From Neuropsychological Testing to Therapeutic Intervention

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Pediatric Neuropsychology (Fennell, 2007)

What this discipline brings to our understanding of disorders and their outcomes is... a shared fundamental perspective about, and accompanying emphasis on the interaction of:
neural development
medical treatments
environmental contexts
educational experiences
family factors

Why Neuropsychology?

• The field of neuropsychology maintains a unique role in furthering the understanding of children with developmental, acquired and degenerative disorders of the central nervous system.

• Significant advances have been made in understanding the cognitive, behavioral, social and emotional sequelae of these conditions.

• An appreciation of normal brain functioning in neuropsychological development is critical for the development of an understanding of age-appropriate intervention strategies. This knowledge serves as the foundation on which intervention strategies are based.

• Although intellectual and academic abilities represent important areas characterizing a child's current functioning, relying on these measures alone could miss subtle deficits in narrower areas of functioning such as memory, language and executive functioning.
Measurement of Deficits

Localization Versus Developmental Description

Child neuropsychology had its roots in adult neuropsychology.

Adult instruments were assumed to major equivalent skills in children and patterns of similar cognitive deficits were assumed to reflect the same underlying neuropsychological dysfunction.

It was assumed that the same methods for differentiating intact versus damaged neurocognitive processes in the relatively static brain of the adult could be applied to cerebral dysfunction in the developing, dynamic brain of the child.

These assumptions have been refuted:
Age of onset of the brain injury may be equally as important in determining the consequences as the location of the injury.

• The full impact of the brain insult in the child may not be immediately evident.
• Only as the child encounters increasingly complex demands for learning and adaption may become apparent that development is not progressing properly
• A brain that is developing normally is not directly comparable to the brain that is developing following an insult much less a brain is achieved adult status
• For these reasons making inferences about the location of underlying brain damage and predicting the effects of that damage across time as is done with adults is fraught with difficulties

Additional Pitfalls

• Tasks designed to assess adults may not be appropriate as they tap demands that had not yet developed.
• Adult test batteries may not be child friendly and overstress demands on attention span, endurance and task persistence.
• These strategies were not developed with the purpose of advancing an understanding of the multidimensional social and environmental influences that may impact development.
Physical, Cognitive and Psychosocial

Relative to age and/or grade knowledge of expectations provides the template for determining the presence, nature and extent of any problem.

This provides the groundwork for the development of appropriate recommendations and subsequent intervention.

Any disruption to development caused by neurological insult is not static and depends on the time at which the insult occurs as well as its chronicity.
8 Key Concepts for Intervention
(Spivak, 2007)

- Developmental Appropriateness
  Strategies that have the greatest chance of facilitating meaningful improvement are based on knowledge of normal cognitive, social, and emotional maturational trajectories and with sensitivity to the unique needs of the child.

- Functional
  Intervention should be targeted at the improvement of functioning in real-world settings.

- Individualized
  Every child is unique and the most effective intervention capitalizes upon an individual’s unique strengths.

- Longitudinal
  The consequences of acquired in neurodevelopmental conditions change as new challenges are encountered. It is necessary to anticipate long-term issues and future problems.

8 Key Concepts for Intervention Cont.

- Systems-based
  A child functions in the context of multiple interacting systems (family, school, community and healthcare providers). It is crucial that collaborative relationships exist in order that integrated treatment efforts are facilitated.

- Family-Centered
  Families benefit most from honest and understandable information about their child’s condition, strengths and weaknesses and anticipated challenges and needs. Equally important is cultural sensitivity.

- Transdisciplinary
  A pediatric neuropsychologist is uniquely qualified to integrate information from multiple perspectives so as to provide a comprehensive and balanced view of the child.

- Scientific
  Intervention needs to not only be clearly defined and measurable but theoretically driven and scientifically sound.

Pediatric Neuropsychological Assessment

Two main objectives:

Diagnosis

Intervention/Treatment Planning
Assessment Process

- Referral is typically based on the concern about functioning in a given setting or settings:
  - Who initiated
  - How pervasive are the problems
  - Problems occur with what degree of frequency
  - Problems occur with what degree of acuity

Assessment Process

Assessment Goals:
- Identify the problem(s)
- Describe factors that cause or sustain the problem(s)
- Provide recommendations for how to eliminate or decrease the impact of the problem(s)

Beyond these shared goals assessment objectives tend to vary widely

Previous Records

First contact vs. history of formal assessment.

When complex neurocognitive disorders have been identified the child will likely have been seen by other providers.

It is extremely beneficial to the neuropsychologist have access to any and all early testing, be it specialized assessments like OT, PT, Speech and Language Therapy.

Results of any serial standardized cognitive and academic testing.
Previous Testing

Provides a benchmark from which progress in development can be measured.

Provides testable hypotheses to guide and direct further testing.

Provide for the integration of past interdisciplinary findings.

The background and training of the pediatric neuropsychologist and test selection provides a unique perspective for the integration and understanding of these findings.

With the establishment of a baseline information:

• Reassessment can document progress made in treatment and identify emerging areas to be addressed.

• It reveals areas that are showing little progress and can suggest intervention approaches that might be more effective.

• It can identify an area in which the student has reached a plateau.
Baseline Information Continued

- It can lead to the adjustment of expectations for the child and the monitoring of the need for future support:
  Consider a second grade student who has just been identified with ADHD and significant executive deficits. Although he is not yet expected to write essays it is reasonable to predict that he will have difficulty with organizing information in written language he would benefit from learning a structured writing approach now that will become a global habit for use later.
- It can help clarify diagnostic questions (e.g., a comorbid condition that is masked may become more apparent as primary symptoms of the other conditions improve).
- For neurologists and physicians, reevaluation can provide critical documentation of stabilization or of progression and possible deterioration that would require more intensive intervention.

Limitations

Although Third Party Providers (insurance) make distinctions upon when and how neuropsychological assessment can be provided, this remains a pivotal tool for the development of effective intervention plans when neurocognitive disorders are identified.

The neuropsychologist can provide:
Confirmatory differential diagnosis
Documentation of need for services
Generate individualized recommendations for treatment
Provide for longitudinal monitoring of progress
Substantiate the need for referrals for appropriate specialty consultations (e.g., medical neurological) or specialized therapies (e.g., OT, PT, Speech, and Assistive Technologies).

Disability Determination

Before any child can receive services disability determination is typically necessary to access appropriate funding:
- Insurance coverage
- School-based services
- Government funding
- Pvt. organizational support
Pediatric Neuropsychology (Fennell, 2007)

What this discipline brings to our understanding of disorders and their outcomes is a shared fundamental perspective about, and accompanying emphasis on, the interaction of neural development, medical treatments, environmental context, educational experiences and family factors.


This approach yields unified descriptions of patterns of cognitive and emotional behaviors that are relevant throughout the course of growth and development and which are crucial to the development of approaches for intervention and rehabilitation.
Intervention Planning

In addition to testing conducted for diagnostic purposes, the ultimate goal of the assessment process should be to develop an intervention or rehabilitation plan. This should be based on the selection of evidence-based practices that have efficacy for the remediation of targeted areas.

This is based on:
- Current Research Evidence
- Clinical experience
- Client preference

National Center for Education Evaluation and Regional Assistance
Institute of Education Science
Where to find evidence-based intervention ratings:
- “What Works Clearing House”

http://www.w-w-c.org

Neuropsychological Assessment and Intervention for Child and Adolescent Disorders

See Handout
Assessment strategies for diagnosis and intervention exist in two mostly exclusive and differentiating dimensions:

**RTI**  
Conventional Assessment

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**National Center for Learning Disabilities (1999-2014)**

It represents a multi-tier approach to the early identification in support of students with learning and behavior needs.

It begins with high-quality instruction and universal screening for children in the general classroom.

Struggling learners are provided with interventions at increasing levels of intensity (tiers) to accelerate their rate of learning.

Services are provided by a variety of personnel.

Progress is closely monitored to assess rate and level of performance.

Intensity and duration of interventions is based on individual response to instruction.

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**Critiques of RTI from a neuropsychological perspective**

Critical findings emerging from research in neuroscience and neuropsychology have been largely ignored.

There is an insistence that all reading problems can be addressed through a phonologically-based curriculum.

There is a failure to accurately differentiate dysfluency from reading comprehension problems from many of the brain processes that bring about effective reading comprehension in later grades.

This model ignores the impact of important confounding factors such as the comorbidity of LD with other neurobiological disorders.

Intervention is provided without the benefit of wealth of information that can be provided from well-constructed, standardized, norm-referenced assessment instruments.
RTI criticism continued

It provides information on progress monitoring for a skill or subskill without consideration of:

- psychosocial factors (e.g., motivation, anxiety),
- the academic environment beyond the instructional method
- or the range of related cognitive functions that could be impacting upon skill acquisition.

Critical elements related to not only individual skills, but core cognitive processes, neurobiological constraints, as well as the health, family and educational contexts is not considered.

Two 4th Graders about to enter a new school for 5th grade for the Fall term
Both carry Dx’s of ADHD and Reading Disorder

<table>
<thead>
<tr>
<th>Child I</th>
<th>Child II</th>
</tr>
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<tbody>
<tr>
<td>FSIQ: 95</td>
<td>FSIQ: 82</td>
</tr>
<tr>
<td>ADHD Dx @ 7</td>
<td>ADHD Dx @ 10</td>
</tr>
<tr>
<td>Positive response to Adderall</td>
<td>3 Stimulant trial failures</td>
</tr>
<tr>
<td>Since age 7</td>
<td>To begin new trial</td>
</tr>
<tr>
<td>Reading Disorder Dx at age 7</td>
<td>Reading Disorder Dx at age 7</td>
</tr>
<tr>
<td>Immediate inclusion in 1:15</td>
<td>Enrolled in 3 schools since</td>
</tr>
<tr>
<td>Adequate self-esteem</td>
<td>Low self-esteem &amp; performance Anxiety</td>
</tr>
<tr>
<td>Athletic/popular</td>
<td>Awkward; bullied in the past</td>
</tr>
</tbody>
</table>

Neuropsychological Approach

Semrud-Clikeman (2005) considers it imperative all aspects of child functioning be considered when any intervention plan is being considered.
Deficit testing reframed

Neuropsychological models of intervention focus on intervention strategies that include the child’s strengths (intact functions) in conjunction with the development of remedial and compensatory strategies (Riccio and Reynolds, 1998).

The need to focus on strengths or intact processes comes in part from evidence from the deficit approach to remediation that has met with less than optimistic results. In relation to the educational context use of cognitive approaches involves attempts at not only restoration, but compensatory training with ultimate goal of optimizing adjustment and outcome.

An exclusive emphasis on underlying impairment ignores existing intact functions.

Example. An individual with strong language skills suggests a whole language approach to reading. An individual with strong visual memory suggests a sight-word approach as an alternative.

Based on aptitude by treatment interactions studies, there is evidence that progress made through drill and practice may not generalize beyond a training situation.

From a neuropsychological perspective instead of drill and practice, the emphasis is on:

Alternative instructional approaches and
Strategy instruction and metacognitive training.
In contrast to deficit models compensatory models focus not only on the underlying impairment, but on the functional deficits that result from the impairment and how to compensate for them in everyday living.

As such, bypass strategies an additional component of intervention planning (i.e., use of intact functions or external aids and/or substitutes) as a means to reach the same goal.

Too often over-reliance upon a deficit approach does not consider the potential for additive effects based on multiple methods being applied to the intervention process.

Intervention strategies need to be designed in the way that assists the individual in moving from a more dependent, externally monitored and/or supported state to a more independent, internally driven and self-regulated state.

Criteria for the selection of interventions should therefore be based on:

• The individual’s level of environmental dependency
• Preserved abilities
• Impaired functions
• Overall level of awareness

(Mateer, 1999)

Evaluation needs to include assessment of the context in which the child currently functions as well as any increasing demands met in that environment (present as well as future).
• Specific goals are formulated and for each goal and adequate approach to intervention is selected and implemented with data on performances (i.e., outcome-based measures) so as to monitor ongoing effects of treatment.

• Generalization strategies also need to be developed and implemented from the point of onset of intervention.

• Finally, there should be an evaluation of the overall efficacy of all interventions and their impact on functioning in natural contexts.

Psychoeducational Evaluation

Wechsler Intelligence Scale for Children-IV
- Verbal Comprehension
- Perceptual Reasoning
- Working Memory
- Perceptual Speed
- FSIQ/GAI

WJ-III Reading subtests
- TOWRE
- GORT
- Nelson Denny Reading Comprehension Test

WJ-III math subtests
- Key Math-3
- WJ-III Acquired Knowledge
Neuropsychological Evaluation

- Sensory Perceptual
- Motor
- Visual Perceptual
- Spatial
- Constructional
- Language
  - Receptive
  - Expressive
- Attention
  - Focus
  - Sustain
  - Shift
  - Encode
- New Learning
- Memory
- Conceptual Ability
- Executive Functioning
Behavior and Adaptation

- A comprehensive neuropsychological battery consists of a tripartite assessment methodology involving:
  - 1) traditional psychoeducational measures
  - 2) a neuropsychological battery
  - 3) objective behavioral assessment to evaluate unique aspects of temperament, coping style and adaptational capacity.

Interventions must be considered separately and carefully for each target area.

Fads and promises based on personal endorsements have proliferated therefore empirical support for the utilization of any practice is crucial.

Assessment strategies that have a high degree of ecological validity will have the greatest potential to be linked with efficacious individual strategies.

Behavior Rating Inventory of Executive Functions

- Provides a two-factor characterization of executive functions in adults.
  - The first factor relates to behavioral regulation defined by skills related to emotional control, the ability to inhibit one’s behavior when appropriate and to demonstrate appropriate behavioral flexibility.
  - The second factor relates to metacognitive and problem solving skills. Here working memory is again stressed along with the ability to plan, organize as well as actively self-monitor one’s behavior.
Behavior Rating Inventory of Executive Functioning

Self Regulation
Inhibition
Set Shifting
Emotional Control

Metacognitive
Initiating Complex Behavior Plans
Everyday Working Memory
Planning
Organization
Self-Monitoring

BRIEF Score Summary Table

<table>
<thead>
<tr>
<th>Index/Scale</th>
<th>Raw Score</th>
<th>T Score</th>
<th>Percentile</th>
<th>90%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhibit</td>
<td>25</td>
<td>78</td>
<td>96</td>
<td>74-86</td>
</tr>
<tr>
<td>SNS</td>
<td>9</td>
<td>41</td>
<td>84</td>
<td>33-99</td>
</tr>
<tr>
<td>Emotional Control</td>
<td>26</td>
<td>80</td>
<td>*90</td>
<td>74-86</td>
</tr>
<tr>
<td>Behavioral Regulation Index (BRI)</td>
<td>69</td>
<td>72</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>Inhibit</td>
<td>13</td>
<td>60</td>
<td>65-77</td>
<td></td>
</tr>
<tr>
<td>Working Memory</td>
<td>25</td>
<td>77</td>
<td>85</td>
<td>64-76</td>
</tr>
<tr>
<td>Flex/Planar</td>
<td>28</td>
<td>65</td>
<td>91</td>
<td>66-70</td>
</tr>
<tr>
<td>Organization of Materials</td>
<td>27</td>
<td>70</td>
<td>63-67</td>
<td></td>
</tr>
<tr>
<td>Monitor</td>
<td>21</td>
<td>72</td>
<td>87</td>
<td>66-79</td>
</tr>
<tr>
<td>Metacognitive Index (MI)</td>
<td>121</td>
<td>66</td>
<td>81</td>
<td>64-80</td>
</tr>
<tr>
<td>Global Executive Composite (GEC)</td>
<td>161</td>
<td>70</td>
<td>94</td>
<td>67-72</td>
</tr>
</tbody>
</table>

Nonacademic Executive Skills Related to Academic Success (Wolf, 2006)

Plan
Set goals
Organize
Initiate
Sustained attention/effort
Flexibility
Monitor
Use feedback
Structure
Manage time
Manage materials
Follow-through
SMALSI

School Motivation and Learning Strategies Inventory

This is a self-report inventory designed to assess 10 primary constructs associated with academic motivation and learning as well as study strategies, seven of which focus on student strengths and three that focus on potential student liabilities.

Student Strengths

Study Strategies: Selecting important information, relating previously learned information and utilization of mnemonic strategies for encoding new information.

Note-Taking/Listening Skills: Discriminating important material when taking notes, the organization of one's notes and the overall efficiency of note taking.

Reading/Comprehension Strategies: Skills involving previewing, monitoring, and reviewing text-based materials including the utilization of self-testing to ensure understanding.

Writing/Research Skills: The act of researching topics in a variety of ways, organizing writing projects as well as monitoring and self-checking for errors.

Student Strengths

Test-Taking Strategies: Efficacy strategies related to test taking including the capacity to eliminate unlikely answers and/or problems with strategic guessing.

Organizational Techniques: Be organization of study materials, the structuring of assignments and the mediation of homework and/or long term projects.

Time Management: Effective use of time in the completion of assignments as well as the capacity to predict the amount of time necessary to complete assignments.
**Student Liabilities**

**Low Academic Motivation:** Lack of intrinsic motivation to engage and succeed in academic tasks.

**Test Anxiety:** Students Experience of Debilitating Symptoms of Test Anxiety, Lowered Performance on Tests Due to Excessive Worry.

**Concentration/Attention Difficulties:** Difficulty attending to lectures and other academic tasks, monitoring and adjusting attention to performance, concentrating and avoiding distractions.

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**Learning and Study Strategies Inventory** *(Weinstein, et al, 2013)*

<table>
<thead>
<tr>
<th>Attitude</th>
<th>Student's interest and investment in scholastic success</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation</td>
<td>Diligence, self-discipline and willingness to invest effort in order to complete academic responsibilities</td>
</tr>
<tr>
<td>Time Management</td>
<td>Ability to apply effective time management in a variety of academic conditions</td>
</tr>
<tr>
<td>Concentration</td>
<td>The ability to self-direct and to sustain attention on academic tasks</td>
</tr>
<tr>
<td>Information Processing</td>
<td>Ability to use imagery, verbal elaboration, organizational strategies and reasoning to build associations between what is known and what needs to be learned and remembered</td>
</tr>
<tr>
<td>Selecting Main Ideas</td>
<td>The capacity to differentiate relevant from irrelevant factual information</td>
</tr>
<tr>
<td>Study Aids</td>
<td>Assesses the range of supplemental strategies a student brings to bear to facilitate new learning</td>
</tr>
<tr>
<td>Self-Testing</td>
<td>Assesses review and comprehension monitoring techniques to determine the level of understanding of the material to be learned</td>
</tr>
<tr>
<td>Test Strategies</td>
<td>Identifies the sophistication of test preparation and test taking strategies</td>
</tr>
</tbody>
</table>

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**Synthesis**

When this information is combined with not only psychoeducational data (i.e., a synopsis of grades, performances on standardized tests, and school adjustment), but the objective evaluation of study skills, one can begin to formulate remedial and or accommodating strategies and to build transitional bridges to help students prepare for new learning expectations.

Having this information before transitioning to middle school, high school or college for many students with executive dysfunction could be hugely beneficial.
• Interventions must be considered separately and carefully for each target area.

• Fads and promises based on personal endorsements have proliferated therefore empirical support for the utilization of any practice is crucial.

• Assessment strategies that have a high degree of ecological validity will have the greatest potential to be linked with efficacious individual strategies.

Synthesis

With a 504 Service Agreement or an IEP that is based on the multifactorial assessment of any identified deficiencies in the metacognitive strategies that support effective studying and test taking a student is far less likely to be sabotaged by unrecognized deficiencies that might underscore a poor transition into the rigors of the next transition they undertake in their academic life.
Explicit Strategy Instruction

Key Ingredients:
Teacher modeling
Providing extended practice on the:
   How
   When
   Where
   Why
of strategy implementation

• This requires opportunities to implement strategies consistently
  and to receive consistent feedback so students learn to self-monitor
  and to evaluate the effectiveness of their strategy utilization.

Explicit Strategy Instruction

• Ultimate Goal: Strategy selection becomes fluent-automatic
• Simultaneously gains are made in self-awareness and an accompanying sense of competence.

Organizational Deficits

Organization
Time Management
Planning

What accounts for such deficits?
Performance Deficit
Have the knowledge: lack motivation.
Skills Deficit
Don’t know behaviors to utilize.
Haven’t observed behaviors carefully enough.
Don’t know when to apply
Necessity of Skill Building in OST
Gallagher and Rosenblatt (2013)

Observations of these children:
- Could not state what to do in hypothetical situations.
- Couldn’t demonstrate even when told how to.

The core symptoms of ADHD interfere with this skill development:
- Poor sustained attention limited attention to detail restricts:
  - Gains from observational learning.
  - Hinders ability to benefit from instruction.
  - Fail to appreciate context cues.
- Hyperactivity-Impulsivity:
  - Rushing is counter-productive when deliberation and time management is required.
- Delay aversion:
  - The slow repetitive practice necessary to accrue habits (recording assignments, storing assignments, checking) is anathema.

Lynn Meltzer’s Drive to Thrive
(Meltzer, Et Al., 2004 and 2005)

• Come to Class Prepared
• Homework Completed
• Homework Passed-in
• Competence and Note Taking
• Studying Effectively
• Performing Well on Tests

She advocates for the creation of a school culture that exposes all students to broad strategies that cultivate basic competencies.

This benefits all students and for at risk students initiated a more positive cycle of success enabling improved attention-effort and ultimately more positive self appraisals of competency as a skilled, independent learners.

Recommendations for Study Skills
and Test Taking Skills (Mapou, 2009)

• Attention When Studying
• Organization When Studying
• Test Preparation
• Test Taking
• Other resources to develop study skills

Other strategies to support study skill enhancement are available online from:
www.muskingum.edu/~cal/database/general. The University provides for review of general purpose and content area specific learning strategies to help bolster new learning.
Extended Time

• This represents the most frequently sought and/or recommended accommodation.

• This involves distinguishing between the need for 50% (time and a half) or 100% (double time)

Determination:

1) The severity of the disability documented on testing
2) The degree slowing was exhibited on timed tests
3) Amount of time (x) incomplete items on the Nelson Denny Reading Test
4) Whether the student finished the essay portion of a Test of Written Expression (TOWEL or WJ-III) within the prescribed time limit
5) Corollary evidence of impairment on tests of cognitive speed and/or excessive time dedicated to general problem solving