

# The Two Faces of ADHD

## Behavioral and Cognitive Conditions

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# Defining ADHD

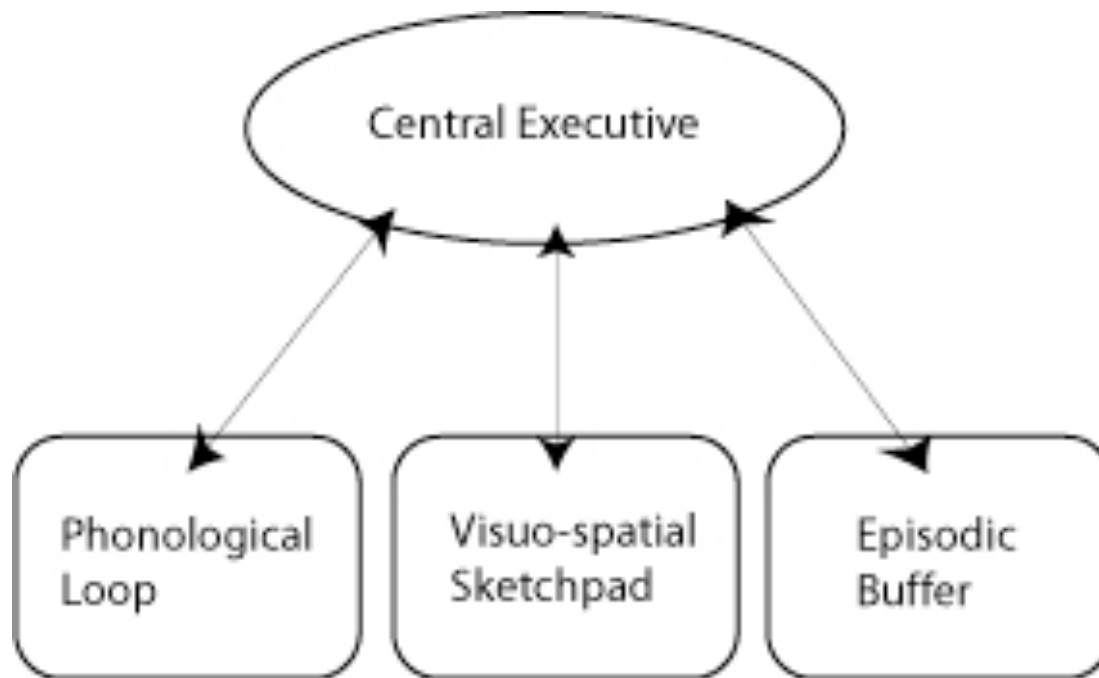
# What is ADHD?

- ADHD is a biopsychosocial condition characterized by core symptoms of inattention, hyperactivity and impulsivity leading to/interacting with cognitive deficits causing impairment in all walks of life.

# What is ADHD?

- ADHD appears to primarily involve the basal ganglia, cerebellum and variably the frontal lobes, depending on associated learning difficulties.
- Comorbidity with ADHD probably confounds findings from different study groups. (Hendren et al, 2000)
- The symptoms of ADHD Lead to a Nearly Infinite Number of Consequences

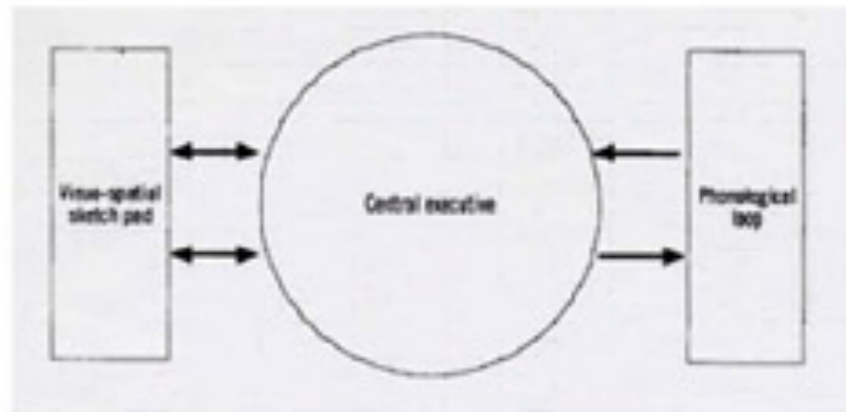
# Baddeley's Model of Working Memory



# Baddeley's Model of Working Memory

Baddeley & Hitch (1974)

## Working Memory



ADHD is a condition stemming from inefficient self-regulation.

# Self-regulation

- The ability to inhibit
- The ability to delay
- The ability to separate thought from feeling
- The ability to separate experience from response
- The ability to consider an experience and change perspective
- The ability to consider alternative responses

# Self-regulation

- The ability to choose a response and act successfully towards a goal
  - » The ability to change the response when confronted with new data
- The ability to negotiate life automatically
- The ability to track cues

# Children with ADHD aren't Clue-less

They are unfortunately often cue-  
less!

# Poor Self-regulation

- Poor self-regulation is synonymous with
  - poor self-control
- Poor self-regulation leads to
  - impulsive behavior

# Inattention

- Conditions under which inattention is observed
  - Repetitive
  - Effortful
  - Uninteresting
  - Not chosen

# Consequences if inattention

- Conditions under which problems with consequences are observed
  - Delayed
  - Infrequent
  - Unpredictable
  - Lacking saliency

Is there a broader conceptual model  
to understand, explain, evaluate and  
treat ADHD?

# Executive Functioning (EF)

EF is comprised of internal and/or external procedures necessary to engage in purposeful behavior and achieve goals.

# What is Executive Functioning (EF)?

- Absent in nearly all of the literature on EF is any truly operational definition of the concept itself
  - One typically finds a vague general statement of EF (e.g., social intelligence, goal-directed action, cognitive control, top-down inhibition, effortful processing, etc.)
  - Or a battery of tests believed to assess EF
  - Or a listing of the constructs subsumed by the term
    - e.g. Inhibition, Nonverbal and Verbal Working Memory, Planning, Problem-Solving, & Goal-Directed Activity, Strategy Development and Execution, Emotional Self-Regulation, Self-Motivation

## Executive Functioning Requires:

1. An intention to act.
2. Formulation of a goal of action.
3. Formulation of a plan of action.
4. Temporally sequencing the chosen plan of action.
5. Executing the plan smoothly from step to step.
6. Evaluating and re-evaluating the outcome in light of the objective.
7. When successful move on – if failed rethink from step #3.

EF is comprised of internal and/or external procedures necessary to engage in purposeful behavior and achieve goals. EF comes online when one or more of these conditions are present:

- 1) when a cognitive task is new as opposed to familiar or practiced;
- 2) when a cognitive task is difficult as opposed to easy;
- 3) when the conditions of the task vary as opposed to remaining stable and predictable;
- 4) when behavior is not automatic; and
- 5) when a quick response is required.

The frontal lobes in combination with mid-brain structures in the basal ganglia and the cerebellum are key to efficient EF.

Just as intelligence is more than the sum of certain intellectual processes, so to is EF more than just the sum of certain executive functions. As such to understand EF one must be able to quantify an outcome, not just a set of hypothetical functions.

# Hypothetical EF Functions

- Cognitive
- Behavioral
- Emotional

# Evidence for EF deficits in ADHD

- Several hundred neuropsychological studies of children and adults with ADHD have found deficits on various EF tasks.
- There is substantial overlap between ratings of EFs and ADHD symptoms.
- There is also moderate to high shared genetic variance in twin studies (64-83%) for some but not for all EF measures and ADHD severity.
- Brain imaging studies implicating the EF regions in ADHD:
  - prefrontal cortex (especially the right orbital PFC)
  - anterior cingulate
  - basal ganglia (especially the caudate)
  - cerebellum (vermis, especially on the right)

# EF Deficits in Neuropsychological Studies of Children & Adults With ADHD

- Greater reaction time variability - erratic attention/persistence
- Impaired response inhibition (cognitive, motor and emotional)
- Poor motor sequencing
- Reduced spatial working memory
- Reduced verbal working memory
- Diminished flexibility of responding
- Greater temporal discounting of future rewards
- Greater errors in time reproduction

# EF Deficits in Neuropsychological Studies of Children & Adults With ADHD

- Poor time management
- Deficient planning & problem-solving ability
- Reduced self-monitoring and sensitivity to errors
- Deficient viewing, listening & reading comprehension
- Poor organization of work
- Less able to sustain motivation to tasks
- Larger positive illusory bias (disparity in self-evaluation)

# Cognitive Aspects of ADHD

Profiles of Ability using the Planning, Attention, Simultaneous, Successive (PASS) Theory

# ADHD Characteristics

- ADHD “results from a failure in self-control” (Barkley, 1998, p. 66)
- Symptoms:
  - problems with inhibition of prepotent responses which limits control of behavior
  - lead to poor planning and anticipation
  - poor organization
  - impaired verbal problem solving and self-directed speech, poor rule governed behavior
  - problems developing, using and monitoring organizational strategies;
  - (Barkley, 2003).

# ADHD Characteristics

- Children with ADHD may have difficulty with 'executive functions' which has been associated with the prefrontal lobes (e.g., Roth & Saykin, 2004)
- If ADHD is a failure of self-control within the context of prefrontal lobe functions (see Goldberg, 2001)
- Then a connection between the disorder and the PASS theory described by Naglieri and Das (2005) based on A. R. Luria's work can be made

# ADHD Characteristics

- There is considerable research that suggests that children with ADHD have a specific profile of abilities on the Planning, Attention, Simultaneous, Successive (PASS) theory
  - Dehn, 2000; Paolitto, 1999; Iseman, 2005; Naglieri, Goldstein, & Iseman, 2003; Naglieri, Salter & Edwards, 2004; VanLuit, Kroesbergen & Naglieri, 2005
- A look at the research

# PASS Theory & Application

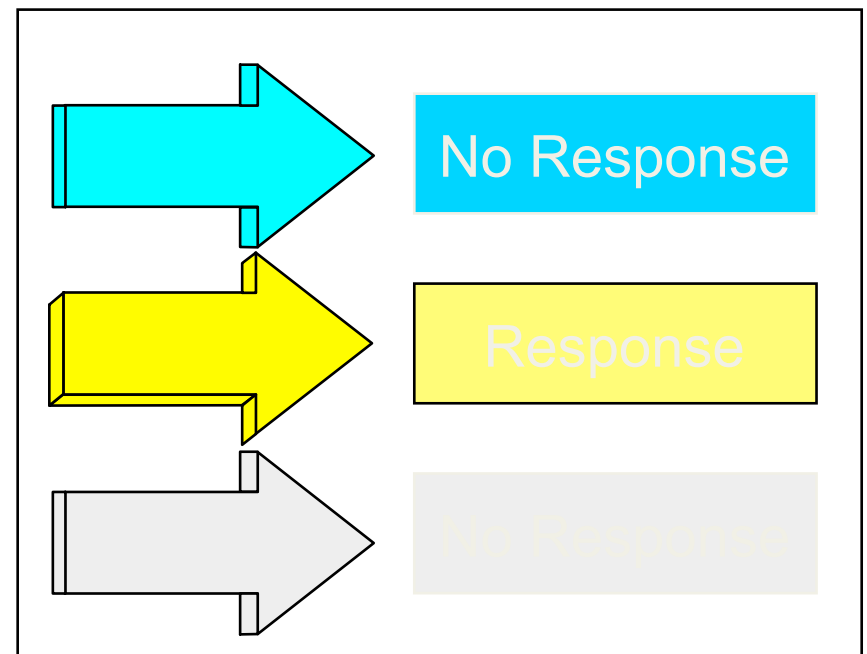
- Basic Psychological Processes include:
  - **Planning** – decisions about how to do things, control of actions, self-monitoring, use of processes and knowledge, (Luria's Third functional unit)
  - **Attention** - focused cognitive activity and resistance to distraction (First unit)
  - **Simultaneous & Successive** - two forms of working with information (Second unit)

# Planning Processing

- Planning is a mental process by which a person determines, selects, and uses, and evaluates solutions
  - Selecting or developing plans
  - Using strategies to solve new problems
  - Impulse control and self-control
  - Self-monitoring
  - Self correction

# Attentional Processing

- **Attention** is a mental process by which the person selectively attends to some stimuli and ignores others
  - focused cognitive activity
  - selective attention
  - resistance to distraction
  - shifting of attention

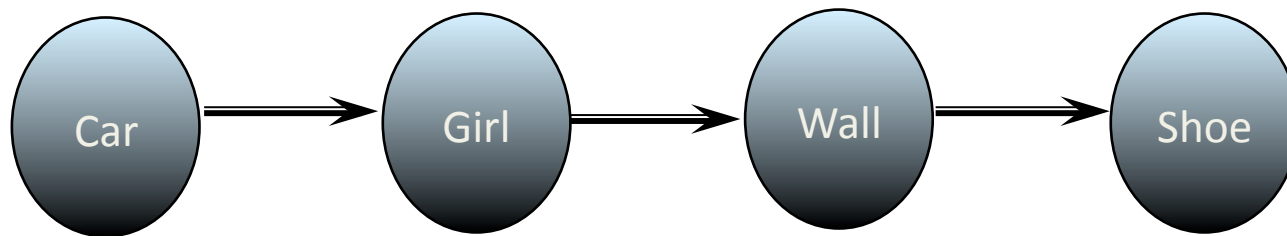


# Simultaneous Processing

- Simultaneous processing is conceptually related to
  - the simultaneous processing scale of the K-ABC II (Kaufman & Kaufman, 2005).
  - concepts like visual-spatial reasoning found in progressive matrices tests (e.g., Penrose & Raven, 1936; Naglieri, 1997)

# Successive

- **Successive** processing is a mental activity by which the person integrates stimuli in a specific serial order
  - Stimuli form a chain-like progression
  - Stimuli are not inter-related



# Successive

- Successive processing is involved with comprehension and recall of information in order
- Successive processing has been empirically shown to be related to the concept of phonological skills (Das, Naglieri & Kirby, 1994)
- The concept of successive processing is similar to sequential processing in the K-ABC2 and the recall of linear information which has a long history in psychology

# A Behavioral Definition of ADHD

# DSM IV TR Categories

- DSM IV TR Diagnostic Categories For ADHD
  - ADHD Inattentive Type
  - ADHD Hyperactive-Impulsive Type
  - ADHD Combined Type
  - ADHD Not Otherwise Specified

# Inattentive Behaviors

- Poor attention to detail.
- Poor sustained effort.
- Doesn't listen when spoken to.
- Fails to finish things.
- Poorly organized.
- Forgetful.
- Easily distracted.
- Avoids sustained effort.

# Hyperactive Behaviors

- Fidgets.
- Doesn't remain seated.
- Runs about.
- Loud.
- Talks excessively.
- Driven by a motor.

# Impulsive Behaviors

- Blurts out.
- Can't wait.
- Interrupts.
- Acts without thinking.
- Risk taking.
- Cueless
- Limited inhibition.

# ADHD Algorithm

- ADHD - IN Forgetful, disorganized and shifts.
- ADHD - HY Runs or climbs excessively.
- ADHD - C Runs or climbs, difficulty playing quietly, difficulty waiting turn, and engages in dangerous activities.

Owens and Hoza, 2003

# Inattentive a Distinct Disorder?

- Better prognosis
- Fewer adverse family variables
- Fewer problems with disruptive behavior
- Greater risk of learning disability
- Greater risk of internalizing problems
- Socially neglected
- Higher incidence in females vs. males

# Problems With the DSM IV ADHD

## Diagnosis

- Categorical models don't predict as well as dimensional models
- Too few impulsive symptoms (3)
- Polythetic system
- Symptom threshold issues
- Age of onset (before 7)
- Impairment issue
- Absence of cognitive data

# Defining the Physical Aspects of ADHD

# Physical Markers

- Body movement - actometers, cold lasers, cushions, tissues
- Hand movements
- Pupil movements
- EEGs
- Respiration
- GSR

# Measuring the Behavioral Symptoms of ADHD

# DSM IV ADHD Criteria

# DSM IV TR ADHD Criteria

- Criteria A
  - Nine inattentive symptoms
  - Six hyperactive symptoms
  - Three impulsive symptoms

B. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.

C. Some impairment from the symptoms is present in two or more settings (e.g. at school, work or home.

D. There must be clear evidence of clinically significant impairment in social, academic or occupational settings.

## Criteria E

The symptoms do not occur exclusively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder and are not better accounted for by another mental disorder (e.g., Mood Disorder, Anxiety Disorder, Dissociative Disorder, or a Personality Disorder).

# Measuring the Symptoms of ADHD

- Questionnaires
- Observation
- Inference from related tests.
- Scores of measures purported or demonstrated to measure ADHD symptoms.

# Measuring the Physical Symptoms of ADHD

# Physical Markers

- Body movement - actometers, cold lasers, cushions, tissues
- Hand movements
- Pupil movements
- EEGs
- Respiration
- GSR

# EF Symptoms Are Better Than DSM-IV at Diagnosing ADHD in Adulthood

## The UMASS Study:

- 3 Groups (mean ages 32-38):
  - 146 adults diagnosed as ADHD (68% male)
  - 97 adults seen at the same ADHD clinic but not diagnosed as ADHD (56% male)
  - 109 community control volunteer adults (47% male)
- Ethnicity – 94% white
- IQ means: 107-109; Education: 14-16
- ADHD diagnosed using DSM-IV by structured clinical interview except for age of onset
- Subtypes – 76% C, 20% I, 4% Residual

From Barkley, R., Murphy, K., & Fischer, M. (2008). *ADHD in Adults: What the Science Says*. New York: Guilford Publications

# Better Definition of EF May Help Explain its Link to ADHD

- Start with a theory of normal EF development involving inhibition, self-regulation, and executive functioning
- Inhibition comprises three related processes:
  - Inhibiting the prepotent or dominant response
  - Interrupting ongoing behavior
  - Interference control: Protecting the EFs from distraction
- Self-regulation can be defined as:
  - Any action a person directs toward one's self
  - So as to change their own behavior
  - In order to change the likelihood of a future consequence
- An executive function can be defined as:
  - a major class of actions-to-the-self (a type of self-regulation)
    - Inhibitory, sensory-motor, verbal, emotional/motivational, manipulative

# Implications of an EF Theory for Understanding ADHD

- ADHD is an Executive Functioning Deficit Disorder (EFDD) involving response inhibition and working memory (private sensing and speech).
  - Diagnostic criteria need to better represent these constructs
- If the general function of the PFC/EF system is the binding of events across time to direct behavior toward the future, then ADHD involves a “Time Blindness” or “Temporal Neglect Syndrome” (Myopia to the Future)
- Individuals with ADHD:
  - live in the moment,
  - are more controlled by external than internal representations,
  - are more influenced by others than self-regulated, and
  - are more focused on immediate and near-term consequences instead of delayed consequences

# More on Understanding ADHD

- If the PFC/EF system uses one's knowledge to guide one's behavioral/social performance, then ADHD is a disorder of:
  - Performance, not skill or ability
  - Failing to do what you know, not knowing what to do
  - The when and where, not the how or what of behavior
  - Using your past at the “point of performance”  
The point of performance is the place and time in your natural settings where you should have used what you know but did not (Goldstein and Ingersoll).
- ADHD is not an Attention Deficit but an Intention Deficit Disorder (Inattention to mental events & the future)

# Implications for Treatment

- Teaching skills is inadequate – One must design prosthetic environments to compensate for an EFDD.
  - Help them to show what they know where & when it matters
- Effective treatments occur at the “point-of-performance”.
  - Re-engineering natural settings and tasks that tax EF is essential
- Medications may be needed for most (not all) cases.
  - ADHD medications are actually EFDD medications and constitute a form of “neuro-genetic” treatment of the disorder
- Behavioral treatment is essential for restructuring natural settings and externally assisting EFD management.
  - but it does not generalize or endure after removal
- The compassion and willingness of others to make accommodations are vital to treatment success.
- A chronic disability perspective is most useful in understanding ADHD and its long-term management.

# EF Based Treatment Strategies

- Externalize important information
  - lists, posters, signs, other cues of critical reminders and post at the point of performance
- Externalize time periods related to tasks
  - use timers, clocks, counters, that signal time's passing
- Break up future tasks into many small steps
  - do 1 step each day; keep the E-R-Os close in time
- Externalize sources of motivation
  - Quick praise, token/point systems, tangible rewards
- Permit more external manipulation of task components
  - manualize the problem as much as you can

# Medication Trends (1986-1996)

- Overall use of psychiatric medications increased from 1.4 to 3.9%
- Stimulants increased from 0.6 to 2.4%
- Anti-depressants increased from 0.3 to 1.0%
- Polypharmacy increased from 0.03 to 0.23%

# Other Classes of Drugs Tried For ADHD

- Selective serotonin reuptake inhibitors
- Venlafaxine
- Anti-convulsants
- Anti-psychotics
- Anti-hypertensives
- Propanolol
- Levodopa

**Pills will not substitute for skills**

But they will relieve symptoms

# The Ideal Mindset of Children Taking Medication For ADHD

- Pills won't substitute for skills
- Active participation in treatment
- I am a person with ADHD not an ADHD person
- A mixed locus of control
- I am important
- I can make a contribution

# Behavioral Treatments for ADHD Symptoms and Impairments

# Psychosocial Interventions for ADHD

- Environmental manipulation of the physical plant
- Environmental manipulation of consequences
- Modification of cognitive function

Symptom relief is not  
synonymous with changing long  
term outcome

Adopt a learning to swim  
mindset!

# Parenting Children With ADHD

- Become educated about the condition
- Become an educated consumer
- Manage consequences effectively
- Facilitate strategy development
- Build islands of competence
- Maintain a positive relationship
- Take care of yourself
- Think long term

**Will counseling reduce the  
symptoms of ADHD?**

NO BUT IT CAN ADDRESS THE  
CONSEQUENCES OF LIVING WITH A  
DISABLING CONDITION.

# Cognitive Processing & Instruction

Does cognition matter?

# *Planning Facilitation*

# Naglieri & Gottling (1997)

Mathematics instruction and PASS cognitive processes: An intervention study. *Journal of Learning Disabilities, 30*, 513-520.

Math intervention for children with  
low Planning

# Planning Facilitation in Math - Naglieri & Gottling (1997)

- 6 females; 6 males; (24% minority)
- Aged 9 to 12 years
- Attended a private school that specializes in treating children with significant learning problems
- All met LD criteria
- Two regular teachers gave instruction in group setting
- They did not know the children's PASS scores
- Teachers were instructed in an initial one-hour session with weekly follow-up

# Planning Facilitation in Math - Naglieri & Gottling (1997)

- 28 Math work sheets constructed by computer to match pages used in class
- Subtraction sheets –  
54 problems; 6 rows X 9 columns; numbers with 1 to 3 digits (no decimals); with and without regrouping.
- Multiplication problems –  
whole numbers by a two-digit number ranging from 10 - 99; with and without carrying

# Planning Facilitation in Math -

Naglieri & Gottling (1997)

- Students were encouraged to
  - determine how they did the pages
  - verbalize and discuss their methods
  - be self-reflective
- Teachers asked questions to facilitate
  - How did you do the problems & why?
  - What will you do next time?
  - What did you notice on this page?

# Planning Facilitation in Math - Naglieri & Gottling (1997)

- Students said:
  - When I get distracted I move my seat
  - I have to remember to borrow
  - I'll do the easy ones first
  - I do them row by row
  - Keep the columns straight
  - Be sure to do them right not just get it done

# Naglieri & Johnson (2000).

Effectiveness of a Cognitive Strategy Intervention to Improve Math Calculation Based on the PASS Theory.  
*Journal of Learning Disabilities, 33, 591-597.*

**Children with Cognitive  
Weaknesses in PASS**

# Children with PASS Profiles

- 21 children with LD and mild mental impairments
- Teachers followed Planning Facilitation method described by Naglieri and Gottling (1997, 1997)
- Students were given instruction that facilitated the use of Planning

# Children with PASS Profiles

- Naglieri & Johnson (1998)
  - Seven 10-minute Baseline sessions
  - Fourteen 10-minute Intervention sessions
  - Children completed math computation worksheets that came from the curriculum
  - Children with a cognitive weakness in each of the PASS areas were identified
  - Cognitive Weakness = significant PASS ipsative score *and* the weakness must be a score < 90.

# Children with PASS Profiles

	# Correct Inter- Baseline Change Size	%	Effect vention
No CW2629		110.2	

Note: Total number correct for all 7 sessions. 7 baseline, 14 intervention sessions (intervention number correct was weighted by .5). The % change =  $(\text{Int} - \text{Base}) / \text{Base}$ . Effect sizes are averages across subjects using  $(\text{mean Int} - \text{mean Base}) / \text{SD baseline}$ .

# Children with PASS Profiles

	# Correct Inter- Baseline Change Size	% Intervention	Effect Size
Suc	283939		0.5
NoCW	2629		110.2

Note: Total number correct for all 7 sessions. 7 baseline, 14 intervention sessions (intervention number correct was weighted by .5). The % change =  $(\text{Int} - \text{Base}) / \text{Base}$ . Effect sizes are averages across subjects using  $(\text{mean Int} - \text{mean Base}) / \text{SD baseline}$ .

# Children with PASS Profiles

	# Correct	Inter- Baseline Change	% Intervention	Effect Size
Att	162450			0.3
Suc	283939			0.5
NoCW	2629			110.2

Note: Total number correct for all 7 sessions. 7 baseline, 14 intervention sessions (intervention number correct was weighted by .5). The % change =  $(\text{Int} - \text{Base}) / \text{Base}$ . Effect sizes are averages across subjects using  $(\text{mean Int} - \text{mean Base}) / \text{SD baseline}$ .

# Children with PASS Profiles

	# Correct	Inter- Baseline Change	Size	% Effect vention
Sim	33		29	-11
-0.2				
Att	162450		0.3	
Suc	283939		0.5	
NoCW	2629		110.2	

Note: Total number correct for all 7 sessions. 7 baseline, 14 intervention sessions (intervention number correct was weighted by .5). The % change = (Int - Base) / Base. Effect sizes are averages across subjects using (mean Int - mean Base) / SD baseline.

# Children with PASS Profiles

	# Correct	Inter- % Effect	Baseline Change	Intervention Size	
Plan	10		25		142
	1.4				
Sim	3329	-11		-0.2	
Att	1624	50		0.3	
Suc	2839	39		0.5	
NoCW	2629	11		0.2	

Note: Total number correct for all 7 sessions. 7 baseline, 14 intervention sessions (intervention number correct was weighted by .5). The % change =  $(\text{Int} - \text{Base}) / \text{Base}$ . Effect sizes are averages across subjects using  $(\text{mean Int} - \text{mean Base}) / \text{SD baseline}$ .

# Iseman & Naglieri (2004)

A cognitive strategy instruction of  
mathematics at the Lab School of  
Washington

# Design of the Study

## Experimental and Comparison Groups

7 worksheets with Normal Instruction

### Experimental Group

19 worksheets with  
Planning Facilitation

### Comparison Group

19 worksheets with Normal  
Instruction

# Normal Instruction and Planning Facilitation Sessions

- Normal Instruction
  - 10 minute math worksheet
  - 10 - 20 of math instruction
  - 10 minute math worksheet
- Planning Facilitation
  - 10 minute math worksheet
  - 10 minutes of planning facilitation
  - 10 minute math worksheet

# Planning Facilitation Intervention

- Teachers facilitated discussions to help students become more self-reflective about use of strategies
- Teachers asked questions like:
  - What was your goal?
  - Where did you start the worksheet?
  - What strategies did you use?
  - How did the strategy help you reach your goal?
  - What will you do again next time?
  - What other strategies will you use next time?

# Student Plans

- Students responded...
  - “My goal was to do all of the easy problems on every page first, then do the others.”
  - “I do the problems I know, then I check my work.”
  - “I do them (the algebra) by figuring out what I can put in for  $X$  to make the problem work.”
  - “I did all the problems in the brain-dead zone first.”
  - “I try not to fall asleep.”

# Instructional Implications

- These results are consistent with previous research (Naglieri & Gottling, 1995, 1997; Naglieri & Johnson, 2000; Hald, 1998; Haddad, et al, 2004) that support the value of Planning Facilitation method
- Children at the Lab School clearly benefited from Planning Facilitation
- Children with ADHD at the Lab School in particular benefit from Planning Facilitation

# Instructional Implications

- Planning Facilitation is easily implemented in the classroom
- The method yields substantial results within a minimal of time (10 half-hour sessions over 10 days)
- Planning Facilitation can be applied in math as well as other content areas (e.g., reading comprehension)

# Planning Facilitation

Reading Comprehension

# Planning Facilitation & Reading

Cognitive Strategy Intervention in Reading  
Comprehension Based on PASS Theory by  
Fred Haddad, Ashley McAndrews, Michelle  
Grimditch, Evie Garcia, Jane Eubanks  
2002 (Feb)

# Planning Facilitation & Reading

- 45 fourth grade general education children occurred
- The children completed a reading comprehension pre and posttest at their respective instructional levels
- The sample was sorted into one experimental
  - a weakness in planning group
- Two contrast groups
  - a weakness in successive processing
  - and no PASS weakness

# Planning Facilitation & Reading

- The following probes were used by the author when deemed appropriate.
  - Talk about how you completed them.
  - Why did you do it that way?
  - What can be done to get more correct?
  - What else did you notice about the questions?
  - What will you do next time?

# Planning Facilitation & Reading

	Pre	Post	Effect
	Size		
Low Successive	7.9	8.1	0.1
No Weakness	7.8	8.3	0.4
Low Planning	7.8	9.2	1.6

# DSM V

# Questions In Need of Answers for DSM V

- Should cognitive measures be part of the diagnostic criteria?
- Should gender be a moderator variable in the diagnosis?
- Should ADHD comorbid with other conditions be considered subtypes (e.g. ADHD+anxiety)?
- What role should impairment play in the diagnosis?

# Need

- Clinicians are required to demonstrate the impact psychological and psychiatric diagnoses have on children and adults
- There is a clear need to measure “impairment” when using the Diagnostic and Statistical Manual of the American Psychiatric Association (DSM) as a guide to diagnosis
- The need to measure impairment is increasing

What is impairment?

# Impairment

- Impairment can be viewed as the outcome of a psychological disorder interacting with other variables manifested by a constellation of measurable behaviors.

# How is impairment defined?

- The medical community?
- The educational community?
- The mental health community?
- The vocational community?
- The AAMR?

# How shall we define:

- Symptoms?
- Severity?
- Situation?
- Adaptive behavior?
- Impairment?

Impairment results from the interaction of risk and protective factors.

How does impairment differ from symptoms?

Why should we care about impairment?

How much AD/HD research has been devoted to impairment?

# How shall we resolve:

- High symptoms – low impairment?
- Low symptoms – high impairment?
- High symptoms – high impairment?
- Low symptoms – low impairment?

How does treatment take impairment into account?

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