

Executive Functions, Language and Literacy
 Presenter: Elisabeth H. Wiig, Ph.D.
 Dansk Audiopedisk Forening, Nyborg Strand, 2012

The Foundations of Learning

LEARNING DISABILITIES

Seven Areas

1. Oral Expression
2. Listening Comprehension
3. Basic Reading Skills
4. Reading Comprehension
5. Written Expression
6. Math Calculation
7. Math Reasoning

Executive Dysfunction - Regulatory Disorders

- Actions
- Attention
- Muscles
- Feelings
- Mood
- Noises
- Pain
- Senses
- Thoughts
- Hyperactivity
- Impulsivity

Hallmarks of Executive Dysfunction are Difficulties with:

- Goal Setting
- Initiating
- Planning
- Organizing
- Prioritizing
- Pacing
- Executing
- Inhibiting
- Sequencing
- Shifting Flexibly
- Using Feedback

Executive Dysfunction

Other Anxiety Disorders

Obsessive Compulsive Disorder

Autism, Pervasive Developmental Delay, Asperger's Syndrome

Tourette Syndrome

Sensory Integration

Mood Disorders

Attention Deficit Hyperactivity Disorder

Learning Disabilities

Brain Development and Executive Functions



Brain Changes in the Development of Competence

The Cerebrum and Learning

Occipital lobe - visual processing.

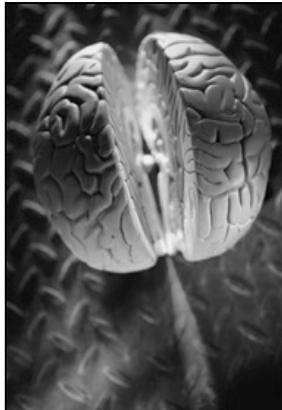
Parietal lobe - coding spatial information, attentional control, bodily sensations.

Temporal lobe - coding auditory and verbal information, memory storage, processing object and faces.

Insular lobe - emotional processing, taste and learning.

Frontal lobe - executive function, reasoning, effort and emotional coding, conceptual information and rules, motor control, speech, smell.

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Domain General Control Areas

Attentional control - posterior parietal cortex.

Process monitoring, decision making, conflict management - anterior cingulate cortex/pre-supplementary motor area.

Goal processing and task switching - dorsolateral prefrontal cortex.

Emotional processing - amygdala.

Episodic coding of associations - para-hippocampus and hippocampus.

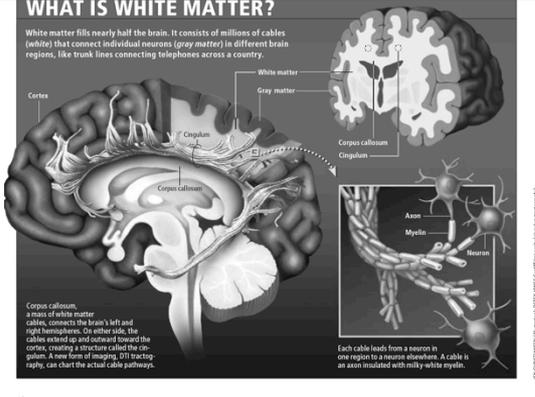
Smooth sequential processing - cerebellum.

Reinforcement and motor control - basal ganglia.

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WHAT IS WHITE MATTER?

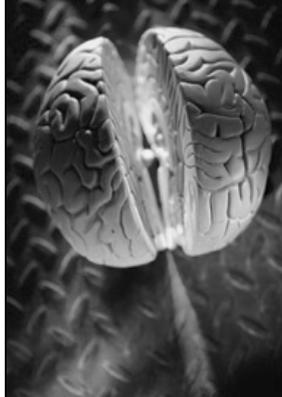
White matter fills nearly half the brain. It consists of millions of cables (axons) that connect individual neurons (gray matter) in different brain regions, like trunk lines connecting telephones across a country.



Corpus callosum: a mass of white matter cables, connects the brain's left and right hemispheres. On either side, the cables extend up and outward toward the cortex, creating a structure called the cingulum. A new form of imaging, DTI tractography, can chart the actual cable pathways.

Each cable leads from a neuron in one region to a neuron elsewhere. A cable is an axon insulated with myelin or white myelin.

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Myelination: Brain Matures

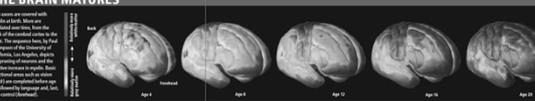
- Few axons are covered with myelin at birth.
- Myelination progresses from back to front as neurons are pruned.
- Basic functional areas (back) completed before age 4, followed by language areas (ages 8-12).
- Last areas to mature (forebrain) are involved in self-regulation (ages 16-20).

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Myelination from Birth to Age 20

- Myelination progresses from back to front.

THE BRAIN MATURES



Frontal areas that mediate executive functions show evidence of myelination till age 20.

- No wonder teenagers have problems with self-control.

Source: 2008 Scientific American.

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Behavioral Dimensions of Executive Functions

Behavioral Regulation

Inhibition of prepotent cognitive and emotional responses (medial prefrontal region).

(Barkley, Brown, Denckla, Lezak, Pennington)

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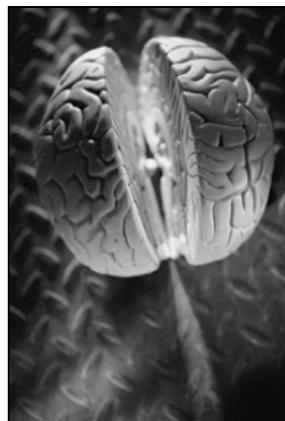


Behavioral Dimensions of Executive Functions

Initiation of Action

Readiness to start an intended action (mediated by medial frontal lobe).

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Behavioral Dimensions of Executive Functions

Planning and Organization

Sequencing and prioritizing, categorizing and developing options (dorso-lateral prefrontal lobe).

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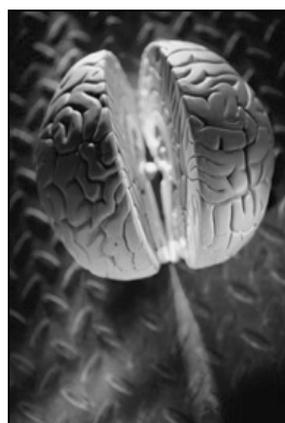


Behavioral Dimensions of Executive Functions

Monitoring

External monitoring to capture errors and evaluate corrections

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Behavioral Dimensions of Executive Functions

Responding to Feedback and Set Shifting

(mediated by orbital prefrontal regions)

Barkley, Brown, Lezak, Lyon & Krasnegor

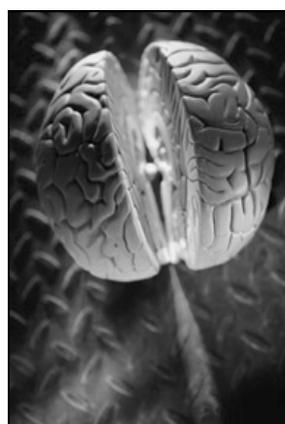
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Memory Functions

1. Long-Term Memory
 - a. Procedural Memory
 - b. Declarative Memory
 1. Semantic Memory
 2. Autobiographical Memory
2. Short-Term Memory
 - a. Immediate Memory
 - b. Working Memory
3. Strategic Memory

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Behavioral Dimensions of Executive Functions

Working Memory

- Explicit working memory for novel stimuli and conscious processing (orbital prefrontal cortices)
- Implicit working memory for familiar and visual stimuli (posterior cortices and left parietal lobe); interacts with selective attention

Goldman-Rakich, Shallice, Tulving, Furey, de Simone

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Brain Changes in the Development of Competence
Brain Activation during Working Memory Tasks

Increases may result from strengthening activation or from spatial expansion.

Decreases may reflect reduction in strength or spatial extent and appear to result from greater neural efficiency (processing efficiency).

Shifts in location may reflect reorganization of regions used to support performance (functional reorganization).

(Source: Hill & Schneider, 2006).

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ASSESSING EXECUTIVE FUNCTIONS



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Case Study: Evidence of Executive Function Disorders

<i>This student ...</i>	<i>Executive Functions</i>
has problems paying attention Doesn't focus on what's going on in class	Attention
has difficulty following directions has problems remembering things in class has difficulty complying with my requests loses things	Memory
has trouble sequencing things in proper order writes in a stodgy or disorganized manner does work in a disorganized way does not come to class prepared seems lost or confused in school	Organization
makes the same mistakes over and over again doesn't ask for help when it's necessary distracts the class	Monitoring
exhibits emotional outbursts is not interested in classroom activities needs to be in control is impulsive needs to be the center of attention	Behavioral Regulation

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Eligibility for Language Services



Language Assessment Issues

Untimed Assessment

Norm-referenced language tests are **untimed**. They do **not** place limitations on the time it takes for a student to respond to or complete test items.

These tests are performance measures. They are designed to give measures of a student's best performance level.

They do **not** capture deficits in speed-of-processing and delays in responding associated with Executive Function Disorders (e.g., Tourette Spectrum Syndrome).

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Eligibility for Language Services



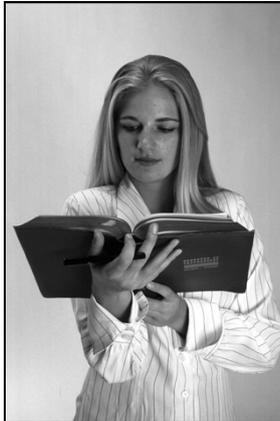
Language Assessment Issues

Timed and Other Assessments

Power tests are timed. They impose time restrictions for completing either simple (e.g., rapid automatic naming) or complex tasks (e.g. formulating sentences with given words).

Performance-based assessments (e.g., portfolio, behavioral observations) should also be used to complement existing tests and measures to respond to educational mandates.

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Language Deficits in Executive Function Disorders

Expressive Language Deficits

In clinical practice, many students with EFD (e.g., Tourette Spectrum Syndrome) have problems with the speed with which they can perform expressive language tasks.

They often cannot express themselves within the expected time limits (i.e., "real time") in academic or social contexts.

Their responses to questions in the classroom and to social conversation are often significantly delayed and disorganized.

They have difficulty forming complex sentences when several dimension (audience, context, theme, etc.) have to be integrated (e.g., CELF-4 Formulated Sentences)

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Processing Speed and Executive Functions

Processing speed is a general term that refers to the rate/speed with which an individual can react and respond to auditory, visual or other input.

Processing speed deficits can affect the auditory and visual domains and are associated with language disorders, reading disabilities/dyslexia, psychiatric disorders and dementia.

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Processing Speed and Attention

There are relations between interactive components that form the functional system involved in executive attention.

Sustained attention maintains attention over time -- controlled by the reticular formation, brain stem and frontal regions

Selective attention maintains ability to focus on a stimulus in the presence of distracters -- mediated by temporal, parietal and striatal regions of the brain

Response inhibition, divided attention and shifting attention and processing speed -- mediated by the frontal regions

Source: Anderson, Anderson & Anderson, 2006.

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Processing Speed and Working Memory

Working memory is a neural activation resource with limited capacity and duration.

Holds information in mind, as in a buffer store, while processing, interpreting, or responding to input

Contains distinct subsystems:

- (1) Phonological loop activates verbal information in memory, important for the acquisition of content and structure
- (2) Visual-spatial sketchpad activates visual information in memory, important for reading and writing -- most processing speed tests use visual input
- (3) A modality free central executive

Source: Baddeley, 1986, 1996.

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Processing Speed during School Age

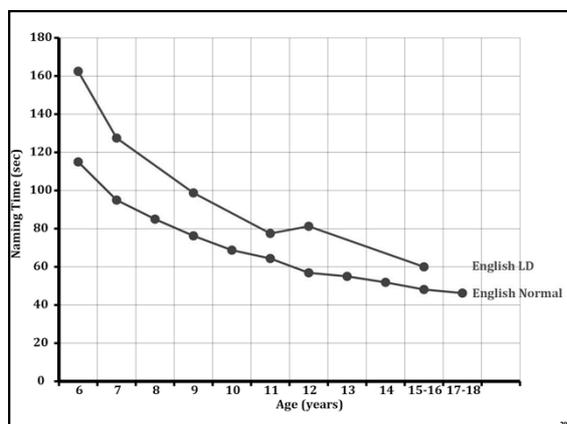
Processing speed differentiates pre-school and school-age children with normal language development from those with specific language disorders.

Both groups show similar, linear patterns of increase in visual-processing and naming speed (decreased naming time) between ages 5-6 and 15-16 years.

Of the children with significant cognitive speed deficits, about half had a severe language disorder with total language scores below 70.

Sources: Wiig, Zureich & Chan, 2000; Wiig Langdon & Flores, 2001; Wiig, Secord & Semel, 2004.

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Conditions with Reduced Processing Speed

- Severe receptive-expressive language disorders
- SLI and primarily expressive language disorders
- Dyslexia/reading disabilities
- Executive function disorders:
 - Attention deficit hyperactivity disorder (ADHD)
 - Tourette spectrum syndrome
 - Mood disorders (e.g., depression)
- Traumatic brain injury (TBI) or stroke (CVA)
- Dementia
 - Frontal-lobe dementia
 - Alzheimer's disease (AD)
 - Dementia with Lewy bodies (DLB)

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Why would SLPs assess processing speed?

Executive function disorders, including reductions in processing speed, are predictors of neurologically-based disorders.

Executive function disorders may require medication as in the management of ADHD, Tourette, mood disorders and dementia of the Alzheimer's type

Executive function disorders require intervention across tasks (e.g., planning and organization) and academic domains (e.g., oral and written language)

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Rapid Automatic Naming

- Continuous rapid naming of dual-dimension visual stimuli (e.g., color-form combinations) requires control of attention, working memory and set shifting.
- Attention is controlled and divided in proportion to:
 - (1) The degree of automaticity and available working memory resources
 - (2) Resource allocation and requirements for cognitive/set switching
 - (3) Structural factors in the input (e.g., single- versus dual-dimension visual stimuli)
 - (4) Degree of similarity and possible confusion

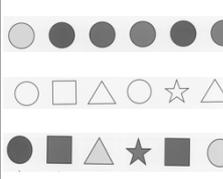
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CELF-4. Rapid Automatic Naming

Diagnostic Purpose
To evaluate the ability to produce automatic speech and evaluate processing speed.

Test Stimuli (36 items per plate)
Colors: yellow, red, green, blue
Shapes: circle, square, triangle, star
Combinations: red circle, green square, yellow triangle, blue star, green square, yellow circle

Administration
Supplementary subtest for all ages
Criterion-referenced as typical, slower than typical or atypical.



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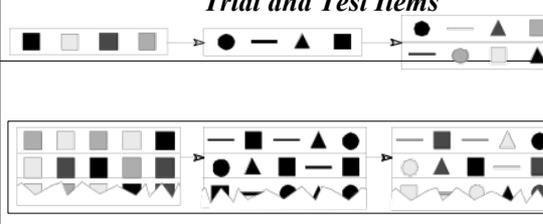
How can CELF-4 RAN help SLPs?

- Atypical naming times (+ 2SD of the mean) on Test 3 point to an executive function disorder with involvement of *attention, visual working memory and set-shifting* (cognitive speed).
- *If naming times are in the atypical range on Tests 1, 2 and 3, this suggests additional problems and slowing in reaction or response time and speed of retrieval.*
- *If there are more than expected naming errors and they are not corrected, this points to a self-monitoring deficits.*
- *Classroom accommodations* are indicated (e.g., added time, cueing).

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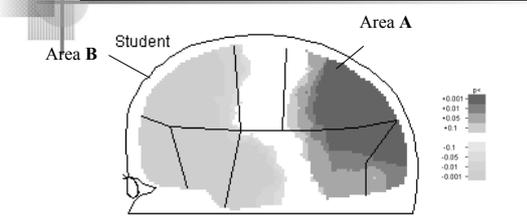
A Quick Test of Cognitive Speed (AQT)

Trial and Test Items



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Cortical Activation for AQT Color-Form Naming



Composite rCBF statistical comparison image for 14 normal adults during *color-form combination naming* (Test 3) compared with *rest*. The temporo-parietal area (A) shows increased activation and the prefrontal cortices (B) show significant decrease.

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Word Association Tests

Evaluate explicit/conscious, verbal working memory, mediated by orbito-frontal lobe activation.

CELF-4 Word Associations
Requires retrieval and naming of members of the semantic categories: animals, foods, and jobs/occupations. Subtest is supplemental and criterion-referenced

Emergent Literacy and Language Assessment (ELLA)
Requires retrieval and naming of members of the semantic categories: snacks, classroom things, words beginning with "m," and words beginning with "s"

Verbal Fluency Test (FAS)
Requires identification, retrieval and naming of words that begin with the same sounds (F - A - S).

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CELF-4 Memory Index

Number Repetition 1 (Ages 5-16)
 Eight digit forward items (2 sequences each); length: 2-9 digits.
 Eight digit backward items (2 sequences each); length: 2-8 digits.

Number Repetition 2 (Ages 17-21)
 Eight digit forward items (2 sequences each); length: 2-9 digits.
 Eight digit backward items (2 sequences each); length: 2-8 digits.

Familiar Sequences 1.
 Number sequences (counting forward and backward); days of the week; months of the year (forward and backward); alternating alphanumerical counting (e.g., A1, B2, etc.).

Familiar Sequences 2.
 Number sequences (counting forward and backward); days of the week; months of the year (forward and backward); alternating numerical/day of the week (e.g., 0/Sun, 6/Mon, 12/Tues, etc.).

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IMPLICATIONS FOR LIFE AND LEARNING



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Executive Dysfunction and Oral or Written Expression



Language Domain

- Difficulty initiating ideas
- Difficulty limiting topic
- Disorganization and lack of planning
- Poor self-monitoring – many careless errors
- Inability to revise verbal or edit written production
- Unable to change sets to maintain topic

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Executive Dysfunction and Written Expression



Memory Domain

- Difficulty handling complex memory demands
- Poor recall and maintenance of ideas
- Difficulty remembering appearance of letters/words
- Difficulty making writing legible

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Executive Dysfunction and Grapho-Motor and Handwriting Domains



Poor Fine Motor Skills

- Handwriting not an integrated skill
- Impulsivity - Rapid, unplanned writing
- Excessively slow writing
- Inconsistencies when writing several paragraphs
- Tic interference (TSS)
- Perseverating on letters
- Perfectionism - erasing constantly

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Implications for Daily Living

Academic Barriers

Students with expressive language disorders, word retrieval and automaticity-of-naming deficits cannot perform within established time limits in the regular classroom.

They need extended time for responding to questions and completing oral-verbal and written assignments and untimed tests.

Teachers may need training to provide models, scaffolding, guided questioning, and individualized cues for retrieval that benefit performance.

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Implications for Learning

Academic Accommodations

- (1) Untimed test taking
- (2) Untimed written language assignments
- (3) Use of computers for written language assignments
- (4) "Word banks" for fill-in-the-blank tests due to word retrieval deficits

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Implications for Daily Living

Social Barriers

Gaining friends and participating in activities that require quick responses (e.g., verbal games) may be difficult.

Peers and adults may interrupt responding due to prolonged delays or revisions.

Reactions such as social withdrawal, poor self-image, depression, passive-aggressive behaviors or anger may result.



Implications for Daily Living

Interventions

Social and pragmatic skills development through group counseling and therapy.

Counseling to increase family and environmental awareness of deficits and develop supportive responding.

Counseling or psychotherapy to develop adaptive social behaviors.

Medical intervention with appropriate medication for depression and other comorbidities.

INTERVENTION OBJECTIVES



Generic Language Intervention Objectives

Provide structure

Support planning, organizing, problem solving and implementing oral or written communication

Use mediated learning

Use guided questioning, cognitive mediation, coaching, and scaffolding

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Generic Language Intervention Objectives

Develop mental models
 Outline scripts and schema for listening to text and interpreting and writing text

Develop critical thinking
 Emphasize analysis, categorization, comparison and contrast, synthesis, evaluation and application of concepts, expressions and text to develop in-depth understanding

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Intervention Objectives for Executive Dysfunction

Executive Functions
 Develop self-monitoring processes by scaffolding, revising spoken and editing written language, and using strategies for elaborating.

Develop strategies for planning and organizing spoken and written narrative (use conceptual mapping).

Develop mental models for narrative structure and compare and contrast different narrative types (story telling, descriptive, expository, argumentative)

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Generic Language Intervention Objectives

Abstract/figurative language
 Provide bridges for the transitions from concrete (e.g., hand) to abstract (e.g., handouts) and figurative (e.g., empty handed) uses of words and expressions

Automaticity
 Develop automaticity for serial language, academic sequences, structural rules, and social pragmatic repertoires

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Generic Language Intervention Objectives

Develop self-monitoring
 Use scaffolding, editing spoken and written language, and using strategies for elaborating

Develop self-awareness
 Explain barriers to performance and inefficient compensatory strategies, and develop effective compensatory strategies for life

Self-advocacy
 Develop strategies for appropriate self-advocacy

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Language Intervention Objectives

Semantics
 Broaden knowledge of meanings and develop word associations
 Compare-contrast words and concepts.
 Relate words from many perspectives
 Build semantic categories and hierarchies

Semantic-Syntactic Interfaces
 Develop automaticity for basic sentence structures
 Develop structural/transformational rules with visual support
 Develop understanding of transition words and phrases to form logical ties and mark relationships between sentences/paragraphs

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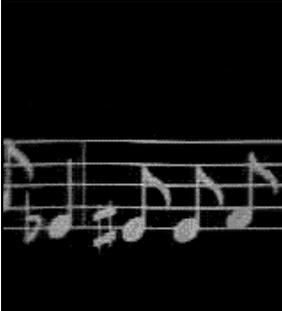
Language Intervention Objectives

Strategies for Word Retrieval

- Expand the stored vocabulary.
- Develop strategies that include:
 - (1) Using word associations, word opposites, visual or symbolic imagery.
 - (2) Substituting synonyms for hard-to-find words.
 - (3) Using appropriate place-holding for processing and answering questions and when writing.
 - (4) Using images and imagery.

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Intervention Objectives for Expressive Language Disorders



Automaticity for Serial Language

Alphabet recital with melodic cues (e.g., the alphabet song).

Sequential and patterned counting (e.g., 2, 4, 6...) and basic multiplication tables.

Time sequences such as days of the week, months of the year, and seasons.

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Intervention Objectives for Expressive Language Disorders



Pragmatic Flexibility

Awareness of audience and situational expectations

Automaticity for commonly used verbal rituals and social exchanges

Using different words and structures to express the same intent (i.e., one intent — many expressions)

Using discourse strategies (e.g., repeating or using the previous speaker's words or phrases)

Role-playing of skits designed to reflect daily-life interactions

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LITERACY: THE BIG CHALLENGE!



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Literacy Defined

National Assessment of Adult Literacy (NAAL) 2003

"Literacy is defined as an individual's ability to read, write, speak in English, compute and solve problems at levels of proficiency necessary to function on the job, in the family and in society."

Scribner, S. & Cole, M. (1981). From *"The Psychology of Literacy."*

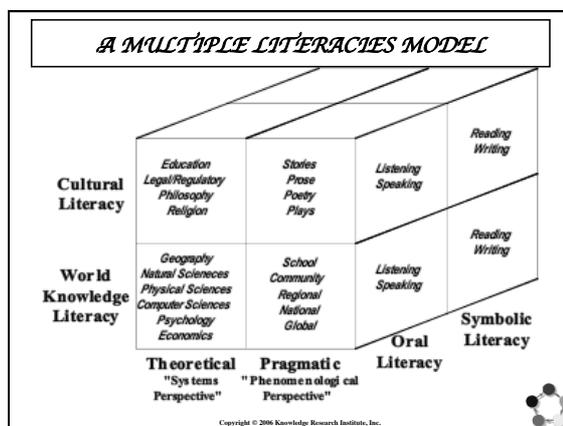
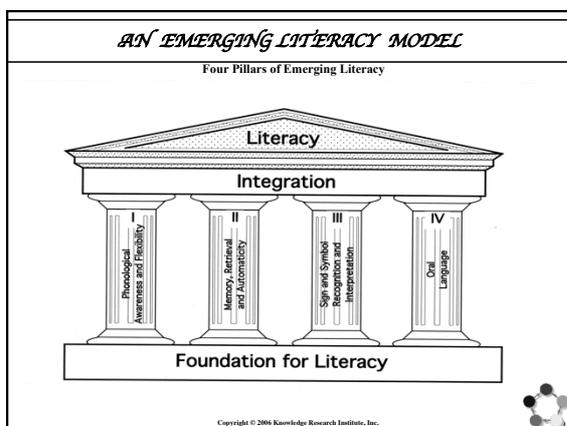
"Literacy is not simply knowing how to read and write a particular script but applying the knowledge for specific purposes in specific contexts of use."

Gee, J.P. (2001). *A sociocultural perspective on early literacy development.*

Specific uses of literacy serve to enhance or amplify ways of thinking, including how we classify, reason and remember.

Olson, D. & Torrance, N. (1991). From *"Literacy and Orality."*

Literate thought is abstract, analytical, logical, reflective, decontextualized and complex.

DIAGNOSTIC PROFILES



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Mixed Language and Emergent Literacy Deficit

Primary Deficiency Areas
 Language knowledge (vocabulary, morphology and syntax, pragmatics)
 Neurobiological factors (brain structure and function, genetics)
 Neurocognitive factors (reasoning, verbal working memory, processing speed)

Secondary Deficiency Areas
 Phonological knowledge (sound categorization onset-rhyme, syllable-level awareness)
 Print knowledge (letter knowledge, print concepts, emergent writing)
 Grapho-phonemic integration (alphabetic principle)
 Word level reading and spelling



Emergent Literacy Deficit

Primary Deficiency Areas
 Neurobiological factors (brain structure and function, genetics)
 Neurocognitive factors (reasoning, verbal working memory, processing speed)
 Phonological knowledge (sound categorization onset-rhyme, syllable-level awareness)
 Print knowledge (letter knowledge, print concepts, emergent writing)
 Grapho-phonemic integration (alphabetic principle)
 Word level reading and spelling

Secondary Deficiency Areas
 Language knowledge (vocabulary, morphology and syntax, pragmatics)
 Discourse knowledge
 Word retrieval



Environmental Disadvantage Deficit

Primary Deficiency Areas
 Language knowledge (vocabulary, morphology and syntax)
 Environmental factors (school instruction, socio-cultural values and expectations, exposure and experiences)

Secondary Deficiency Areas
 Phonological knowledge (sound categorization onset-rhyme, syllable-level awareness)
 Print knowledge (letter knowledge, print concepts, emergent writing)
 Grapho-phonemic integration (alphabetic principle)
 Word level reading and spelling

Source: L. J. Lombardino, *Assessing and Differentiating Reading and Writing Disorders*. 2011.



SELECTED INTERVENTIONS



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Requirements for Developing Literacy

Critical Thinking

Analysis
Identification of significant features, components, relations or sequences.

Synthesis
Perception/creation of patterns in stimuli, contexts, relations or processes.

Hypothesis Formation
Formulating and testing hypotheses about the significance of patterns.

Evaluation
Checking the adequacy and completeness of every step above.

Decision Making
Selecting a response or plan of action with high probability of success.

Execution
Self-monitoring, evaluation, revision and repair to improve efficiency or effectiveness.



Curriculum Objectives for Critical Thinking

1. *Analyzing Meanings and Topics*
2. *Grouping and Categorizing Information*
3. *Comparing and Contrasting for Similarities and Differences*
4. *Making Predictions and Drawing Inferences*
5. *Generalizing to New Contexts and Applications*
6. *Summarizing and Supporting Ideas*
7. *Evaluating Outcomes and Products*
8. *Showing Awareness and Use of Metaknowledge*

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Building Mental Reference Models!

Stories provide the basic structure and are often the origin of mental reference models!

This is because ...

- It is difficult to grasp the whole coherently
- Stories are unsurpassed for effective communication
- We rely on stories to tackle new problems
- Stories help us learn, remember and recall
- We use stories to perform mental simulations



The Power of Stories

Stories ...

- give context, structure, meaning, and overall understanding of complex topic areas and relations
- portray actors, tell of conflicts and relationships, illuminates objectives and drives, and identifies threats and opportunities and other aspects in interesting situations
- cover many abstraction levels (how to, know that and why; patterns and metaphors)
- tie together concepts, judgments and other objects into mental models (schema) that provide meaningful structure, organization and relations



Steps for Interpreting Given Information in Text

Step 1. Interpreting the Title

What does the title tell me?

Awareness of relationships among words/concepts in title and content

Step 2. Prior Knowledge of Theme

What do I already know?

Awareness of strategies for recalling existing knowledge

Step 3. Key Words and Concepts

What are the key words and ideas?

Identify, explain, mark or write difficult words and concepts

Step 4. Prior Word and Concept Knowledge

What words and ideas do I already know?

Broaden meanings for critical words and concepts in text

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Steps for Interpreting Given Information in Text

Step 5. Strategies for Recalling Information

What can I remember?

Use of new/additional strategies for recalling information

Step 6. Likenesses and Differences

How are words and ideas alike or different?

Knowledge of meaning relations for establishing semantic networks

Step 7. Cause-Effect, Time, Location, and Human-Relationships

What changes do I see?

Knowledge of cause-effects, times, locations, and emotions and their changes

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Steps for Interpreting Beyond the Given

Step 8. Application to Self and Others

How does it apply to my life?

Student - Ability to use and extend acquired information to related contexts

Step 9. Identifying and Organizing Main Ideas

What are the main ideas?

Student - Develop mental models for organizing text

Step 10. Predicting, Creating, Imagining

What can I predict or imagine?

Student - Ability to use information to predict, create, and imagine beyond the given

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Using Visual Maps for Planning, Organizing and Communicating

1. Develop critical thinking and assist in constructing individual and group knowledge
2. Facilitate storage of the constructed knowledge in memory as mental models such as for routines, scripts, or schema
3. Augment and structure existing knowledge
4. Integrate old and new knowledge for immediate and long term learning and application

MEANINGS OF ABSTRACT WORDS

Actions (How to get there?)
Discuss
Negotiate
Compromise
Agree
Document

Driving Forces (Reasons for existing)
Necessity, compromise, peace or safety, disagreement
Process: negotiation, compromise
Products: written, legal documents

Persons - Entities (Who's involved?)
Treaty parties: persons, representatives, governments, countries, tribes, religious

Functions/Outcomes
Guides relations
Orders or initiates aggressive action
Sets conditions
Contractual
Guarantees

Examples
Nuclear weapons ban; peace or cease fire Treaty

Definition
A written document that sets conditions and guides relations between two parties, arrived at through negotiation

Process - students generated the word in a history lesson. They were asked to identify aspects for each major dimension, then, by a category name, we drew examples related to each response in telegraphic form. Each student wrote a definition based on the word in the table.

MAP 97 0071

CONCEPT HIERARCHY FOR INFERENCE
Conceptual Master Map

Expression - Statement

People, Objects, Other
One
Several
Group
Other

CIRUMSTANCES
Places: Private, Public, Official, Other
Conditions: Physical, Emotional, Social, Other

Resources
Financials
Equipment
Permits
Other

Process - create a statement or expression at the top, detail each dimension, priority of each dimension step by step, detail details and reasons written for each dimension/level category.
Applications - and do (to generate) the organization of expressions or statements with multiple references such as songs or text. It sets boundaries, structure, categories, or sets, values, directions.

MAP 97 0071 -- Case Illustration

A narrative story task was introduced to a five-year-old boy with severe disorders of expressive language and articulation, but normal hearing and intelligence.

Nonverbal reasoning and problem solving were in the superior range, measured by *Matrix Analogies Test - E* (1985). He also demonstrated tactile and kinesthetic strengths.

Expressive language score fell 1.5 standard deviations below the mean on the *Clinical Evaluation of Language Fundamentals - Preschool* (1992).

He had unusual difficulty recalling, sequencing, and telling stories and personal events.

MAP 97 0071 -- Illustrative Procedure

A multimodality approach with conceptual mapping seemed appropriate for this boy.

It would use his significant visual and kinesthetic strengths and weaknesses to reinforce his weak expressive language.

It would help him comprehend relations among ideas in story parts.

It would help him organize and formulate his own story.

MAP 97 0071 -- Illustrative Procedure

The goal of this first lesson was for Ian to tell a story with a beginning, middle, and end.

I type the story he dictated on the computer and run off a copy for him.

I drew a "mind map" consisting of three squares.

I explained to Ian that the squares represented the three parts of a story, beginning, middle, and end.

Then I told him the story of "The Three Bears" using a picture book.

MAP IT OUT! – Illustrative Procedure

The idea that he could tell his own story was introduced by reviewing the story “mind map.”

He dictated his own simple story to me as I typed with a child’s computer program that placed pictures in the story to represent some of the words.

He retold the story of “Sara Raccoon” instead of an original story. Although it was not my intention for him to retell a story, I realized that he had greatly improved his ability to retell a story.

He supplied a beginning that included the characters and the setting, a middle with some of the events of the story, and an ending

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MAP IT OUT!

The Kindergartener’s Story

The Knights of the Golden Cup

Once upon a time there was a castle. There were four good knights and one King of the Lions. A long way off came the Dragon Knights and the Boss of the Dragons. And they say, “Give up!” And the Good Knights said, “No!” There was a huge battle.

The Dragon Boss said, “Give me the Gold Cup! I’m going to rule the castle.” The King of the Lions said, “No!” Then, they had a battle. Then, the Dragon Knights got in jail.

Then, there was a bunch of wind, a huge storm. Then, the skeleton of the Dead came in the storm. He said, “I want the cup.” So he fled up and got the Golden Cup. The Lion Knight said “We have to go to the Haunted Castle and get it back!”

There was lightning and a storm. The Skeleton got dead. Then the Lion Knights got the Golden Cup and put it in the Lion Castle. That was the end of the Skeleton of the Dead. The Golden Cup was safe forever. That is all.

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Selected Intervention Resources

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- Costa, A. L., & Lowery, L. F. (1989). *Techniques for teaching thinking*. Pacific Grove, CA: Midwest Publications.
- Hyerle, D. (1996). *Visual tools for constructing knowledge*. Alexandria, VA: Assoc. for Supervision and Curriculum Development.
- Wiig, E. H., Freedman, E., & Schreiber, L. R. (2011). *The WORD BOOK: Learning Words through Meaningful Connections*. Verona, WI: Attainment & The Cognitive Press.
- Wiig, E. H., & Wilson, C. A. (2000). *Map It Out! Visual tools for planning, organizing, and communicating*. Eau Claire, WI: Thinking Publications.
- Wiig, E. H., & Wilson, C. C. (2001). *The Learning Ladder: Assessing and developing text comprehension*. Eau Claire, WI: Thinking Publications.

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