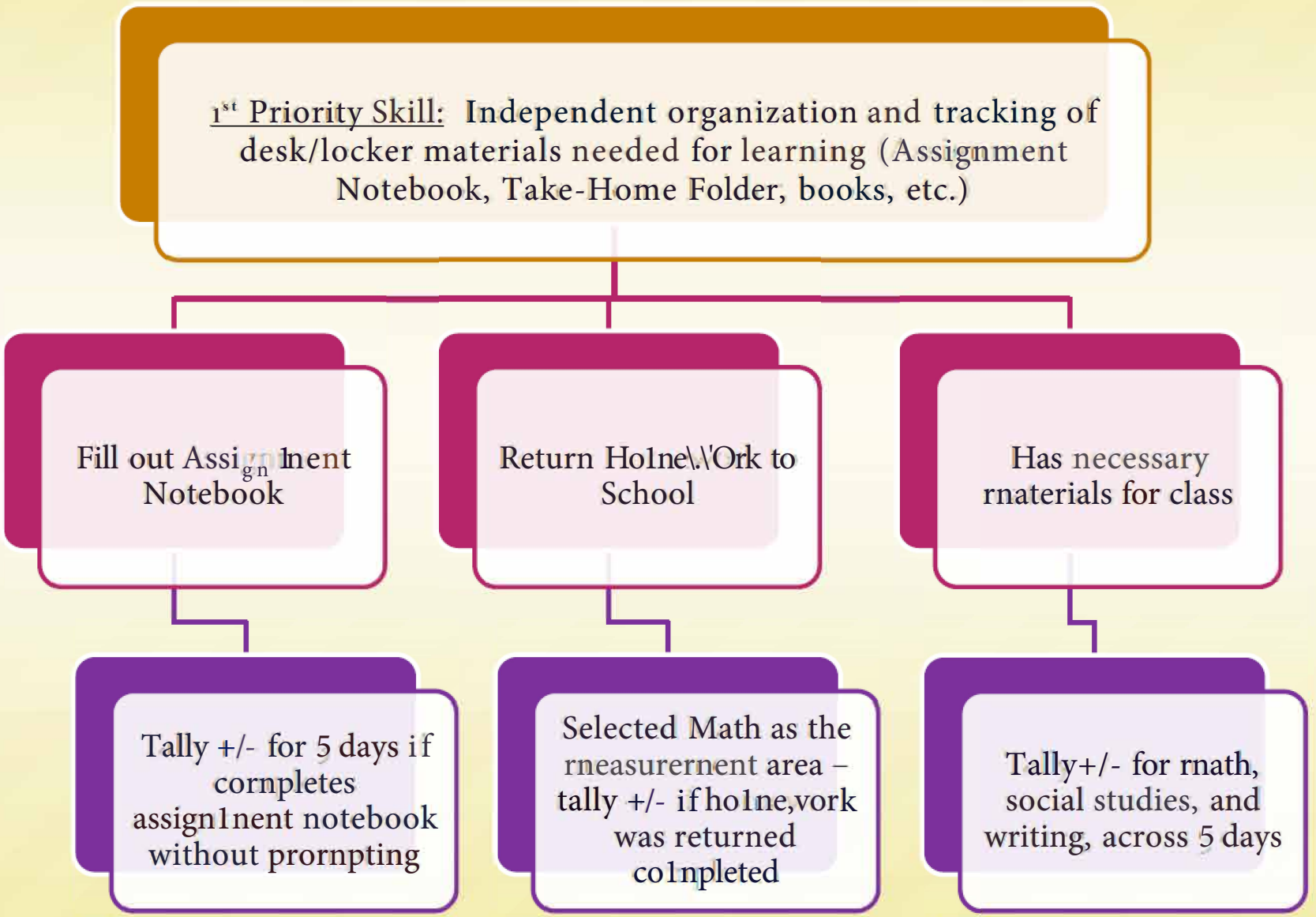
New PLAN

- New Plall: put nly planner in my bacl<pacl< after I brush my teetll. Harig bacl<pacl< on bedroom doorl<1lob.

Intervention Plan: Case Study Example



EF l11for1nal Baseline Data for Ja1nie



Jatnie's Baseline o,ata:

• Completed Assignment notebook independently - writing in all assign1nents accurately - for 1 out of 5 days.

• Brought co1npleted Math home work back to school for 2 of the 5 days.

• Brought all necessary materials to 3 identified classes (social studies, writing, and math) - for 6 of the 15 class periods (5 day data period). (Forgot materials for math for 5/5 class period, for social studies for 3/5 periods, and writing 1/5 periods)

INTERVENTIONS SHOULD TARGET:

MATH (at this point in time - start small!)

-Increase independence in writing in the Assignment notebook
- Increase the frequency of returning math homework
- Increase Jamie's independence in bringing all materials needed for math (calculator, pencil, graph paper, notebook, & text)

Intervention Plan & Timeli11e for Ja.1nie:

Assignment Notebool<: Mat-1

- 10/7 - 10/18
  Post-it note from teacher to near-point copy assignment hirnself & teacher signature
- 10/21 - 10/25 - Fade post-it note, to verbal cue & teacher sign.ature
- 10/28 - n/1 - Fade verbal cue - data collection on independence

Retur11 Math Ho1newor<

- 10/7 - 10/18
  Homework Planning Sheet w/Resource Teacher daily 3:15-3:3o
- 10/21 - 10/25: Jamie complete homework planning sheet on his own, in resource roon-i - check f'oni resouTce teacher before going home
- 10/28 - n/1 - Provide Jamie ,vith 5 copies of Homework Planning Sheet. Remain in classroom at end of day. Data collection on returning math homework

Bri11g materials to 1natl1 class

- 10/7 - 10/18
  Create visual cue card with Jamie - place inside locker door. Check in with him on 10/10 & 10/17 to remind him to use it
- 10/28 - 11/1
  Consult ,vith math teacher
  Data collection this week

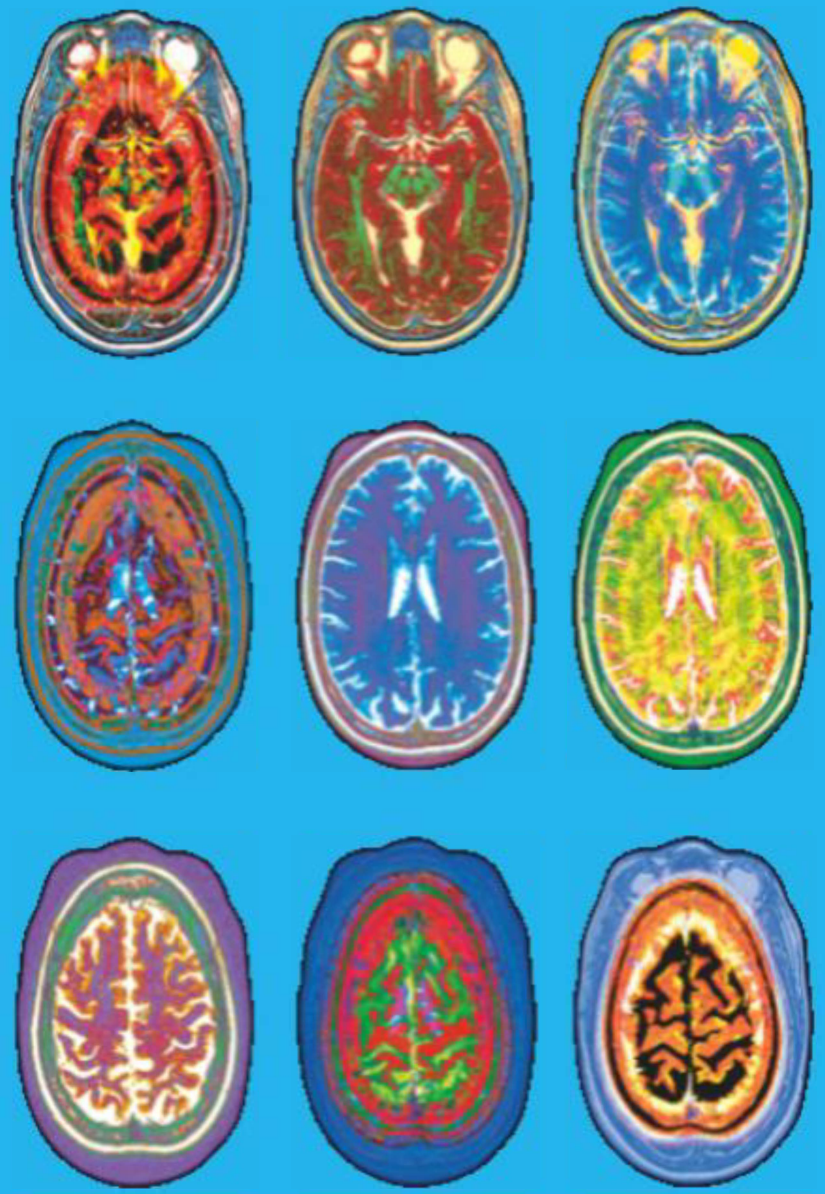
Some good web resources for EF interventions/tools

- https://jillkuzma.files.wordpress.com/2008/09/ef-facing-the-frontal-lobe-ppt.pdf
- Sarah Ward, M.S. CCC-SLP & Kristen Jacobsen, M.S., CCC-SLP https://www.efpractice.com/
- Seeing My Time (SIT) Program https://executivefunctioningsuccess.com/
- Cognitopia (Life management apps) https://cognitopia.com/ *http://blog.cognitopia.com/using-goal-guide-manage-routines-home-school/*

"One of the most useful skills for children and adolescents to acquire will be the ability to effectively use this universe of information-to critically evaluate the data, to discern signal from noise, to synthesize the content, and to apply it to real-world problem solving."

– Dr. Jay Giedd, NIH

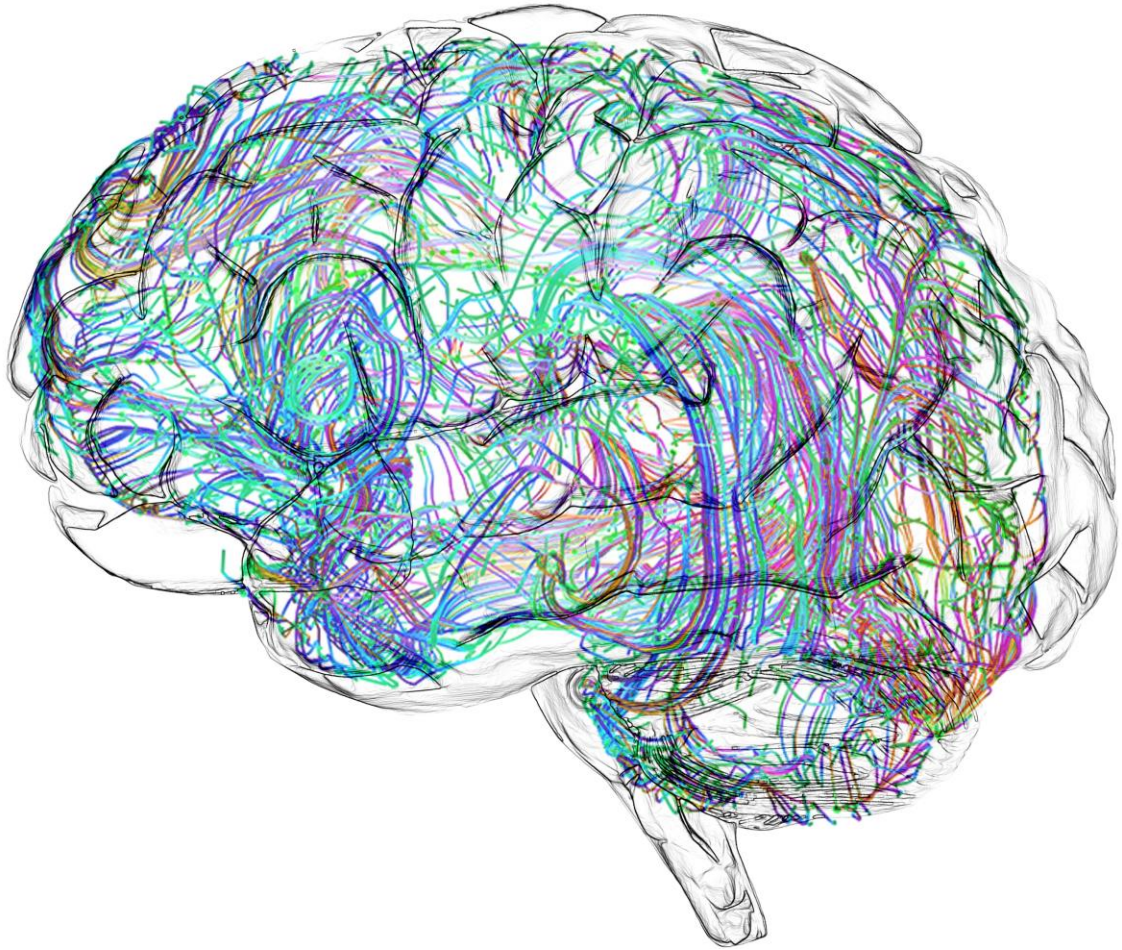
(Giedd, 2012, Journal of Adolescent Health)



Building brain resilience through cognitive strategies

- Take charge of the stressors you have more control over

- Build resilience to help tackle and bounce back from the stressors you have less control over



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Strategic Attention

How can we help them **best balance their mental energy?** Foster being good stewards of their technology tools, time, and cognitive resources to improve focus, productivity, and reduce brain fatigue.

Technology/Media in Youth Today

American Academy of Pediatrics estimates that kids (ages 8-18) spend, on average, 7 hours per day — up 2.5 hours over the last decade —on entertainment media

The most common forms of digital entertainment are:

1. TV
2. Music
3. Nongaming use of computers
4. Video games — computers, the Internet, game consoles, or handheld/mobile devices

https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/pages/media-and-children.aspx

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Media Multitasking:
8- to 18-year olds

- When engaging with digital media:
  - 30% of the time simultaneously using more than one device/multiple media streams

- When doing homework at the computer:
  - 2/3 of the time also doing something else
  - Many teens report at least sometimes doing homework while using another medium, including TV (51%), social media (50%), texting (60%), and listening to music (76%)

(Kaiser Foundation Survey, 2010)

Multi-tasking is “toxic” to the brain—particularly impacting frontal lobe functions

Technology allows us to push our brain to do things it was not built to do. We are seeing the consequences.

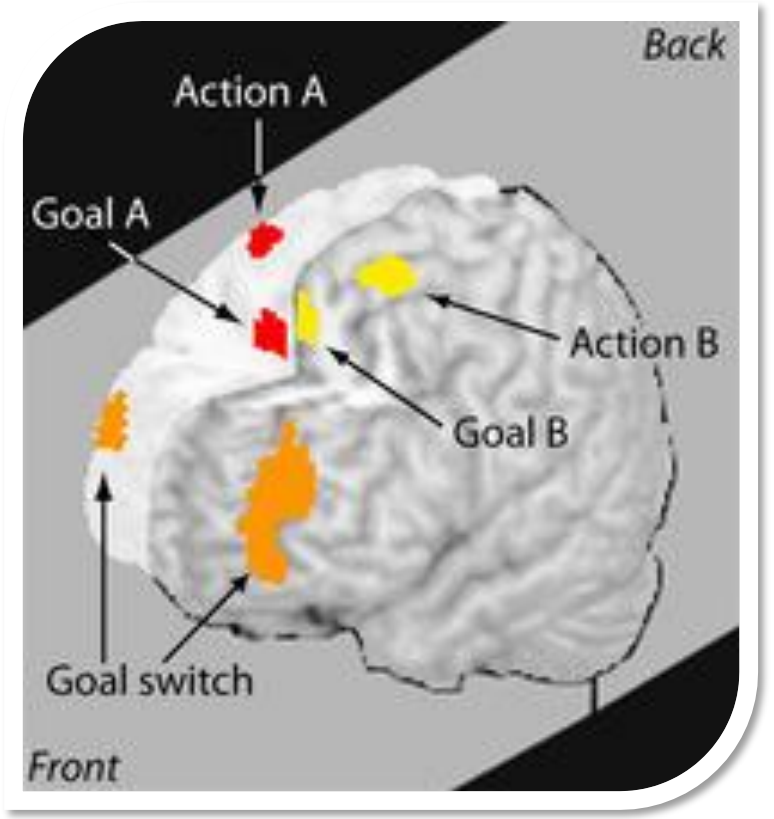
Multitasking in the Brain

Research suggests that chronic multitasking causes us to be:

- Suckers for irrelevancy
- Constantly distracted
- Shallower thinkers
- Error prone

Multitasking has also been linked to:

- Decline in fluid intelligence
- Greater brain atrophy
- Chronic stress



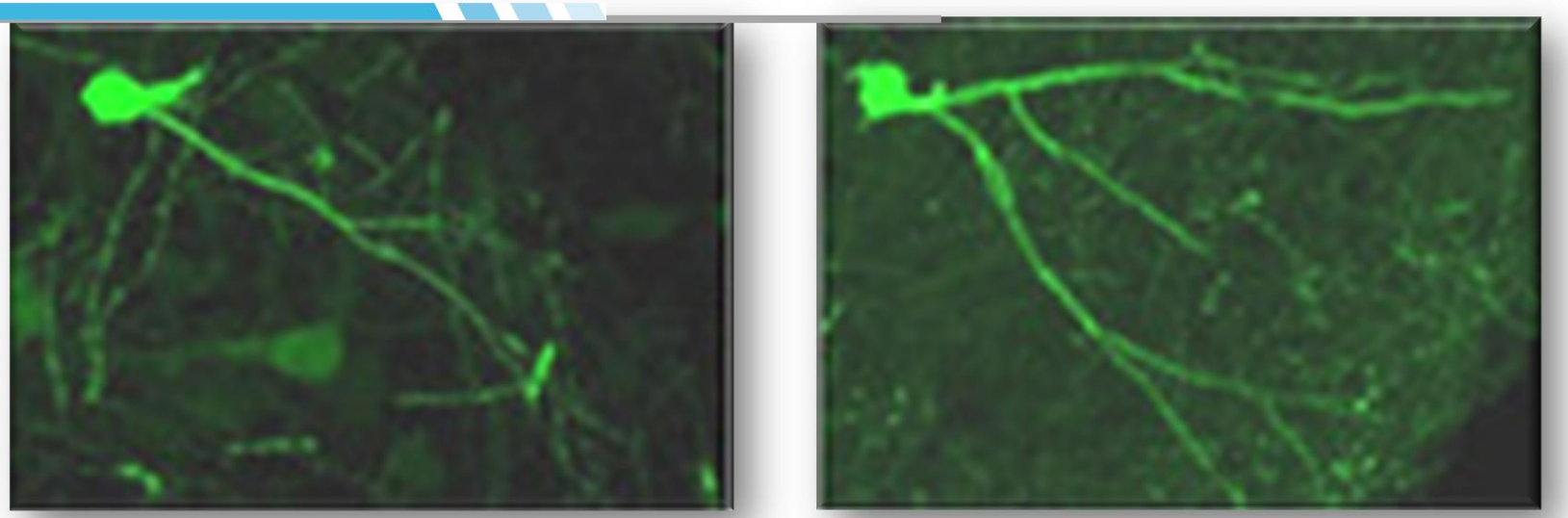
(Charron & Koechlin, 2010, Science)

How is technology *misuse* potentially impacting the brain in detrimental ways?

- Hindered memory/learning
- Elevated stress levels
- Lowered social cognition
- Increased isolation, depression, & agitation
- Interrupted sleep patterns

Uncapher, M., Lin, L., et al. (2017). Media multitasking is associated with cognitive, psychological, neural, and learning differences. Pediatrics: Official Journal of the AAP, 140, s62.

A Brain Under Chronic Stress



- Chronic stress reduces neuronal activity
- When a brain is stressed, it does not operate efficiently
- Associated with high incidence of depression, anxiety, and rage in the general population
- A brain exposed to chronic environmental stress is not as effective at learning new information or storing new learning in memory networks

AAP Recommendations

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

< 18 months: avoid use of screen media (other than video-chatting)

18-24 months: if desired, can begin to introduce high-quality programming and watch together

Ages 2-5 years: limit to 1 hour per day of high-quality programs (co-view to help them understand & apply to the world around them)

Ages 6 years and up:

- place consistent limits on time spent using media & types of media
- make sure media does not take the place of adequate sleep, physical activity & other behaviors essential to health
- designate media-free times together as well as media-free locations at home (e.g., bedrooms)
- have ongoing communication about online citizenship & safety, including treating others with respect online & offline

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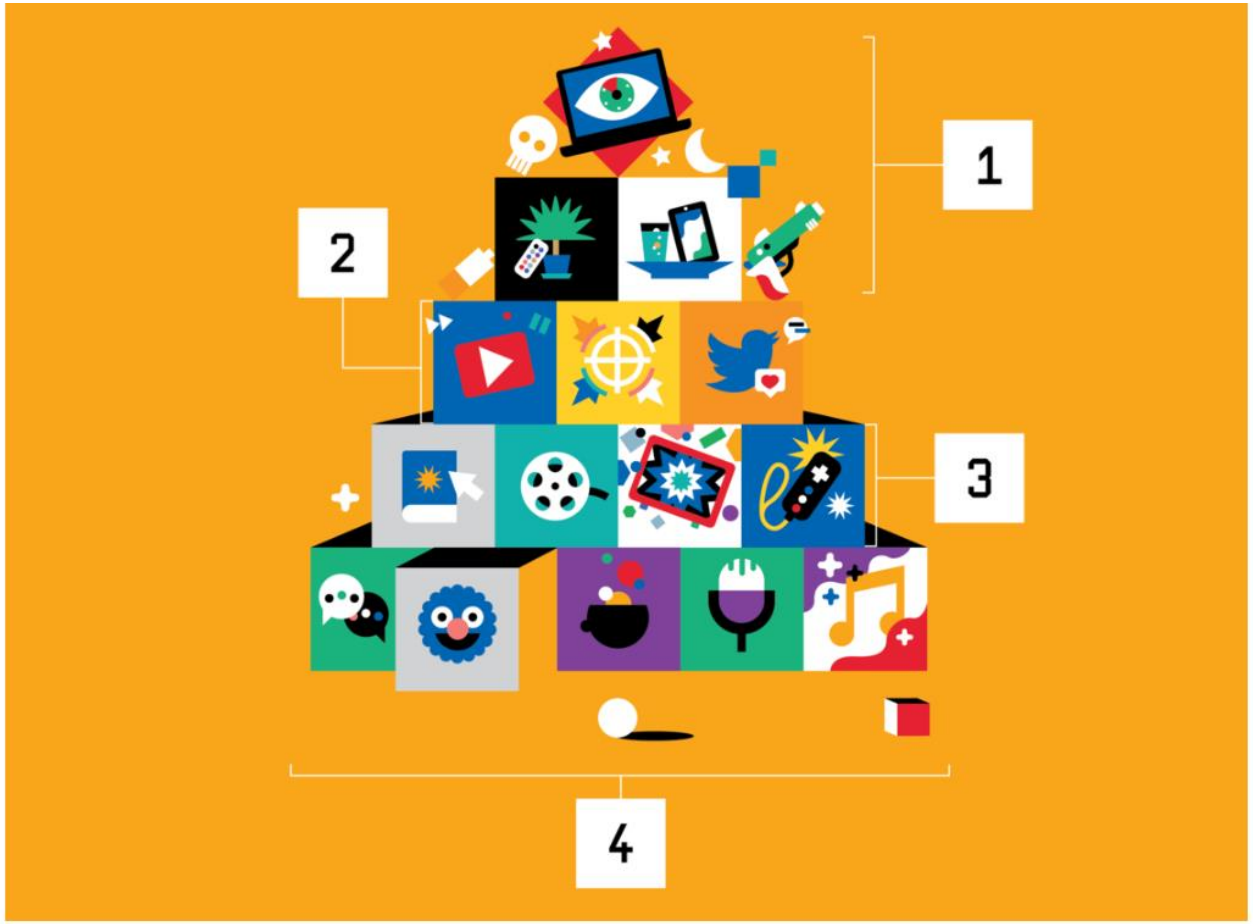
1. **Use Sparingly**
   - Screens before bed
   - Background TV
   - Screens during mealtime
2. **Use Occasionally**
   - YouTube
   - 1st person shooter videogames
   - Social media
3. **Use Moderately**
   - Interactive Ebooks
   - Movies/TV
   - Active TV/video
   - Active videogames
4. **Use Freely**
   - Video chats (family)
   - PBS co-viewing
   - Skill building/creating
   - Affinity groups
   - Music, audiobooks, podcasts

CAITLIN HARRINGTON CULTURE 05.20.19 08:00 AM

A FOOD PYRAMID FOR KIDS' MEDIA CONSUMPTION



DANIEL RAMIREZ PEREZ

SOURCES: MIMI ITO, CONNECTED LEARNING RESEARCH NETWORK; ANYA KAMENETZ, THE ART OF SCREEN TIME; CAROLINE KNORR, COMMON SENSE MEDIA; JENNY RADESKY, UNIVERSITY OF MICHIGAN MEDICAL SCHOOL; MICHAEL RICH, CENTER ON MEDIA AND CHILD HEALTH

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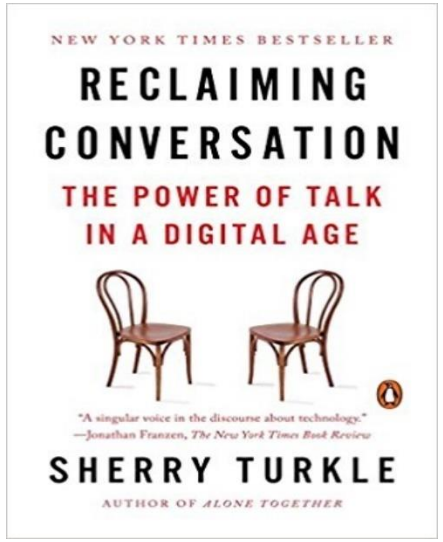
Homefront Suggestions

- Schedule technology-free times
- Keep TVs, computers, and charging stations out of the bedrooms
- Encourage setting priorities to help resist impulses
- Promote the idea of silencing electronics or ignoring the ‘ping’ of text messages
- Participate in activities that foster exercise, socialization, and time away from technology
- Be a role model!

We need to foster being good stewards of our technology tools



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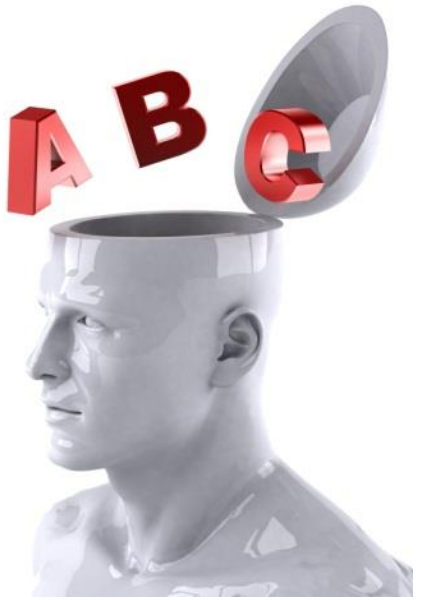
A brain rewired by technology: What Parents (& Educators) should consider

Does your student:

1. Procrastinate homework while spending time online?
2. Spend less face time with friends?
3. Have trouble sleeping?
4. Use online activity as an escape?



"Will the availability of technologies that can keep dopamine levels so high raise the threshold for what our brains deem rewarding in terms of relationships, studying, or working toward other long-term goals that may not have immediate reinforcements?" (Giedd, 2012)

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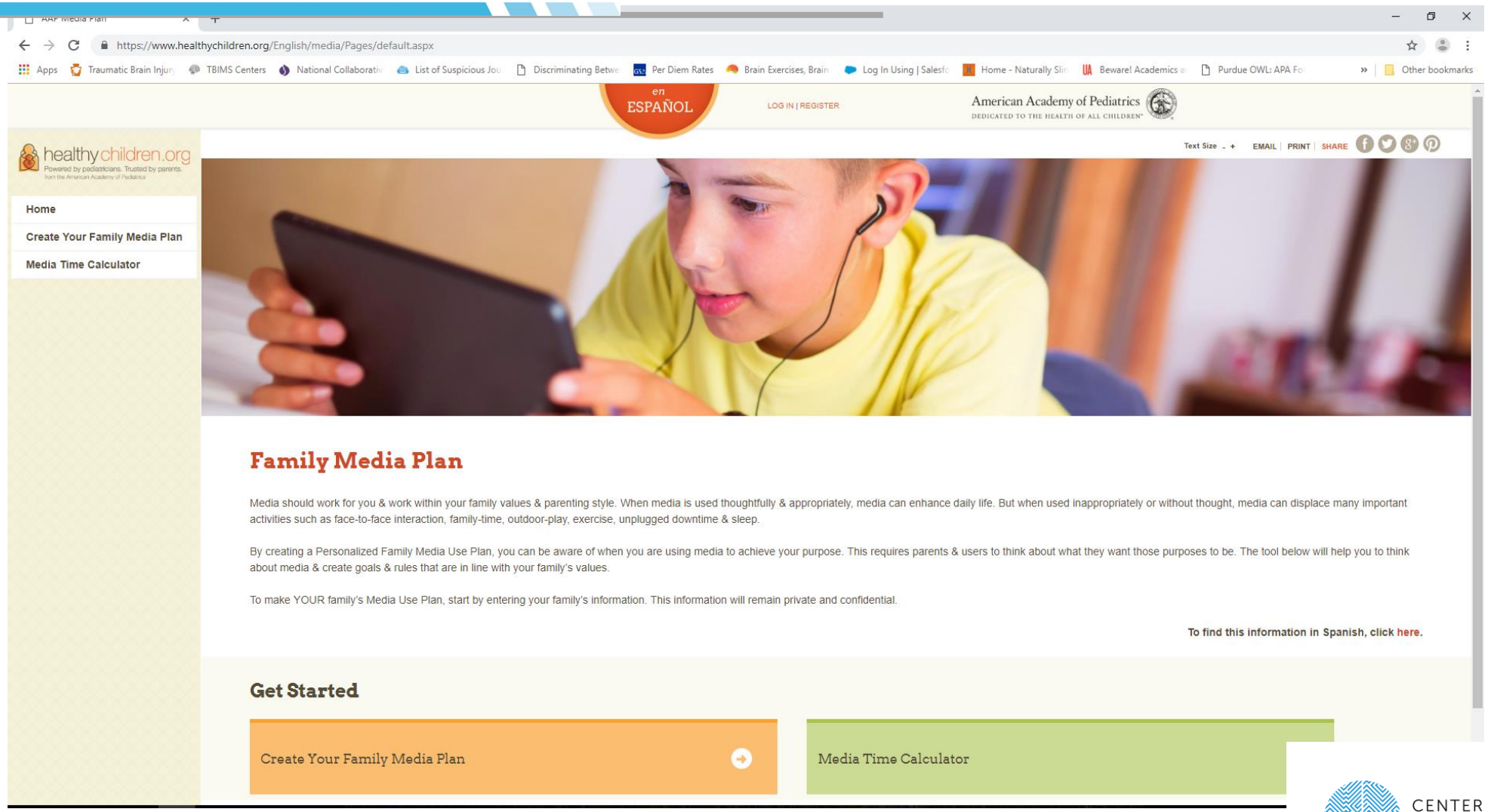
Create a Family Media Plan



https://www.healthychildren.org/English/media/Pages/default.aspx

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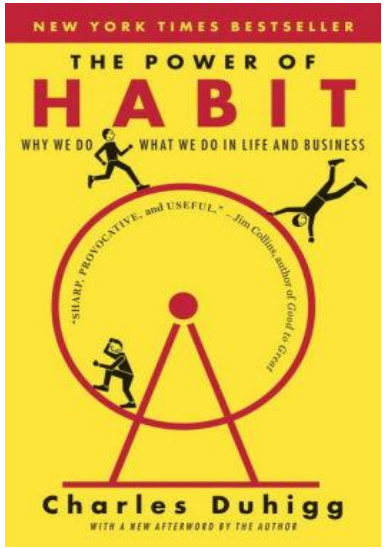
How can we empower & equip our students?

Help them enhance their metacognition

- Understanding the costs of task switching
  - Decreased learning
  - Increased time
  - Increased stress
- Monitoring their time with technology
- Strategies for enhancing strategic attention

(Rosen, 2016)



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Engage Their Metacognition

- The best place for me to study is _____ because _____.
- Some ways that I can avoid distractions while studying are _____.
- A good place for me to put my phone before a class or before studying is _____.
- If I use technology in class, some ways that I can make sure I don't get distracted are _____.

(Rosen, 2016)

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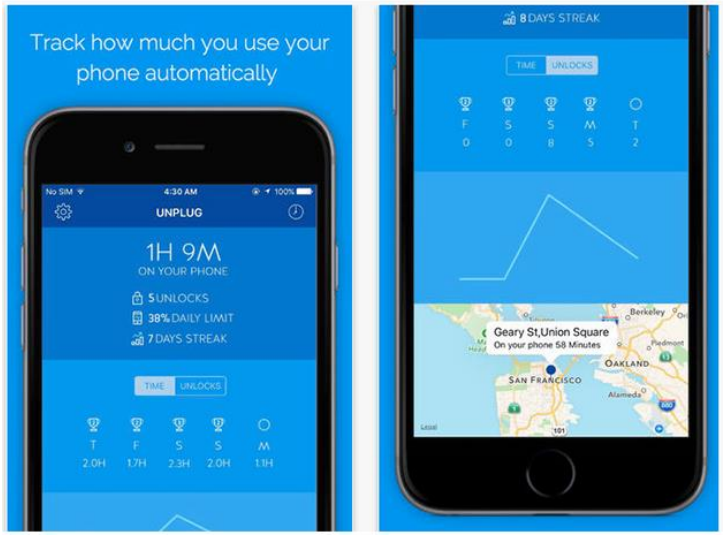
Get some zzz's!!!

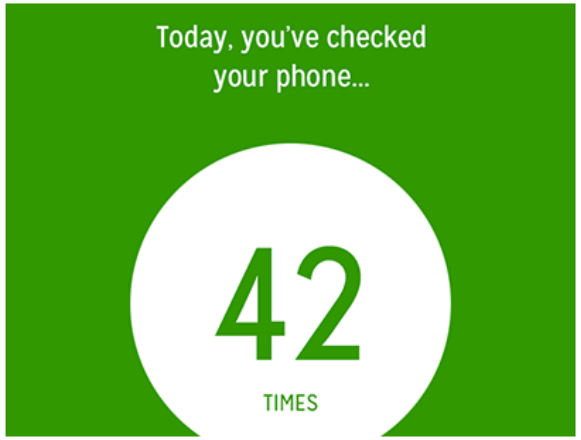
- Learn about the impact of poor sleep on learning and memory *(it's not good!)*
- Monitor sleep activities
- Turn off portable devices beginning one hour before bedtime
- Avoid FOMO: Alert others of your unavailability
- Consider going back to a traditional alarm clock
- Do not grab the phone the instant you wake up

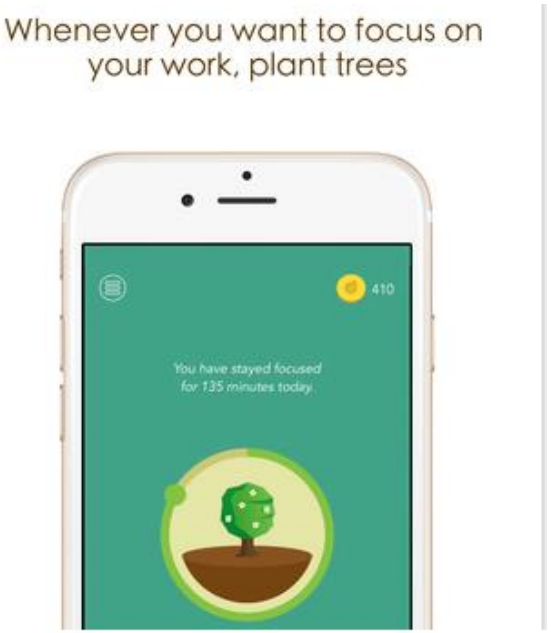
(Rosen, 2016)

“Gamify it!”

- Forest
- Checky
- SPACE
- UnPlugged
- Freedom
- SelfControl
- FocusMe
- KeepMeOut
- SuperBetter







SUPERBETTER

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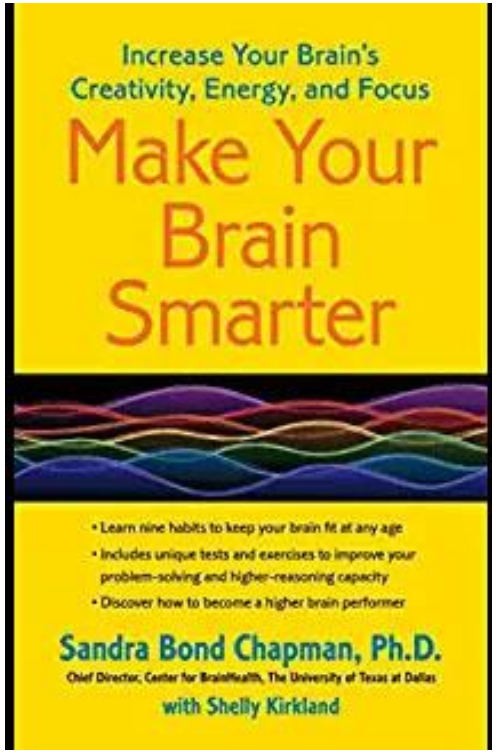
Remember the importance of the frontal lobes!

We want to engage with information in a way that builds strong frontal lobe function

- Strategic Attention
- Advanced Reasoning skills
  - Critical thinking
  - Judgment; Decision making
  - Problem Solving
- Dynamic & Innovative cognitive capacity



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Strategic Attention

Brain Power of Two

- Select the top two priorities from your to-do list
  - *Break bigger tasks into more manageable chunks*
- Calibrate your mental effort
  - *Identify your brain "prime time" and dedicate uninterrupted time to your elephants*

Strategic Attention

Brain Power of One

- Limit multitasking
  - *Sequence tasks one at a time versus toggling between multiple tasks simultaneously*
- Engage in filtering
  - *Block out unimportant information and eliminate distractions*
- Consider “interval training” for your important tasks

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Outcomes in TBI: Current Research

Brain Power of None

- Proactively recharge your brain throughout the day (5x5) with zero-effort “brain breaks”
- Take a break when you “hit a wall” mentally

“To attain knowledge, add things every day. To attain wisdom, subtract things every day.“
- Laozi, Chinese philosopher

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Recap: Strategic Attention Strategies

BRAINPOWER OF TWO

- Identify top two priorities each day
- Make the most of your brain “prime time”

BRAINPOWER OF ONE

- Tackle one thing at a time
- Reduce multitasking and eliminate distractions

BRAINPOWER OF NONE

- Proactively take 5-minute “brain breaks” (5x5) to recharge your battery

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Now What?

The What	The Why
Start single tasking	Multi-tasking tires the brain and activates stress hormones
Limit information	Information overload comes at the price of reduced efficiency
Detox distractions	Constant interruptions cause our brain to be addicted to interruptions
Think BIG!	The brain is overwhelmed by an over-focus on details; shift to the 10,000 foot view to get the big picture
Calibrate mental effort	Mental energy, like physical energy, can be depleted
Innovate	Stepping outside your routine is important to brain health
Motivate	Focusing on what motivates and matters increases your rate of learning

Promote Shift in Learning Engagement

Passive	to	Active
Casual		In-depth
Rote - verbatim		Transformed
Distracted		Focused intervals

Social/Emotional & Behavioral Functioning

The Behaviors You See…

- Are often hard to understand because the underlying deficit makes it difficult for the student to communicate, reason, and think flexibly!

- WILL NOT subside without helping to support the development of the lagging cognitive area and related social-emotional competencies

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5 Constructs of Social Learning

Acquire and effectively apply the knowledge, attitudes, and skills necessary to understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions.

Strategic Social Attention

Discourse

Theory of Mind

Expressive Reasoning

Transformation

CASEL Collaborative for Academic, Social, and Emotional Learning

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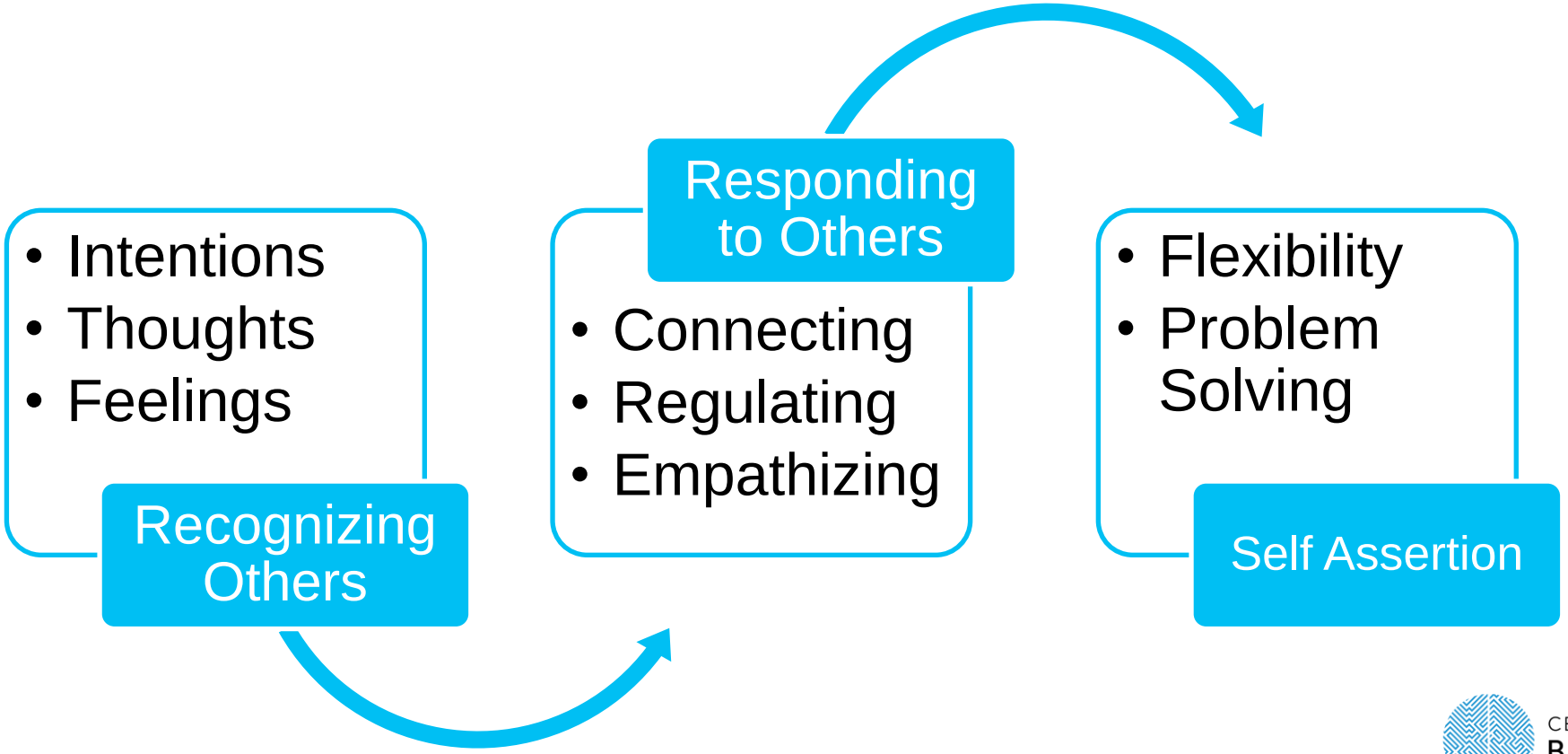
Characterizing & Building Social Learning

SOCIAL REASONING TRAINING + MOTIVATING VR =
POSITIVE BRAIN CHANGE



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Charisma™ – Youth Social Training

- 10 Session Training
- Computer-Based
- Strategy-Focused
- Research-Supported

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What It Can Look Like

Students are seen twice a week for 45 minutes each session across 5 weeks

We collect parent & teacher insight and concerns before & after training

Clinicians offer strategies and support to students, teachers, and parents

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Advantages of Virtual Learning Platform

- Practice of Real World Conversational Context
- Emotional Connection (Immersive)
- Controlled Environment
- Dynamic Practice
- Flexible / Customizable
- Safe to Fail
- Real-Time Feedback
- Record / Review
- Remote Capability
- Fun & Rewarding

"We live in a highly social world that puts more emphasis on knowing somebody than work or brain power. The best thing about this program is that it's a very low-stakes way to practice interacting in everyday ways with others. It provides five to six years of social training in just a few sessions."

CLARK THURSTON, *social cognition research participant*

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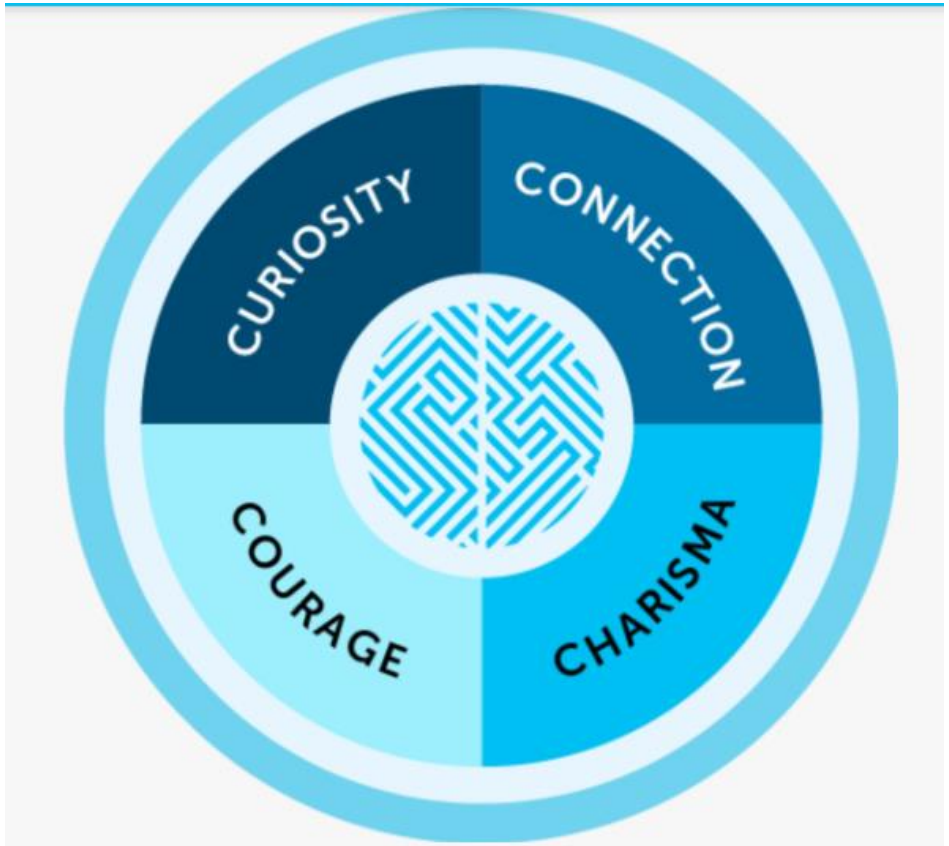
Charisma Objectives

CURIOSITY - Approach social environments with an open mind

CONNECTION - Stimulate powerful and meaningful conversations

COURAGE - Embrace social risks that drive relationships forward

CHARISMA - Envision the future and transform the status quo



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Social SMART Objectives

- To be goal-driven rather than reactive, using ongoing reflection of social self
  - Specific attention should be given in regard to *confidence & comfort*, progress toward personal goals, and evaluating when, why, and how social cognitive strategies are utilized
- To recognize the purpose of and/or build specific social relationships in own life
- To evaluate the social actions required to achieve a specific goal

Social SMART Strategy

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STRATEGIC ATTENTION

Improve focus and prioritize important social information

RECOGNIZE

INTEGRATED REASONING

Connect and customize social responses to make strong decisions

RESPOND

THRIVE w/ RESILIENCY

Assert Self with Confidence & Resiliency

SELF-ASSERT

Overall Benefits of VLE Social Cognition Training

- Improved social relationships and social flexibility
- Greater confidence and self-awareness
- Stronger recognition of others' feelings and perspectives

  - *Most show a 50-80% improvement in starting and maintaining a conversation*
  - *90% report improvement in their ability to recognize other's emotions*
  - *90% report improvement in understanding other points of view, and 75% double their scores*

- Johnson, Herron, Allen, Gould, & Chapman, under review

- Yang, Allen, Abdullahi, Pelphrey, Volkmar, & Chapman, 2017

- Didehbani, Allen, Kandalaft, Krawczyk, & Chapman, 2016

- Kandalaft, Didehbani, Krawczyk, Allen, & Chapman, 2013

- Kandalaft, Didehbani, Cullum, Krawczyk, Allen, Tamminga, & Chapman, 2012

Intervention: My Take-Home Messages

- **Be proactive, not reactive.** Because pediatric TBI can have a significant impact on new learning, a forward-thinking approach is crucial to empowering and equipping students for key transitions.
- **Build big-picture thinking.** The brain is better at extracting central meaning than storing details. Help students go “top down” to avoid getting lost in the details and missing the big picture as well as to minimize “information overload.”
- **Integrate to innovate.** Intervention approaches targeting higher-order, integrated skills (rather than discrete/isolated skills) have the potential to better impact overall cognitive performance and real-world functioning in the longer term.
- **Equip strategies in service of meaningful goals.** The brain’s plasticity provides much hope for facilitating positive change following brain injury throughout the lifespan. A functional, strategy-based approach to cognitive intervention is key to promoting global gains.

Key SMART References

Chapman, S.B., Aslan, S., Spence, J.S., Hart, J.J., Bartz, E.K., Didehbani, N., … Lu, H. (2015). Neural mechanisms of brain plasticity with complex cognitive training in healthy seniors. *Cerebral Cortex, 25*(2), 396-405. doi: 10.1093/cercor/bht234.

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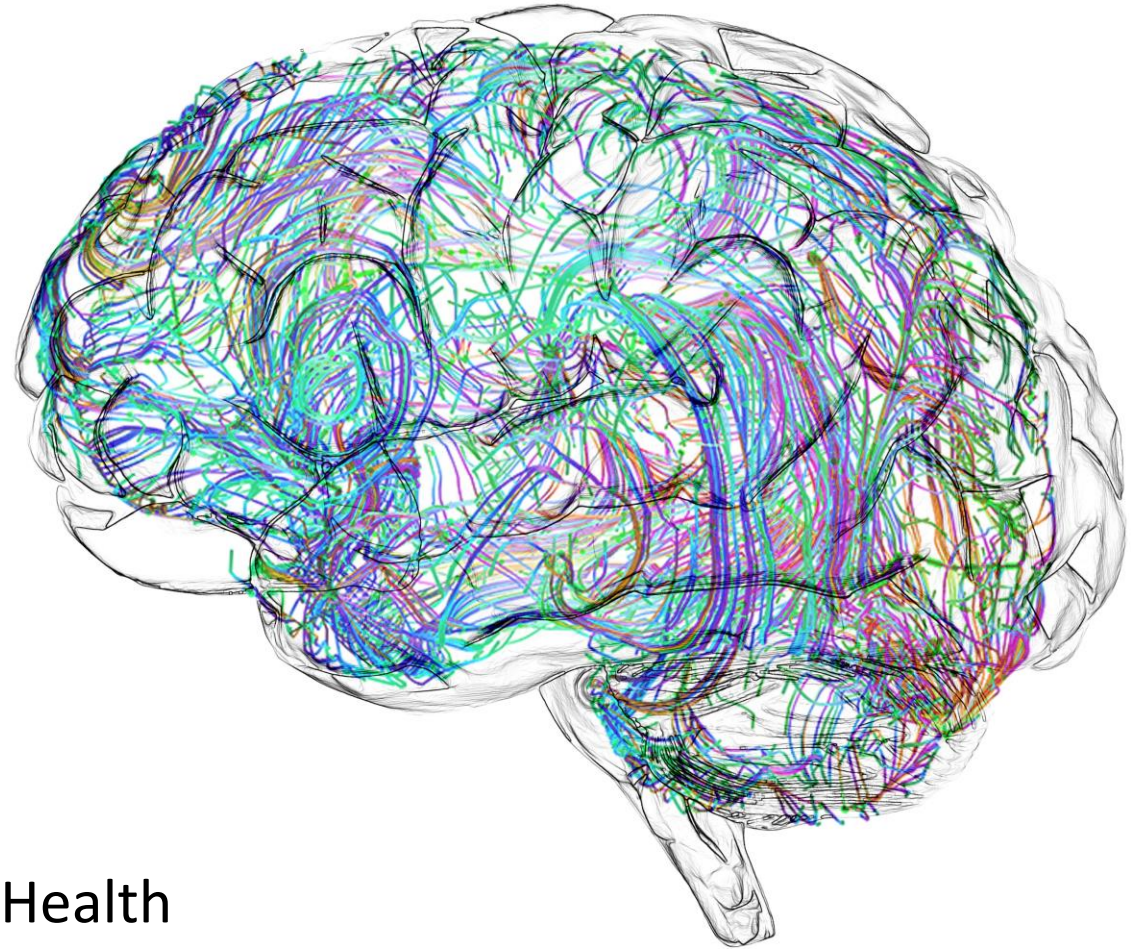
Questions?



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