

Cognitive Processing Model for Academic Learning

An integrated approach to
assessment and treatment.

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1

Disclosures

Financial: Currently no relevant financial relationship exists. In the future, I will receive a royalty for my Cognitive Processing Model online course that I am in the process of developing for Northern Speech Services.

Nonfinancial: No relevant nonfinancial relationship exists.

2

Cognitive Modifiability

“Structural changes refer not to isolated events but to the organism’s manner of interacting with, i.e., acting on and responding to, sources of information. **Thus, a structural change, once set in motion, will determine the future course of an individual’s development.**”

-Reuven Feuerstein

(Feuerstein, Falik, and Rand (2006), *Creating and Enhancing Cognitive Modifiability: The Feuerstein Instrumental Enrichment Program*, ICELP Publications, page 16.)

3

Cognitive Learning Model

Executive Functions

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4

Speech Development

Executive Functions

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5

Speech Development

IFG (left)
articulatory-based speech codes

STG (bilateral)
acoustic-phonetic mapping

MTG/ITG (left)
sound-meaning interface
lexical activation

(Poepffel, D. et al. 2008.)

6

Speech Development

Function: Speech processing

Skills???

Babbling, cooing, talking,
verbal sound play,
articulation...

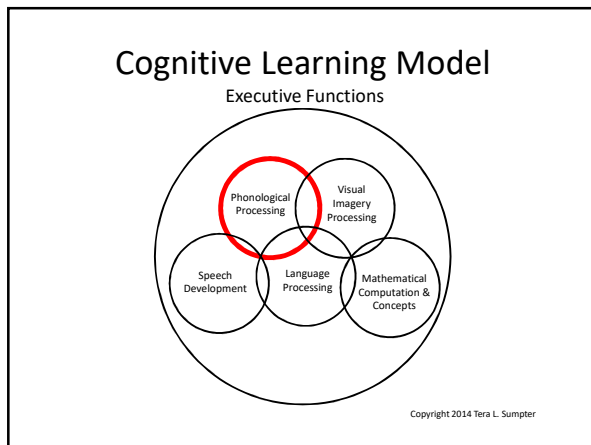
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Speech Development

More than HALF of children with
Speech Sound Disorders
experience difficulty with
reading!!!

(Bishop & Adams, 1990; Catts, Adlof, Hogan, & Weismer, 2004; Catts, 1986; Catts, 1991; Catts, Fey, Tomblin, & Zhang, 2002; McCardle, Scarborough, & Catts, 2001; Nathan, Stackhouse, Goulandris, & Snowling, 2004; Tomblin, Zhang, Buckwalter, & Catts, 2000).

8

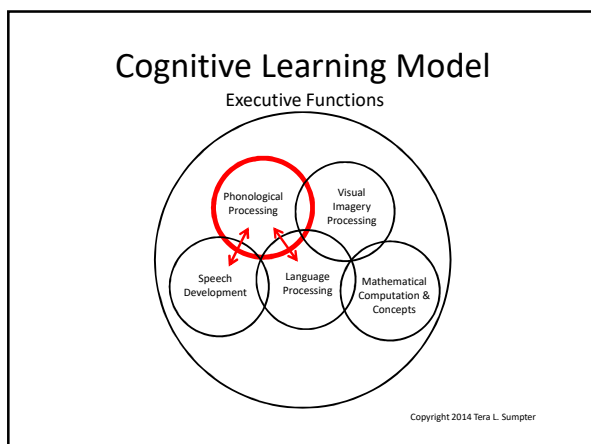


9

Phonological Processing

Phonological processing is the use of the sounds of one's language (i.e., phonemes) to process spoken and written language (Wagner & Torgesen, 1987).

10



11

Speech Development

A 28-year follow-up of adults with a history of moderate phonological disorder: educational and occupational results.

- Results revealed that, in comparison to control subjects, the proband adults (a group of 24 adults with a documented history of a moderate phonological/language disorder that persisted through at least the end of first grade) reported that:
 - they had received lower grades in high school,
 - required more remedial academic services throughout their school careers, and
 - completed fewer years of formal education.

Felsenfeld, Broen, and McGue (1994)

12

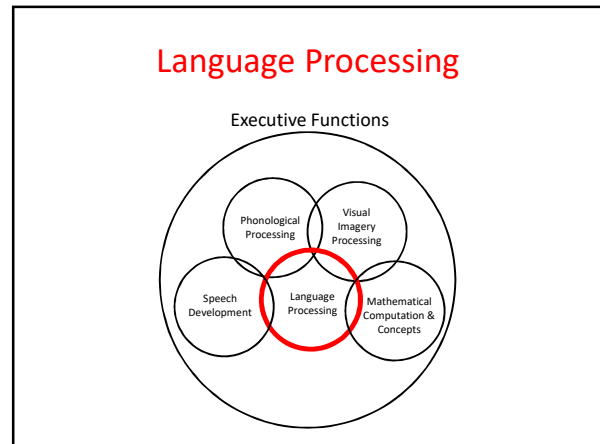
Phonological Processing

Function: Phonological processing

Skills???

Imitation, phonological awareness, phonics, decoding, phonetic spelling, reading accuracy...

13



14

Language Processing

“I don't think that we think in language, or think in words. I think we think in visual images, we think in auditory images, we think in abstract propositions about what is true about what.”

-Steven Pinker, experimental psychologist at Harvard University

15

Language Processing

“If I can't picture it, I can't understand it.”

-Albert Einstein

16

Language Processing

MENTAL WORKSPACE

Eleven areas of the brain are showing differential activity levels in a Dartmouth study using functional MRI to measure how humans manipulate mental imagery. (Schlegel, A. et al, 2013)

17

Language Processing

Function: Language processing **Skills:**

<p><u>Auditory Comprehension</u></p> <ul style="list-style-type: none"> • understanding lecture, • following directions, • acquiring vocabulary, • understanding concepts- concrete/abstract, • understanding relationships between words/ideas, • connecting to/understanding the world 	<p><u>Verbal Expression</u></p> <ul style="list-style-type: none"> • expressing oneself, • answering questions accurately, • using appropriate vocabulary, semantics, grammar, etc., • thought organization, • interacting with the world
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18

Language Processing

Language skills for Reading

- Vocabulary
- Context cues
- Reading comprehension
- Identifying the main idea
- Making inferences, predictions, etc.

19

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20

Visual Imagery Processing

Left Ventro-Occipital Cortex: Visual Word Form Area

(Dehaene, S. et al, 2010)

21

Visual Imagery Processing

Symbols

22

Visual Imagery Processing

- Skills
 - Sight word acquisition
 - Orthographic spelling
 - Reading rate
 - Reading fluency
 - Math computation skills (math facts)
 - Math symbols

23

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24

Math Computation & Concepts

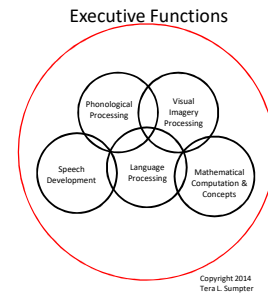
- ➔ VISUAL IMAGERY PROCESSING
 - Learn, access and utilize a new symbol set
- ➔ LANGUAGE PROCESSING
 - New vocabulary/language
 - Word problems

To solve a word problem successfully, a child must:

- process and comprehend the linguistic message
- access background knowledge of the relationships between sets of numbers
- determine the underlying problem structure/schema
- select a solution strategy and calculate the solution (Mayer, 2003)

25

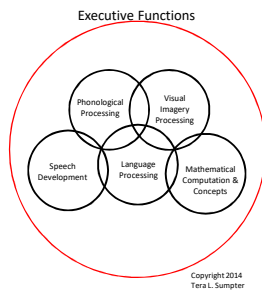
Cognitive Learning Model



26

Executive Functions

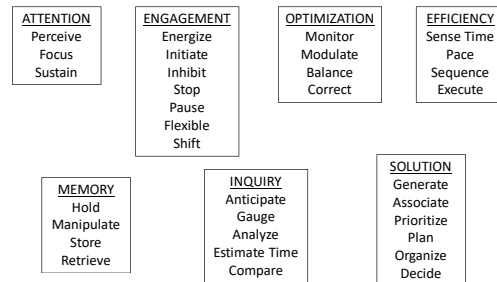
- System that regulates all cognitive processing



27

Executive Functions

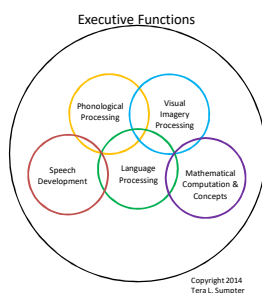
Executive Function Skill Clusters (McCloskey, 2015)



28

Executive Functions

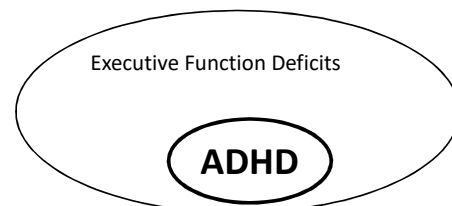
Cognitive Processing



29

Executive Functions

Executive Functions & ADHD



McCloskey, 2015

30

Executive Functions

Executive Functions & Social/Pragmatic Development

*You must **attend** to your conversational partner in order to comprehend and adjust to social cues- verbal and nonverbal.

*You must **inhibit** your own impulses during social situations in order for there to be some social give-and-take.

31

Executive Functions

Executive Functions & Impact on Learning

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32

Cognitive Learning Model & Literacy

PHONOLOGICAL PROCESSING

- Sound to symbol/phonics
- Sounding out/decoding
- Reading accuracy
- Phonetic spelling

VISUAL IMAGERY PROCESSING

- Word recognition/ Sight word acquisition
- Reading rate
- Reading fluency
- Orthographic spelling

LANGUAGE PROCESSING

- Vocabulary
- Context cues
- Reading comprehension
- Main idea, inferences, predictions

33

The Literacy "SHIFT"

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34

Cognitive Learning Model & Literacy

Executive Functions

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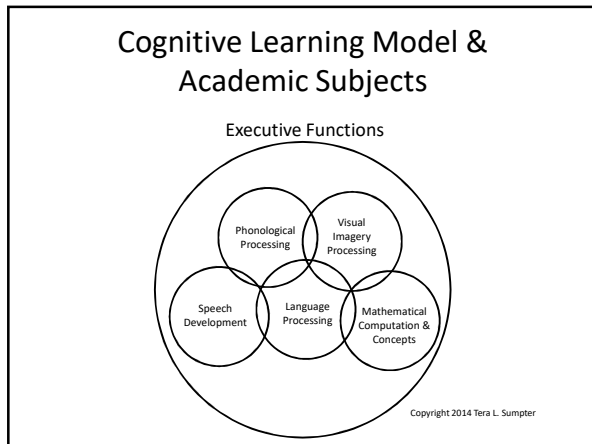
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Cognitive Learning Model & Literacy

Executive Functions

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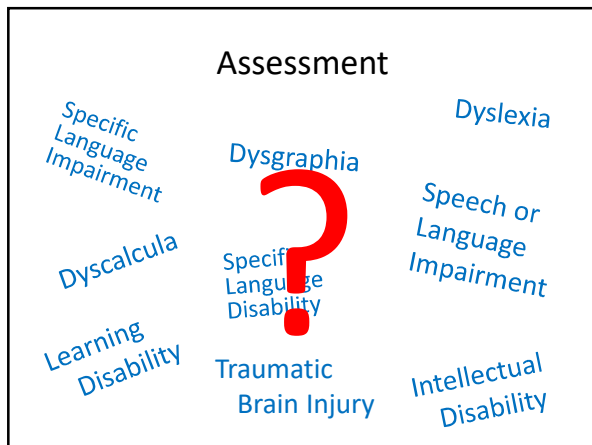
36



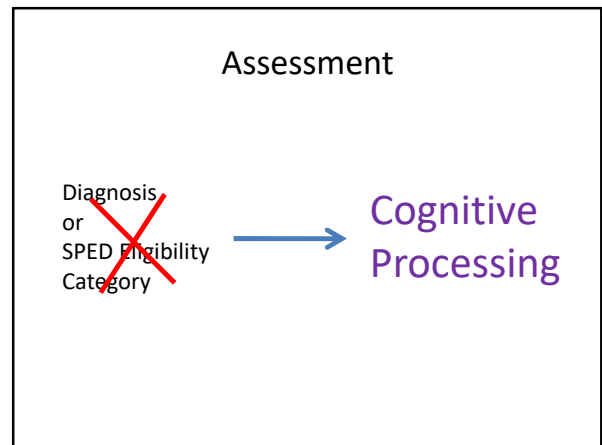
37

ASSESSMENT

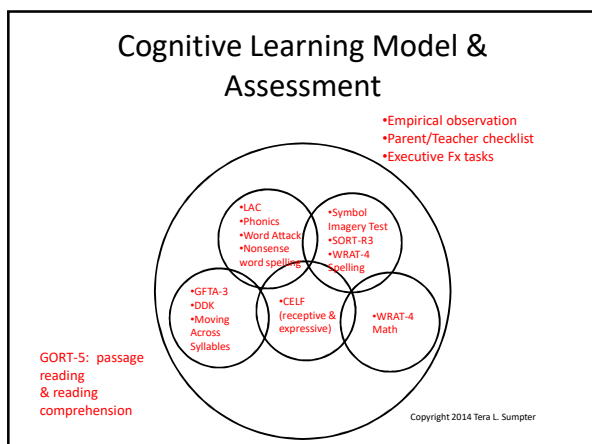
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39



40

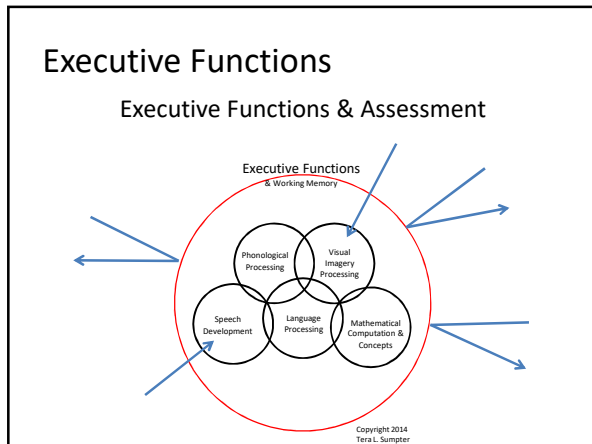


41

Assessment

- Take Note:
 - Does your assessment tool require more than one type of cognitive processing? (ex. Phonological processing assessed using verbal expression.)
 - Are you examining receptive & expressive pathways?
 - if assessing reading comprehension, always compare to oral comp!

42



43

- ### Executive Functions & Assessment
- Empirical observation
 - Noting everything from attention to redirection to impulsivity to ability to refocus
 - Parent/Teacher checklist or report
 - McCloskey Executive Functions Scale
 - Executive Fx tasks
 - Alphabetizing
 - Crossing out

44

Self-Talk/Alphabetizing 1 Level 1

What am I learning?
 Plan my strategy
 State my strategy aloud

■ Rewrite the following word list in alphabetical order.

family _____
 mischief _____
 hammock _____
 willow _____
 pocket _____
 bulk _____
 wallet _____
 calico _____
 temporary _____
 frolic _____
 doorknob _____
 umbrella _____
 janitor _____
 handle _____
 eggnog _____
 actually _____
 staircase _____
 poultry _____
 yesterday _____
 garage _____

Used the skill? Yes No

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45

Cancellation Activities Numbers 1

8	4	3	2	1	4	7	5	3	6	5	3	4
3	2	6	6	8	8	4	4	5	3	8	4	5
4	2	7	3	6	5	2	8	9	1	4	8	7
4	5	6	3	2	8	6	4	8	5	9	2	1
1	6	8	5	8	9	5	4	2	3	1	4	6
7	4	0	2	0	3	4	5	4	5	1	7	6
1	5	6	3	9	8	1	3	4	5	7	5	6
2	6	9	8	5	9	4	2	1	3	5	9	8
4	4	3	2	3	6	5	8	4	6	5	4	2
9	6	4	5	3	2	1	8	5	7	5	4	2
1	2	5	6	7	5	8	2	8	4	5	3	0
3	3	5	6	8	5	4	7	8	9	6	3	4
8	3	9	7	3	9	1	9	6	4	8	3	2
8	5	2	6	4	5	3	5	8	4	8	5	2
3	4	5	3	2	8	6	9	2	5	7	4	6
1	6	5	0	4	3	2	1	4	7	5	6	4
3	2	6	6	8	8	4	6	5	3	8	4	5
8	2	7	3	6	5	2	8	9	1	4	8	7
4	5	6	3	2	8	6	4	8	5	9	2	1
1	6	8	5	8	9	5	4	2	3	1	4	6
7	4	6	8	2	8	3	4	8	5	1	7	6
1	2	6	7	5	8	6	4	9	2	4	8	5
1	4	6	5	8	9	7	5	3	8	4	7	6
9	1	4	6	8	7	5	9	5	3	1	2	6
4	5	8	7	4	2	6	4	2	1	9	5	4
8	8	4	6	5	9	5	4	3	2	1	5	8
3	9	4	5	8	7	2	4	1	2	3	7	5
1	6	5	8	5	7	4	5	9	8	5	3	2
2	5	2	2	3	4	6	8	5	9	7	3	6
3	6	8	6	8	5	4	7	8	9	6	3	4
4	3	7	7	5	9	1	2	6	4	8	3	2
8	6	2	6	4	5	3	5	8	4	6	5	2
3	4	5	3	2	8	6	9	2	5	7	4	6
9	5	8	4	4	3	2	8	4	5	1	5	6
1	2	5	8	8	2	6	7	5	8	4	8	8
7	6	3	4	8	9	5	1	2	8	6	2	1

The Source® for Executive Function Disorders.
By Susanne Phillips Keeley

46

Assessment

ANSWERS ARE IN THE ERRORS!

47

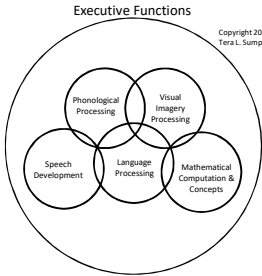
All of these kids got a below average score on their reading test.

48


Assessment

Tom (Grade 5.0, CA:11-1)

- LAC: 42nd percentile
- Word Attack: AE 13-1
 - 100% accuracy on 2-syll.; 20% acc on 3-syll.
- Phonological Encoding: 75% acc on 2-syll., 0% acc. on 3-syll.
- GORT-5: reading rate, accuracy, fluency all at 16th %ile



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DDK: moderate difficulty at 2 sound sequencing
Severe difficulty at 3 sound sequencing

49

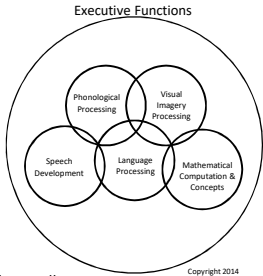
Let's problem solve...

Bobby

- Chronological Age: 9-5
- Grade Level: 3rd

Symptoms/Complaints

- Struggling in reading
- Sounds out most words
- Reading is slow and choppy
- Writing is phonetic
- Lots of letter reversals
- Reading comprehension is poor
- If information is presented orally, he does well
- Math is difficult- see number reversals and uses incorrect operations and has trouble keeping columns straight



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50

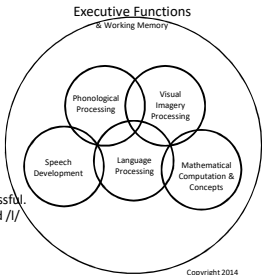
Let's problem solve...

Kelly

- Chronological Age: 10-8
- Grade Level: 5th

Symptoms

- Does well in math and science
- Comprehends everything presented orally
- Struggles in language arts
- Has had speech therapy since 4-years old.
- Traditional therapy has not been very successful.
- Has residual articulation errors of /r/, /s/ and /l/
- Speech is "slushy"
- Reading scores are below average
- Doesn't attempt to sound out when reading
- Guesses a lot when reading
- Spelling is not phonetic
- Reading comprehension is below average.
- Very hard working



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51

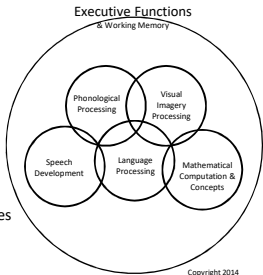
Let's problem solve...

Jacob

- Chronological Age: 15-2
- Grade Level: 9th

Symptoms

- Never turns in homework
- Extremely disorganized
- Has difficulty using a planner
- Doesn't take notes during class lectures
- Forgets books at school all the time
- Misplaces personal items
- Makes careless mistakes on work
- Doing poorly in all subjects
- Often procrastinates, difficulty initiating tasks/projects
- Difficulty with time management skills



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52

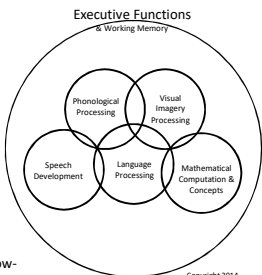
Let's problem solve...

Katie

- Chronological Age: 12-3
- Grade Level: 7th

Symptoms

- Reading fluency and accuracy are good
- Reading comprehension is poor
- Zones out during class lectures
- Has trouble explaining her responses to questions orally and in writing
- Has trouble following and participating in class discussions
- Has trouble following classroom instructions
- Doesn't understand classroom material
- Verbal and written expression is hard to follow- very disorganized and jumps from idea to idea
- Doing poorly in math
- Teachers say she's simply lost
- Homework takes a long time



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53

Let's problem solve...

TEACHER: "These students aren't understanding what they're reading."
All 3 of the following students have reading comprehension below the 9th percentile.
Where is the processing breakdown? Do they have reading comprehension issues?

Joey	Karen	Suzi
•Residual artic issues	•Reading rate: 90 th percentile	•Reading rate: 5 th percentile
•Reading rate: 50 th percentile	•Reading accuracy: 75 th percentile	•Reading accuracy: 37 th percentile
•Reading accuracy: 13 th percentile	•Phonological Processing: 84 th percentile	•Phonological Processing: 50 th percentile
•Phonological Processing: 1 st percentile	•Nonsense word decoding: 50 th percentile	•Nonsense word decoding: 75 th percentile
•Nonsense word decoding: 5 th percentile	•Sight words: 63 rd percentile	•Sight words: 2 nd percentile
•Sight words: 37 th percentile	•Oral language comprehension: 10 th percentile	•Oral language comprehension: 90 th percentile
•Oral language comprehension: 75 th percentile		

54

Let's problem solve...

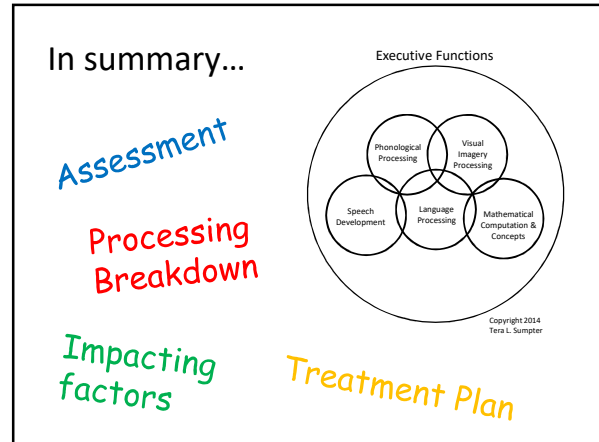
Kelly B.: 5th grade

Clinical Evaluation of Language Fundamentals-Fourth Edition (CELF-4)

	Standard Score	Percentile
Core Language	109	73 rd
Receptive Language	102	55 th
Expressive Language	108	70 th

Subtest	Scaled Score	Age Equivalent	Percentile
Concepts & Following Directions	13	>12-11	84 th
Recalling Sentences	12	13-3	75 th
Formulated Sentences	13	17-9	84 th
Word Classes-Receptive	8	9-2	25 th
Word Classes-Expressive	9	9-6	37 th
Word Classes-Total	8	9-4	25 th

55



56

Let's Stay in Touch...

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57

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58

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59

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