

Effects of Combined Pharmacological & academic intervention for children with ADHD + comorbid dyslexia

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Overview of Presentation

- **Rationale**
 - for intervention for ADHD+Dyslexia
- **Study Objectives & Design**
 - Academic Remedial Programs, medication
- **Results:**
 - Major findings

Attention-Deficit/Hyperactivity Disorder



“Behavioral disorder” - Diagnosis based solely on 6/9 observable behavioral features of Inattention &/or Hyperactivity/Impulsivity

Symptoms: developmentally inappropriate, impairing, onset before age 7, persistent, cross-situational

- High prevalence: conservatively estimated to occur in 5-9% (17%) in school-age population
- High heritability
- Documented anomalies in brain structure, function chemistry: but no specific neural signature
- Documented deficits in executive functions (response inhibition, working memory) but no specific neurocognitive signature

Reading Disabilities (RD)

Unexpected failure to learn the code used by one's own culture for representing speech (*units of sound – phonemes*) as a series of distinctive visual symbols (*graphemes*)- in otherwise normally developing children.

- High prevalence: 5-15% estimated for the school-age population.
- Solid evidence of heritability.
- Known neurobiological substrates.
- **Signature neurocognitive deficits: universal**
 - Speech/Language: Inability to manipulate individual speech sounds in words (“phonological awareness”).

What is dog without the d? “ob”
 What is tip without the t? “it”
 What is the first sound in wish? “s”
 What does ‘b-r-i-ck’ say? “birk”

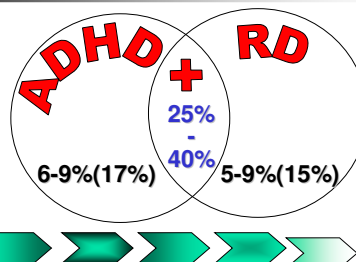
Impact of orthographic consistency in children's accuracy (% correct) of word decoding at end Grade 1

[Data from: Seymour, Aro, Erskine, 2003]

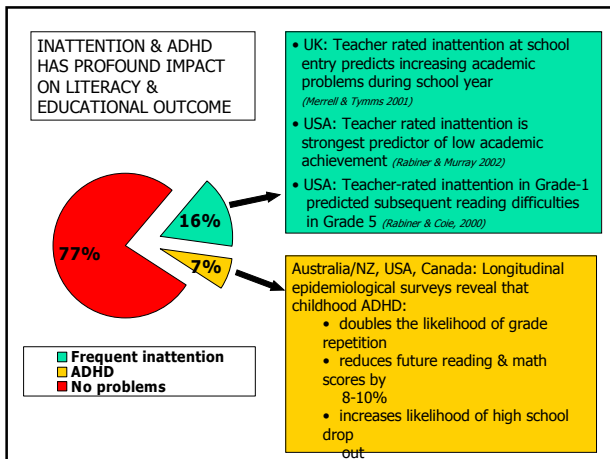
Language	Familiar real words	Pseudowords
German	98	94
Italian	95	89
Norwegian	92	91
English (scottish)	34	29

Conclusion: a universal neurocognitive basis for dyslexia: cross-cultural differences are due to varying degrees of inconsistency of different orthographies

Why worry about intervention for ADHD+RD?



Developmental Outcomes worse than for either disorder alone



Limitations of current treatment approaches for ADHD

Pharmacological treatment (+/- behavioral treatment) improves behavioral symptoms...

but...

no robust evidence to date that it mitigates the negative academic consequences of ADHD (+/-RD)

Limitations of current intervention approaches for RD

Robust evidence that intense, systematic, individualized instruction that targets the deficits in phonological awareness and use of metacognitive strategies improves reading

but...

Does not normalize reading : no robust evidence to date that it enhances the fluency of word decoding or reading comprehension.

Also no evidence that reading instruction has any impact of behavioral symptoms of ADHD

Intervention needs for ADHD+RD: critical points

treatment for ADHD+RD will need to consider co-existing problems in this population:

- executive function
- phonological processing
- language comprehension & expression
- metacognitive strategies
- as well as behavioral problems (particularly inattention)

Published RCTs for ADHD+RD (n=2)

- **Richardson et al., 1988**
 - Combined MPH & specific reading remediation (n=42)
 - 24 weekly individual sessions with teacher, plus daily home practice with parents)
 - treatment effects on reading were small, indirect and mediated through behavioral control,
 - but *no effects on the core phonological processing deficits* in these children.

Existing RCTs for ADHD+RD cont.

- Aro et al., 1999
 - Investigated how ADHD symptoms influenced treatment outcome for LD (33% had ADHD+LD)
 - Neurocognitive training versus homework assistance & reading exercises
 - 76 hrs (2-hr group sessions 1/week for 9 mos)
 - Results
 - Both groups improved in reading
 - Improvements in inattention in the ADHD+LD group were related to improvements in reading and writing
 - high initial level of hyperactivity associated with treatment-induced improvements in mathematics (but not in reading).

School-based reading program for young children with inattention &/or reading problems (Rabiner et al: J Abnormal Child Psychology 32(3), 2004)

- Objectives:
 - to determine whether inattention moderates the impact of tutoring in reading
- Sample:
 - Grade 1 students from *Fast Track* project on development & prevention of conduct problems
- Intervention:
 - Tutoring in initial reading skills (3x 30 min/week)
 - PATH Lessons (2-3/week: recognizing & labelling emotions; friendship skills; self-control skills; social-problem solving skills)
 - Also, high-risk subset received parent group & child social skills training
- Outcome measures:
 - Inattention at end Grade 1 (ADHD Rating Scale)
 - Reading (standard score on letter-word, word attack)

Results

school-based reading program for young children with inattention &/or reading problems (Rabiner et al: J Abnormal Child Psychology 32(3), 2004)

- Inattention predicts reduced Grade-1 reading achievement even after controlling for IQ and earlier reading ability
- Intervention had...
 - **Substantial** reading gains for children with reading problems but not inattentive
 - **Moderate** reading gains for inattentive children without reading problems
 - **NO** effects on children who were both inattentive *and* poor early readers

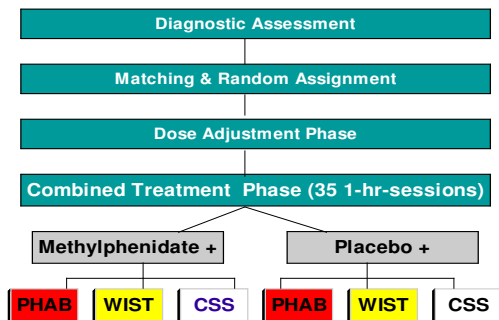
Challenges for helping children with comorbid ADHD+RD

- Growing evidence of effective treatment for ADHD or RD alone, but no credible evidence of effective treatment for ADHD+RD
- Children with ADHD+RD at risk for being treated ineffectively even by best available treatments for separate conditions of ADHD, RD...because they are typically provided independently and in disjointed manner by health & education agencies, respectively.

Study Objectives

- * Evaluate relative efficacy of **reading instruction versus social/cognitive strategy training**, for reading & behavioral difficulties in children with ADHD+RD
- * Determine relative efficacy of two different forms of reading instruction - **direct phonological-decoding, reading-specific strategy training** - for improving reading & promoting transfer-of-learning to uninstructed reading material
- * Determine whether **adjunctive stimulant medication** is necessary and potentiates the effects of the academic instruction

READ STUDY PROCEDURES



READ STUDY PROGRAMS

- Instruction in a small classroom in local elementary schools (K-5)
- 35 hours of instruction in total, 1 hour per day for approximately 10 weeks
- 1:4 student/teacher ratio
- Children assessed pre and post program

Reading Remedial Programs

- **PHAB/DI (Phonological Analysis and Blending Program)**
 Uses the direct instruction program: Reading Mastery Fast Cycle (Englemann & Bruner, 1988)
 - Sounding out (say it slowly: say it fast)
 strand: *sss + t + rrr + aaa + nnn + d*
- **WIST (Word Identification Strategy Training)**. Instructs children in the acquisition, use and monitoring of four specific word identification strategies
 - Rhyming (Compare/Contrast) (based on Benchmark Word Identification program)
 - Vowel Alert
 - I Spy
 - Peeling-Off

Social and Cognitive Remediation (SCORE) – nonprint program

- Goals are to:
- teach children to be independent and effective learners by facilitating their *ability to use language to solve problems*
 - explicitly teach children a set of metacognitive and cognitive strategies to utilize across multiple settings (social and academic)
 - facilitate the full participation of the students in the thinking/learning process by providing appropriate instructional scaffolds

Four Components of SCORE

Academic skills	IDEAS	Getting Along Together	Being a Detective
Temporal Skills	Think Aloud/Ideas	Promoting self-esteem	Direct instruction in cognitive strategies
Instructional Language	Verbal mediation lessons	Emotion/Anger Management	E.g., tangrams, scientific methods
Organization, study strategies, listening	Explicit modelling of application to cognitive and social problem solving	Social Skills/Problem solving	Attribute blocks, mazes, pentominoes

RESULTS

Referrals, eligibility, exclusion

	Telephone Screen	Behavior Rating Screen	Reading Assessment	DSM-IV ADHD assessment	Consent
Number of children	221	183	156	133	65
% excluded at each stage	18%	15%	15%	53%	8%

Sample characteristics (n=65)

Age	8.5 (1.4)
Girls (%)	16 (25%)
WISC-III FSIQ	91.5 (10.6)
Verbal IQ	91.1 (11.2)
Performance IQ	94.1 (13.2)
CELF : Receptive Lang.	87.0 (15.5)
Expressive Lang.	92.0 (16.0)
ADHD symptoms	Inattention Hyp/Imp
Parent Interview	5.1 (2.1) 6.2 (2.1)
Teacher Interview	6.0 (1.5) 4.4 (2.4)
Comorbidity (%)	ODD 29%
CD	8%

Compliance & Issues

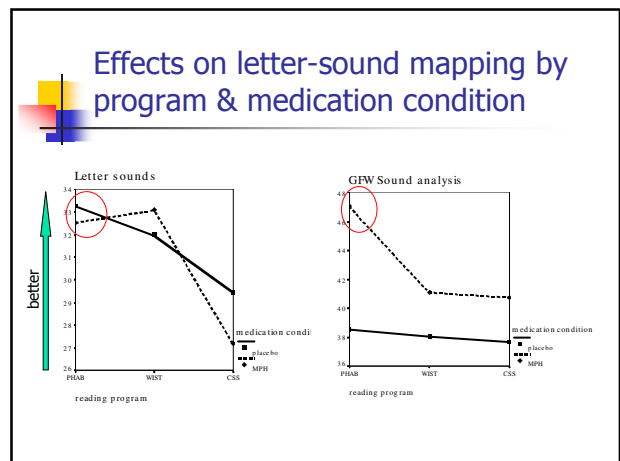
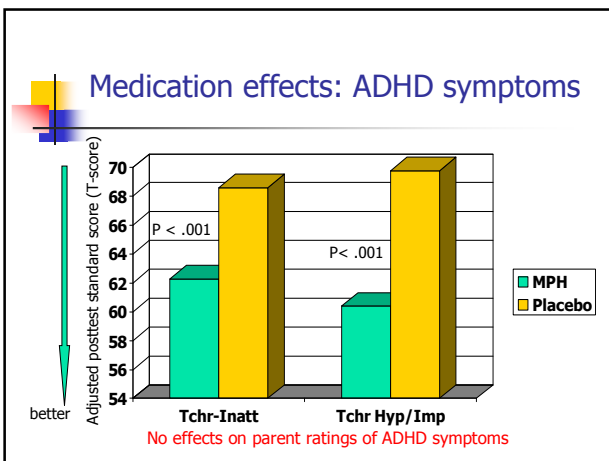
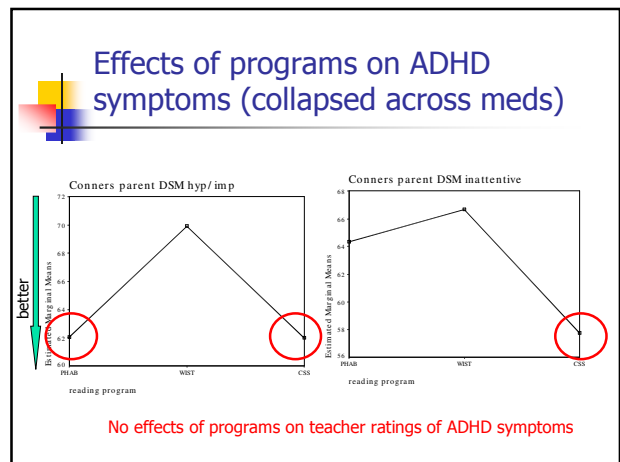
- Academic programs:
 - 100% completion of 35 hrs instruction
- Medication:
 - 20% requested cross-over to "other pills" within the dose-adjustment phase
 - 8 PL > MPH
 - 5 MPH > PL
- Issue for Intent-to-Treat Analysis

Sample: as-treated

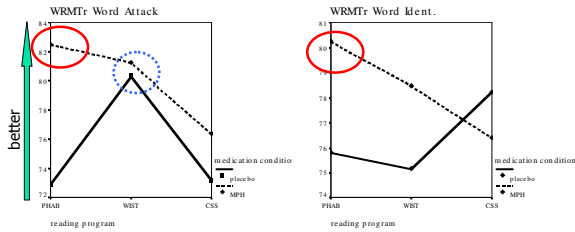
MPH			PLACEBO		
PHAB/DI	WIST	CSS	PHAB/DI	WIST	CSS
N=18	N=12	N=9	N=10	N=11	N=5

Statistical Approach

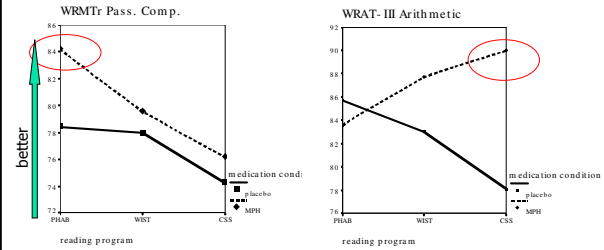
- As-treated (not ITT as planned)
- MANOVA:
 - Posttest score adjusted for pretest score
 - Focused orthogonal contrasts
 - Reading program (PHAB/DI, WIST) vs CSS
 - PHAB/DI vs. WIST
 - MPH vs PL



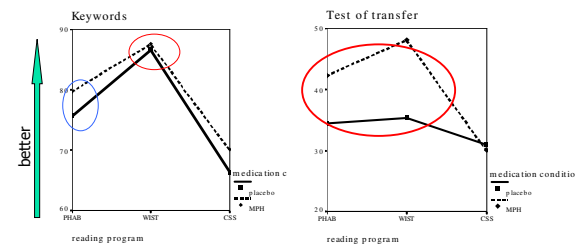
Effects on reading measures: medication x program interaction



Medication x program interactions



Generalization of intervention effects



Conclusions

- Children with ADHD+RD need specific treatment for *each* component of this comorbid condition
- Combined treatment approach (reading instruction + stimulant medication) may be effective for children with ADHD+RD
 - Specific, focused, individualized, and intense reading instruction improves phonological processing abilities
 - Stimulant medication improves behavioral symptoms of ADHD but has no effect on phonological processing
 - Stimulant medication may potentiate focused academic instruction

READ STUDY: Acknowledgements

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