Reach & Teach ADHD: Teacher Professional Development

CHERI: Hippocrates Socrates XII, Sep 5-6, 2007
Rosemary Tannock, PhD.
Overview of Presentation

• A rationale for classroom-focused intervention
  – High-risk triad: inattention, poor working memory, poor academic outcomes

• Delineate & review 2 major approaches to educational intervention for ADHD/Inattention
  – student focused; teacher-focused

• Describe our ongoing teacher professional development program on ADHD, which targets inattention and poor working memory
Why is it important to provide Teacher Professional Development about ADHD?

4 reasons...
1. ADHD impedes Academic Attainment

<table>
<thead>
<tr>
<th>Educational Outcome</th>
<th>ADHD vs Peer Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low achievement at school</td>
<td></td>
</tr>
<tr>
<td>Grade repetition(^1,2)</td>
<td>2-fold risk</td>
</tr>
<tr>
<td>Low academic grades (C’s/D’s)(^3)</td>
<td>2- to 4-fold risk</td>
</tr>
<tr>
<td>Achievement scores (reading, mathematics)(^1-3,)</td>
<td>8%-10% lower</td>
</tr>
<tr>
<td>23(^{rd}) percentile (^5) (low average)</td>
<td></td>
</tr>
<tr>
<td>Early school leaving(^4)</td>
<td>1 year lower</td>
</tr>
<tr>
<td>Highest level completed</td>
<td></td>
</tr>
<tr>
<td>Tertiary level attainment (college)(^5)</td>
<td>lower GPA</td>
</tr>
<tr>
<td>College GPA</td>
<td></td>
</tr>
</tbody>
</table>

2. ADHD & its cognitive impairments impede school functioning

- Children with ADHD and poor executive function (EF) perform more poorly academically than children with ADHD alone (1)

- ADHD symptoms predict poor social and school functioning; EF predicts poor school functioning (2)

- Children with poor EF (irrespective of ADHD) show poor social functioning (3)

- EF impairments in ADHD are stable & persist into adulthood, particularly poor working memory (4)

The Risk Triad

- Inattention
- Working Memory Impairments
- Slow processing speed
- Academic Impairments

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## Working memory at school

<table>
<thead>
<tr>
<th>Age</th>
<th>Working memory is needed for</th>
<th>Indicators of working memory problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-school</td>
<td>Learning the alphabet, Completing a puzzle, Following instructions</td>
<td>Problems in learning, Avoids, can’t complete, Forgets, gets distracted</td>
</tr>
<tr>
<td>Elementary School</td>
<td>Reading comprehension, Mental arithmetic, Writing a story</td>
<td>Didn’t understand the connections, Forgets one of the numbers, Misses parts, disorganized</td>
</tr>
<tr>
<td>Middle school</td>
<td>Participating in group project, Complex word problems</td>
<td>Doesn’t listen or participate, Unable to grasp/breakdown word problems</td>
</tr>
<tr>
<td>High School</td>
<td>Writing essays, Note-taking during a lecture</td>
<td>Essays are disorganized, incoherent, Unable to take coherent notes while listening</td>
</tr>
</tbody>
</table>
3. Teachers make a difference

- Teachers are well-placed to identify unrecognized ADHD\(^1\)-\(^2\)
  - Daily contact with children
  - Symptoms & impairment readily observable
  - Often the first to suggest referral

- Teachers are in a position to act as “central change agents” in the classroom and reduce risk by promoting academic success and mental health in at-risk children\(^3\)

- Quality of teaching is the key determinant of students’ cognitive, affective, and behavioral outcomes of schooling\(^4\)

4. Teachers are inadequately informed about ADHD, EF

• Teachers typically have limited knowledge about ADHD, executive functioning, and their effects on school functioning

• Teachers cite lack of training as one of the major barriers to providing effective instruction for students with ADHD

• According to teachers in the USA, the most important topics for inservice education is ADHD and implementation of behavior plans
Implications for Intervention

- Need to think of inattentive behavior and poor working memory as RISK indicator for academic problems.

- Need to ensure intervention addresses both inattention and working memory in the academic context: i.e., in classroom instruction.
Current approaches to ADHD in school settings emphasize behavioral management

Are they effective?
**Classroom-based Behavioral Intervention**

**Barkley et al., J Child Psychol Psychiat 41(3) 319-342, 2000**

**Shelton et al., J Abnorm Child Psychol 28(30) 253-266, 2000**

158 Kindergarten children
At registration for US public school system
Highly aggressive, hyperactive, impulsive, inattention

**Treatment duration: 1 School Year**

- **No Treatment**
- **Parent Training**
- **Treatment Classroom**
- **Combined PT/TC**

**Post-Treatment**

- **No effects**
  - (Poor attendance)

**No Effects: All had**
- **behavior problems at**
  - home/school
- **academic achievement**
  - Compared to community controls

**2-year Post-treatment**

**Improved:**
- Teacher-rated attention, aggression, self-control, social
- Obs. externalizing class-behavior

**No Effects:**
- Academic achievement
- Parent ratings home behavior
- Lab measures M-C interaction, attention, impulse control

**No Effects: All had**
- behavior problems at
  - home/school

**Compared to community controls**

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Multi-Modal Intervention for ADHD
MTA Cooperative Group 1999

- ~ 600 children
- Combined Type ADHD

Treatment duration: 14 months

1. Community Treatment
2. Psychosocial Treatment
3. Managed Medication
4. Combined Psych/Meds

Positive effects on ADHD Symptoms:
- Managed Medication
- Combined Psych/Meds

> Psychosocial Treatment

Community Treatment

No substantial effects on academic achievement
Consequent-based strategies

- Manipulation of events that occur after a target behavior in an attempt to either
  - increase the probability that adaptive responding will occur, or
  - decrease the probability that problematic behavior will occur
Concentrating, Matt!

Time

1  2  3  4  5  6  7  8  9  10

Intended Target

Actual Target

Consequential approaches may be limited by poor working memory capacity!

Great job concentrating, Matt!
Antecedent-based strategies

- Involve manipulation of events that precede the target behavior in an attempt to increase probability that an alternative, more appropriate behavior will be exhibited (and decrease likelihood of problematic behavior from occurring)
Prompt for Target Behavior

Concentrating

Praise approximations

Ignore

Antecedent /at-point-of-performance approaches will be more effective

Time

1  2  3  4  5  6  7  8  9  10
Educational Interventions for Inattention &/or WM

Child-Focused
- General Attention-Training
- Specific Attention-Training
- Working Memory Training

Teacher-Focused
- Knowledge, Awareness, Identification
- Instructional Strategies
- Hybrid
General Behavioral Attentional Training: Impact of pre-teaching attention skills prior to specific intervention program


• Sample: 4- & 5-year olds in Head Start
• Intervention focusing on phonemic awareness
• Pre-teaching of attention skills enhanced efficacy of both intervention programs
Attention Process Training

  - 14 children with ADHD: 7 exp. 7 control
  - “Pay Attention!” materials (Thomson et al, 1994)
    • Focused, sustained, selective, alternating, dividing attention
    • graduated difficulty
  - 30 min, twice weekly, for 8 weeks

- Experimental group improved in non-trained measures of attention & academic efficiency
- But no changes in parent/teacher ratings of inattention
Examples of Pay Attention Training Activities

1. Visual sustained attention
   - card sort by single (color, hat/nohat) or multiple features (specific hair color)
   - audiotape: press response button when hear target(s); slow vs fast pace

2. Selective attention
   - audiotape: as above but with distracting noise

3. Divided attention
   - card sort: place cards with specific features in correct stack and face down
   - card sort task plus audiotape task
Attention Process Training as adjunct to Literacy Instruction
Chenault et al (2006: Dev Neuropsychol)

– 20 children (Gr 4-6) with dyslexia
– randomized to attention training (Pay Attention!) or reading fluency group: 10 x 25-min individual sessions
– Both groups then received 10 x 55-min group writing instruction lessons with attention bridges
– Pre-training attention resulted in more rapid gains in oral and written fluency following the writing intervention.
– Effects on inattentive behavior unknown
Progressive attentional training
Shalev, Tsal, Mevorach, Child Neuropsychol, 2007

• Computerized progressive attentional training: randomized controlled trial
  – Posner & Petersen’s theory of attention networks:
    • vigilance, visual orienting, executive attention

• 20 ADHD: CPAT for 8 weeks (2 x 1-hr/week)
• 16 ADHD: Computer games (same schedule)
  – All children 6-13 yrs (mean age = 9 yrs)
CPAT reduces inattentive behavior,
Shalev, Tsal, Mevorach, *Child Neuropsychol*, 2007

**Figure 2** Mean pre- and posttraining scores (± s.e.m.) on the behavioral rating scale for experimental and control participants. The Y-axis represents the cumulative score of symptoms on each factor: a. Inattentive symptoms. b. Hyperactive-impulsive symptoms.
CPAT enhances academic outcomes in children with ADHD
Shalev, Tsal, Mevorach, *Child Neuropsychol*, 2007

*Figure 1* Mean pre- and posttraining measures (± s.e.m.) of academic performance for experimental and control participants. a. Proportion of correct answers in math exercises. b. Number of copied words per second. c. Proportion of correct answers in reading comprehension.
Computerized Cognitive Training of Working Memory in Children with ADHD

Klingberg, T (MD, PhD), et al. Karolinska Institute, Stockholm, Sweden

- a Controlled, Randomized, Double-blind Trial

Computer program (RoboMemo®, from Cogmed Cognitive Medical Systems AB, Stockholm, Sweden (www.cogmed.com). Practice: 25 sessions, each 45 mins

(Comparison condition identical to the treatment - but difficulty of the WM trials remained on the initial low level)

Level of difficulty increases as working memory improves,

Robot guides child through the exercises

Reward: robo- racing game at end of each session

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RESULTS:

Working memory training improved:
1. Parent ratings of Inattention, hyp/imp
2. Digit span, for at least 6-mos
Educational Interventions for Inattention &/or WM

Child-Focused
- General Attention-Training
- Specific Attention-Training
- Working Memory Training

Teacher-Focused
- Knowledge, Awareness, Identification
- Instructional Strategies
- Hybrid
Impact of screening & information on ADHD on child outcome & teacher quality of life


• 2040 schools & 23 local education authorities (LEA)
• Randomized to Interventions at LEA or School level upon school entry at age 4
  – Screening for ADHD &/or Information book on ADHD for teachers
• Outcomes at end Year 1 (age 5) & Year 2 (age 6-7)

• No effects of Screening or Intervention at LEA level
• Providing teachers with information book on ADHD
  – enhanced teachers’ reported quality of life &
  – Improved behavior and attitudes towards school and reading in students with ADHD
  – Cost effective
Teacher Professional Development program on ADHD

- RCT to determine effects of a series of training sessions for teachers (8 x 3hrs, at a rate of 2 sessions/month) that focused on behavior modification, cognitive behavioral strategies, instructional management strategies

- *Marked reduction in ADHD symptoms, plus improved academic test scores*

  Miranda et al, *J Learn Disabil* 2002
Teacher Professional Development on Auditory Processing

• Teachers were taught how to:
  – assess a student’s ability to process & remember verbal information
  – adapt their communication strategies
    • Catch child’s attention; speak slowly & chunk information; maintain eye contact & wait for compliance; repeat information if required; use routines & visual cues

• Children showed improvements in:
  – literacy outcomes
  – behavior
  – Improvements persisted over several years

Rowe KJ: 2003 Australian Council for Educational Research
TeachADHD

www.teachadhd.ca

Rosemary Tannock,
Rhonda Martinussen, Peter Chaban
and Alison McInnes
In collaboration with

Drs Bruce Ferguson & Hetherington of HSC Community Health Systems Resource Group,
York University’s ABEL Program
Dr Declan Quinn, University of Saskatchewan, & Tall Pines School, Mississauga, ON

Funding from: NIMH, CIHR, TVOntario, HSC, Shire
Development of Multi-Media Materials

- Three videos on 1 DVD
  1. ABC’s of ADHD
  2. Taking a Closer Look at the Symptoms of ADHD
  3. Teaching Children with ADHD
- Comprehensive Teacher Resource Manual
- Website: www.teachadhd.ca
- Training program – series of workshops using above resources as training materials
Effect of matching cognitive load to student’s level

• Increases explicitness of instruction
• Increases student engagement
  – Student has specific tools to work with
• Increases opportunities for evaluation
  – By using strategies or instructional supports, is the student
    • Gaining skills?
    • Completing more work?
    • Becoming more independent?
Pay attention to inattention

• “the simple act of paying attention produces real and powerful changes in the brain”

• Promote children’s attention by…
  – Collective engagement (whole class, with pre-teaching weaker students if needed)
  – Start lesson with activity that weaker students can complete successfully: monitor & adjust language as needed; verify success before proceeding
  – Raising the bar incrementally
    • Break down the task into small steps
    • Explicit instruction
    • Extend the pattern: graduated challenges
    • Monitor memory
Big Ideas

• Explicitness
  – Structure tasks, provide clear goals, teach steps, provide checklists, organizers

• Engagement
  – Increased opportunities to respond, vary group size

• Emotional support
  – Encouragement, feedback – specific and clear

• Evaluation
  – Is the child making gains? Under what situations/contexts is improvement observed?
Instructional Planning Process

- Curriculum
- Reflection And Analysis
- Student Profile

Instructional Choices
- Learning Context
- Instructional Supports
- Instructional Language
- Student Learning Strategies
Task analysis: Writing an explanation paragraph

• What are the preskills?
  – Ability to transcribe oral to written
  – Spelling
  – Genre knowledge- structure of a explanation paragraph
  – Knowledge of how to plan, edit, and revise

• What are the cognitive demands?
  – High levels of executive control to coordinate various processes
  – Sustained attention, working memory
• The learning context describes the learning situation

Goals: We want to:
• Actively Engage students
• Provide Frequent feedback to student
• Provide opportunities for dialogue
• Varying instructional groups (e.g., large group, One to One Teaching)

Need to consider:
• Instructional objectives
• Teacher’s Instructional Role (how explicit or direct)
• Class Grouping (may depend upon status of unit)
• Activity Scheduling (flow)
Teaching How to Write an Explanation Paragraph

• What options – whole class, partner, small group?
• How could you ensure greater engagement and feedback?
• How could you provide explicit instruction in the task?
Instructional language refers to the language the child must understand and use during learning.

**Goals**
- Reduce cognitive load
- Reduce level of inference
- Promote teacher sensitivity to classroom language use

**How to accomplish:**
- Gain attention, shorten/chunk, pause, repeat (Rowe and Rowe)
- Support Conceptual words
Language Issues in Writing

Lesson

• Types of Vocabulary – topic sentence, first, next, last, concluding sentence, plan, revise,
  – How do you explain these terms concretely?

• Instructions for student work – how to scaffold so student comprehends task

• Other issues?
Instructional Supports

- Also known as “Accommodations”
- Teaching techniques
- Concrete tools
Teaching Techniques

- Modelling: Think aloud demonstrations
- Offering Explanations: Providing guided practice
- Ordering & Sequencing Information, Giving examples
- Modifying task difficulty or reducing amount of information presented at one time
- Providing prompts, cues, supportive questioning, supportive feedback
Concrete tools

Visual & memory aids:
- Posters, drawings, manipulatives,
- Think sheets, checklists,
- Mnemonics, charts

Content Organizers:
- Graphic or advance organizers,
- Semantic webs

Technological & Media Aids:
- Word processors, assistive technology
- Tape-recorders, Multimedia, films,
Student Learning Strategies

• Techniques and strategies that help students learn more efficiently and effectively

• Strategy: A plan of action, a systematic method or steps for accomplishing a goal

• Strategies are action based:
A writing example (Reid & Ortiz-Lienemann, 2006)

• Taught 3 students with ADHD strategies to improving writing outcomes

• Baseline writing
  – 3 out of 7 story parts included in narratives (highly variable)
  – Quality ratings between 1-2 out of 7
  – Poor output
After Students Taught Specific Strategies

• Improvements found in
  – Number of story parts
  – Number of words –doubled for most students
  – Quality Ratings
Thinking about teaching math

- You walk into a service centre (e.g., bank, passport office) and have to take a ticket with a number
- The Indicator Board flashes “#122” and that ticket holder goes to the counter to be served
- You hold ticket “# 255”
- How many people are there in front of you waiting to be served?

133  132

2\textsuperscript{nd} versus 5\textsuperscript{th} in line
Recognizing patterns:
9-times table

<table>
<thead>
<tr>
<th>Number</th>
<th>9 x</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>09</td>
<td>1</td>
<td>09</td>
</tr>
<tr>
<td>18</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>27</td>
<td>3</td>
<td>27</td>
</tr>
<tr>
<td>36</td>
<td>4</td>
<td>36</td>
</tr>
<tr>
<td>45</td>
<td>5</td>
<td>45</td>
</tr>
<tr>
<td>90</td>
<td>10</td>
<td>90</td>
</tr>
</tbody>
</table>

If ¼ + ¼ = 2/4, what does ¼ + ¼ + ¼ equal?
A school has organized a school trip; the students will visit a nature park where they will see plants and animals. All the students will go on this outing. In the school there are 12 classes of 23 students each. In addition, 27 teachers will go with them. The students are very excited because they will be able to see some wild animals.

How many people will go on this trip?

- **Find what you are solving for**
  - Underline the question
  - Box key words (all of the students, in addition teachers)
- **Ask what is the important information**
  - Find & circle the number phrases
- **Set up the equation**
  - 12 classes each with 23 students and 27 teachers
- **Tie down the sign**
  - \((12 \times 23) + 27\)
Evaluation of knowledge translation work

- Funding from Ontario Provincial Centre of Excellence for Child & Youth Mental Health
  - Collaboration with Bluewater District School Board & York University’s ABEL Program
  - Randomized Controlled Trial of sustainable Teacher PD using TeachADHD materials
  - Participants: 8 schools, 32 teachers, 144 children
- Primary endpoints:
  - Teacher knowledge about ADHD
  - Teacher’s use of effective teaching practices
  - Child’s school behavior & academic function
Summary of Main Points

• Persistent and marked inattention in childhood is a developmental risk factor for poor academic outcome

• Inattention predicts poor response to educational intervention

• Need to target & monitor both the behavioral symptoms of inattention & underlying cognitive difficulties to enhance academic outcomes of inattentive students
Pay Attention to Inattention

• Tier 1 Intervention - for all students
  ➢ Teacher-focused
  ➢ Knowledge about inattention & underlying cognitive problems
  ➢ Instructional strategies

• Tier 2 Intervention - more intensive for small groups or individual students
  ➢ Student-focused
  ➢ (Teacher) Instructional Strategies
RESOURCES FOR YOUR CLINICAL PRACTICE


• CHADD Educators Manual (2006)
  For purchase: [www.chadd.org](http://www.chadd.org)

• TeachADHD Resources (Teacher’s Resource Manual, Videoclips: all public domain)
  [www.teachadhd.ca](http://www.teachadhd.ca)
“Tell me and I'll forget; Show me and I may remember; Involve me and I'll understand.”

Chinese Proverb
Thank you for your attention!
Time for Questions & Discussion
Thinking about teaching math

- You walk into a service centre (e.g., bank, passport office) and have to take a ticket with a number.
- The Indicator Board flashes “#122” and that ticket holder goes to the counter to be served.
- You hold ticket “# 255”.
- How many people are there in front of you waiting to be served?

   ![Image of people in a queue]

   133 132

   2nd versus 5th in line
Recognizing patterns:
9-times table

<table>
<thead>
<tr>
<th>09</th>
<th>9 x 1 = 09</th>
<th>9 x 7 = 6 -</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>9 x 2 = 18</td>
<td>9 x 4 = - -</td>
</tr>
<tr>
<td>27</td>
<td>9 x 3 = 27</td>
<td>9 x 8 = - -</td>
</tr>
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<td>36</td>
<td>9 x 4 = 36</td>
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<tr>
<td>45</td>
<td>9 x 5 = 45</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>9 x 10 = 90</td>
<td></td>
</tr>
</tbody>
</table>

If $\frac{1}{4} + \frac{1}{4} = \frac{2}{4}$, what does $\frac{1}{4} + \frac{1}{4} + \frac{1}{4}$ equal?

Counting on

“6 + 1”
“Say 6 with fist closed”
“Then say number that comes after 6 while raising 1 finger”

“17 + 1”
“23 + 1”
“35 + 1”

“6 + 2”
“Say 6 with fist closed. Raise 2 fingers as count on from 6”

“18 + 2”

09 18 27 36 45
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